# SHOULD TAXES BE INDEPENDENT OF AGE?[1]

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## Abstract

Raising marginal tax rates at income x distorts work incentives at income x, and increases tax collected from people with greater income. Distortions per dollar of revenue are therefore proportional to f(x)/(1-F(x)), where F is the cdf of income. This hazard rate is five times greater for youth than prime-age workers. The deadweight loss of taxation is even more than five times greater, since young people are likely to have particularly elastic labor supply. Finally, lower marginal tax rates for youth equalize the lifetime income distribution, since income when young is only weakly correlated with lifetime income.

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## I. Introduction

Under the Mirrlees [1971] optimal tax model, the optimal marginal tax rate at a particular income depends on the hazard rate of the income distribution, the elasticity of labor supply, and distributional considerations [Diamond 1998]. All three factors imply that marginal taxes should be lower for youth than for prime age workers.

To see why optimal marginal tax rates depend on the hazard rate of the income distribution, recall that the tax on someone of income q, T(q), can be represented as the tax on someone with zero income, plus the integral of the marginal tax rate from 0 to q:
Perturbing the tax schedule by increasing the marginal tax rate on income earned in the interval $[x, x + \Delta x]$ reduces work incentives for people with income in the interval, and increases tax revenue collected from all those with income greater than x. Under quasi-linear utility, the distortion of effort per dollar of revenue collected is proportional to the hazard rate of the income distribution, $f(x)/(1 - F(x))$, where f is the density of the income distribution, and F is the cumulative distribution function. For 22 - 64 year-old workers, the effect of raising the marginal payroll tax rate on earnings in the interval [0, $5,000] is illustrated in the top panel of Figure 1, which was constructed with data on earnings from the March 1992-1995 Current Population Survey (CPS). Approximately 13 percent of this population has earnings in this interval and will therefore face reduced work incentives. Increased tax revenues, however, will be collected from the entire population. The ratio of marginal to infra-marginal taxpayers is ten times larger in the more compressed income distribution for youth, as illustrated in the bottom panel of Figure 1, which shows the distribution of earnings for 17-21 year olds. Over sixty percent of the population of young people would face a distortion from an increase in the marginal tax rate in the interval (0, $5,000 per year).

Over a wide range of income levels, hazard rates -- and thus the number of people for whom work incentives are reduced per dollar of revenue gained from increasing marginal rates -- are typically more than five times greater for 17-21 year-olds than for 31-64 year-olds. Hazard rates for 22 - 26 year-olds are typically more than twice those for prime-age workers.

To see the intuition for why reducing taxes on the first $5,000 of earnings for youth and raising them slightly for prime-age workers improves efficiency, note that taxes on the first $5,000 of income are marginal taxes for the typical young person, but infra-marginal lump-sum taxes for the typical prime-age worker. Replacing a marginal tax with a lump-sum tax improves efficiency.

Reducing marginal tax rates for the young not only improves work incentives at little cost in lost revenue, but also focuses work incentives on the people who are most responsive to those incentives. Although there is no definitive evidence on differences in labor supply between youth and prime-age workers, the work of Clark and Summers [1981] suggests that labor supply elasticities for teenagers may be much greater than for prime-age workers.

Finally, distributional concerns militate towards lower marginal tax rates for young people. Data from the National Longitudinal Survey of Youth indicate that the correlation between earnings when 18 to 21 and earnings 8 years later is only 0.1, so that the distribution of permanent income is likely to be equalized by reductions in marginal tax rates for young workers, combined with revenue-neutral increases in marginal tax rates for older workers.

The chief potential disadvantage of reducing marginal tax rates on young people is that it might distort the choice between education and work. This will only be a serious problem if education subsidies are insufficient to offset positive externalities from education and if the education decision is elastic to labor market conditions. (To the extent that credit constraints prevent people from obtaining education, reducing marginal tax rates on the young is likely to *increase* education.) If necessary, education distortions could be minimized by restricting tax reductions to full-time students working part-time, to age groups in which few people attend school, or to income levels characteristic of students working part-time. Remaining distortions could be counteracted by combining reductions in marginal tax rates on the young with subsidies for education designed to leave average incentives for school relative to work unchanged. Since reductions in marginal tax rates for young people lead to such a small revenue loss per person for whom incentives are improved, it will typically be possible to finance both the tax cuts and the

associated educational subsidies with increases in marginal taxes on prime-age workers, while still reducing the average distortion of the labor-leisure tradeoff across all age groups.

This principle that taxes should be conditioned on observable, immutable indicators of skill goes back at least to Akerlof [1978].[2] Akerlof focuses on how the *distributional* effects of the tax system can be improved by conditioning the *intercept* of the tax system on observable characteristics correlated with poverty, such as blindness or single parenthood. In contrast, this paper also examines how the *efficiency* of the tax system can be improved by conditioning *marginal* tax rates on observable characteristics. Whereas the distributional advantages of conditioning the intercept of the tax system on observable characteristics depend on the correlation between the observable characteristics and income, the efficiency benefits of conditioning marginal tax rates on observables depend on differences in the hazard rates of the income distribution between groups with different observable characteristics. Thus, although 19 year-olds are no poorer in lifetime income than 45 year-olds, the optimal tax system will have lower marginal tax rates for 19 year-olds than for 45 year-olds.

The remainder of this paper is organized as follows. Section II reviews the Mirrlees optimal tax model, as presented by Diamond [1998], and adapts it to allow for age-specific taxation. Section III applies this model to U.S. data, and argues that the model suggests substantial gains from conditioning taxes on age. Section IV discusses the impact of age-specific taxation on education. Section V discusses how the analysis could be applied to other demographic groups, such as senior citizens, women, and minorities. The concluding section notes that the current system of social security taxes is implicitly conditioned on age and sex in exactly the opposite way to that suggested by theory. It then argues that although conditioning taxes on race or sex would not be feasible, conditioning taxes on age has ample precedent and might well be politically feasible.

Two limitations of this analysis should be noted. First, this paper merely argues that

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2 Zeckhauser [1970] makes the related point that medical insurance coverage should be conditioned on observable variations in the diseases that affect customers.

given the current tax system, in which taxes are not conditioned on age, welfare will be improved by small reductions in marginal tax rates for youth combined with revenue-neutral increases in marginal tax rates for prime-age workers. I do not attempt to solve for the optimal schedule of age-specific taxes. Whereas only weak assumptions and observable data are needed to show that the first-order condition for an optimal tax system are far from satisfied when tax rates are independent of age, solving for the optimal age-specific tax schedule would require fully specifying the social welfare function and the process determining ability at various ages. Second, the analysis is based on the static Mirrlees model. In order to abstract from inter-temporal issues, I will consider a model in which output is non-storable, and no mechanism exists for enforcing inter-temporal contracts. A more satisfactory analysis must await the development of a dynamic version of the Mirrlees model.

## II. The Model

In this section, I lay out the basic Mirrlees optimal tax model, as presented by Diamond [1998], and adapt it to account for observable immutable differences between people, taken here to be differences in age.

The population is a continuum of mass one with each person's skill level (taken to be her marginal product and thus in a competitive labor market her wage) indexed by $w$. I assume that there is some minimum ability $\underline{w}$ and some maximum ability . Each person also has an observable age, indexed by $i \in \{1, \ldots, I\}$ . Each individual has the representative utility function $u$ defined over consumption and labor supply.

I write the joint distribution function of age and ability as $F_i(w)$ and its associated density (assumed to be strictly continuous) as $f_i(w)$, so that

and

where $\&_i$ is age group $i$'s population share.

The government chooses taxes as a general non-linear function, $T_i(y)$, of income, y, and

age, I, to maximize the integral of some non-decreasing concave social welfare function $S_i$; S is subscripted by age to allow for the possibility that society may value additional income for a 19-year-old differently than for a 45- year-old with the same income. This formulation is fairly general; it may be reasonable to further specify that the weight in the social welfare function of someone of ability w and age i will depend on the expected lifetime ability of someone who has ability w at age i. The government chooses taxes to maximize social welfare subject to the constraints that the government must raise a fixed amount of revenue and that taxpayers choose work effort optimally based on the tax schedule.

This paper follows Diamond [1998] in specializing the Mirrlees model to the case of quasi-linear utility. (Drozd and Kremer [2000] show that the results are typically stronger under more general utility functions that allow for income effects.) Slightly adapting Diamond's results to allow for the fact that age is observable yields a first-order condition for optimal taxation given positive labor supply:

where, slightly modifying Diamond's notation,

where $\_i(w)$ denotes the elasticity of labor supply at wage $w$, and

where $\lambda$ is the multiplier on the government budget constraint.

The interpretation of these terms is as follows. As discussed in the introduction, the inverse hazard rate $A_i(w)$ determines the revenue raised from an increase in the marginal tax rate per person distorted by the tax.

$B_i(w)$ varies inversely with the labor supply response to marginal tax rates -- if the elasticity of labor supply is large, a given marginal tax rate is relatively more distortionary. The multiplicative term $1/w$ weights the marginal tax-generated labor supply reduction by the cost of this reduction in labor supply: at high wages, any given reduction in labor supply is more costly.

$C_i(w)$ measures the distributional impact of raising marginal taxes. It is the welfare impact of taking a dollar away from each agent of type i with skill greater than $w$[3] and using it to

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3 Given quasi-linear utility, a unit reduction in income implies a unit reduction in utility.

loosen the government's budget constraint. Intuitively, it is possible to think of this extra revenue as reducing the revenue requirement, thus allowing a lump-sum refund of taxes to all agents, so that the implicit value of this loosening is _, the multiplier on the budget constraint.

This condition for optimal marginal tax rates is effectively the same as in Diamond (1998), except for the modifications that skill levels, utility, tax functions, and distribution-related functions are all differentiated by age group. Note that this first-order condition for an optimal tax system implies that Group *j*'s *marginal* tax rate should be less than group *k*'s at the optimum if and only if $A_j(w)\, B_j(w)\, C_j(w) < A_k(w)\, B_k(w)\, c_k(w)$.

In addition, there is another condition that arises when agents are distinguishable by age: the age-specific intercepts of the tax system, $T_i(0)$, must be set such that social welfare is unaffected by lump-sum transfers among age groups. For the tax system to be optimal, the increment in social welfare created by giving a dollar to all seventeen year-olds must be equal to the increment in social welfare created by giving an additional dollar to all forty-five year-olds.

In the absence of credit constraints, changing the pattern of taxation over the life-cycle by varying the intercept of the tax schedule with age would not affect the time-path of consumption. Taxpayers would simply reallocate borrowing and saving to maintain their path of consumption over time. However, given that credit markets are imperfect, lowering T(0) for young people and making up the lost revenue by increasing T(0) for prime-age workers may help people smooth consumption and finance investment, for example in human capital.[4]

Assuming that the social planner can use the age-specific intercepts of the tax system, $T_i(0)$, to influence the distribution of income among age groups, marginal tax rates, $T_i.(w)$, will determine income distribution among people of different current earning ability within age groups. The average $S_i.(u_i(w))$ is the same for all age groups under the optimal tax system, but the weight in the social welfare function for someone of given ability will typically depend on

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4 The desire to redistribute from relatively rich, younger cohorts to poorer, older cohorts works in the opposite direction. However, such transfers could be accomplished by taxing, say, 45 year-olds and transferring the revenue to 60 year-olds.

their age. It is natural to assume that at ages when w is correlated with permanent income, S., the weight in the social welfare function will be sensitive to w, and at ages when w is less correlated with permanent income, S. will be less sensitive to w. Redistribution from people with high to low current income within an age group will therefore be more desirable in age groups in which current income is correlated with permanent income.

In practice, the design of the tax system may be subject to the additional constraint that taxes must always be less than income, and in particular that $T_i$ (0) œ 0. If this constraint is binding, age-specific marginal tax rates will be an instrument for transferring income between age groups, as well as within them. In the presence of credit constraints, it seems likely that the planner would want to transfer income to people when they are young, so that they could invest in human capital and smooth consumption over their lifetime.

Allowing for income effects by generalizing the analysis beyond the tractable case of quasi-linear utility considered by Diamond is likely to strengthen the case for reducing marginal tax rates for youth. In the presence of income effects, reductions in marginal tax rates at income x not only reduce revenue, but also aggravate any pre-existing labor supply distortions for people with income greater than x, since beneficiaries of the tax cut will reduce labor supply. (See Triest [1990b]. ) Since prime-age workers are more likely to face high marginal rates and thus to have large pre-existing labor supply distortions, income effects are also likely to militate towards reducing marginal tax rates for youth and increasing marginal rates for prime-age workers, at least if the young and prime-age workers have similar income elasticities of labor supply. Drozd and Kremer [2000] use a generalization of Diamond's [1998] analysis by Saez [1999] to allow for income effects. We find sufficient conditions under which a revenue-neutral tax reform which reduces marginal tax rates for young workers would improve welfare.

## III. Empirical Analysis

This section argues that hazard rates for the young are greater than those for prime-age

workers, so $A_y < A_p$, where y denotes young workers and p denotes prime-age workers; that young workers have a more elastic labor supply than prime-age workers, so $B_y < B_p$; and that income when young is relatively uncorrelated with income later in life, so under reasonable social welfare functions, $C_y < C_p$. Together this implies that $A_yB_yC_y < A_pB_pC_p$, and hence that marginal tax rates should be lower for the young. This section then briefly examines two issues outside the standard optimal tax framework, credit constraints and crime, arguing that both militate towards low marginal taxes on youth.

## A. Hazard Rates

The empirical analysis is conducted with data on earnings, rather than wages.[5] Since people differ not only in ability, as assumed in the Mirrlees model, but also in preferences and endowments, two people with the same skill may have different labor supply and earnings. A cut in marginal payroll taxes at a particular earnings level reduces taxes paid by all people with greater *earnings*, not all people with wages greater than the average wage earned by people at that earnings level. Moreover, although wages correspond to the theoretical concept of skills better than earnings, slight mistakes in measuring the number of hours worked per week could lead to large errors in estimated wages, particularly for people who work few hours.[6]

I focus on hazard rates of the earnings distribution, rather than the taxable income distribution, because it is probably better to condition payroll, rather than income, taxes on age. Conditioning income taxes on age would be complicated for spouses of different ages. Moreover, conditioning income taxes on age is likely to be politically difficult, but conditioning social security contributions on age is more intuitively appealing.

Earnings data are taken from the person file of the March 1992-1995 Current Population Surveys (CPS).[7] Log earnings in each year were converted to 1993 equivalent log earnings by

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5 Results with wages are fairly similar to those with taxable income.

6 One problem is that the observed earnings distributions are the result of the current distribution of tax rates by age, and as discussed in the conclusion, effective tax rates are currently higher for younger workers.

7 Note that CPS data on earnings, particularly for low earners, are subject to measurement error.

subtracting mean log earnings for the year, and adding mean 1993 log earnings. The sample was restricted to the working population. ( Hazard rates for those with zero earnings are shown in the row labeled "Zero Earnings.") Earnings are the sum of wage and salary earnings and self-employment earnings. The earnings data are top-coded at $100,000 for each source of income, but this does not affect the hazard rates calculated at earnings levels below the top-code.[8]

Table 1 and Figure 2 show the ratio of the hazard rate of the earnings distribution at various ages to the hazard rate of the earnings distribution for 31 through 64 year-olds.[9] In order to give a sense of where the mass of the distribution lies, Figure 2 includes "x" for the earnings level closest to the 25th and 75th percentile of earnings for that particular age. The figures in parentheses in Table 1 show the percentage of the working population at the age level with earnings in or below the earnings interval. The bottom row shows the average ratio of hazard rates for the age group across all income levels, weighted by the proportion of population in each income interval. The weighted average ratio of hazard rates is 32 for 17 year-olds, 9 for 19 year-olds, 5 for 21 year-olds, 3 for 23 year-olds and 2 for 25 year-olds.

The ratio of hazard rates is shown for earnings levels encompassing 95 percent of the distribution in the age group. At higher earnings levels, the number of observations in each $2,000 earnings interval becomes small, and the empirically calculated hazard rates therefore jump around from one $2,000 earnings interval to the next.

The row labeled "zero earnings" shows the ratio of the hazard rates for people who did not work. Note that for workers 20 and under, this ratio is greater than one, but for workers between 21 and 30, it is less than one. The high hazard rates at zero earnings among older cohorts are likely to be due to the greater number of retirees and of women who are not in the labor force in these cohorts. Since more women are working full time in younger cohorts, it

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8 The raw data exhibit spikes at $5,000 intervals because people have a tendency to report earnings at $5,000 levels. Therefore, the raw earnings data are smoothed with an Epanechnikov kernel using a fixed bandwidth of $1,000. The density is estimated at $2,000 intervals on points between $0 and $46,000. (The results are not very sensitive to this smoothing, or to the particular choice of bandwidth.)

9 The hazard rate is computed as the ratio of the number of people with taxable earnings in the earnings interval to the number of people with taxable earnings above the earnings interval.

seems likely that the ratio of hazard rates at zero earnings will rise in the future. Under the Mirrlees model, a reduction in the marginal tax rate at a positive earnings level will have no effect on the labor supply of people with zero earnings. However, if there are fixed costs of getting a job, reductions in taxes on people with low earnings could encourage some non-workers to work.

In the absence of labor supply response, the marginal tax increase on prime-age workers at a particular earnings level needed to maintain revenue neutrality given a one percentage point cut in marginal tax rates on youth at the same earnings level is the ratio of the hazard rate for prime-age workers to that for the young times the ratio of the number of young people to the number of prime-age workers at the earnings level. Algebraically, the marginal tax increase on prime-age workers needed to maintain revenue neutrality in the absence of labor supply response is

where $N_y$ and $N_o$ are the total populations of young and prime-age workers, respectively. The marginal tax rate on all older workers at $10,000 of earnings would only need to increase by 0.02 percent to finance a one percentage point reduction in marginal taxes on 17 to 21 year-olds, or by about 0.12 points to finance a one point reduction in marginal taxes on 22 to 26 year-olds.

Eliminating the 12.4 percent old-age component of the social security payroll tax for young workers and their employers would require only a small payroll tax increase for 31 - 64 year-olds. For example, abolishing the old-age component of social security taxes on the first $5,000 in earnings for 17 to 21 year-olds would reduce tax revenue by $4.9 billion. This revenue could be recouped by increasing the tax rate on the first $5,000 in earnings of 31-64 year-olds by 1.3 percentage points. Alternatively, it could be recouped by increasing the threshold above

which people pay no social security tax from its 1993 level of $57,600 by approximately $5,000, to $62,600. Abolishing the old-age component of social security taxes for 17 to 25 year-olds would reduce revenue by $11.9 billion. This could be made up by increasing the OASDI tax by 3.2 percentage points for 31-64 year-olds over the same earnings range or by increasing the threshold above which people pay no social security tax by roughly $17,000.

These calculations do not allow for labor supply response to the tax changes. Since more young people are infra-marginal, and their labor supply is more elastic, the necessary tax increases are likely to be even smaller if one allowed for labor supply response. (On the other hand, prime-age workers are likely to be paying higher income taxes. Thus a given increase in their social security tax will represent a greater percentage decrease in their after-tax wage, and thus may spur a larger labor supply response.)

**B. Labor Supply Elasticity**

The second determinant of optimal marginal tax rates is labor supply elasticity. Differences in labor supply elasticity between workers of various ages are likely to significantly strengthen the case for reducing marginal tax rates for young workers. Not only is the revenue cost of improving work incentives for young workers smaller than the revenue cost of improving work incentives for prime-age workers, but young workers are also likely to be much more sensitive to work incentives than prime-age workers. While many prime-age workers are likely to work approximately forty hours a week over a wide range of possible wage rates and tax levels, many young people are on the margin between getting a job and not, or are deciding how many hours to work part-time. According to the 1996 Current Population Survey, unemployment among sixteen- to nineteen-year olds is 15 percent, in contrast to 4 percent among adults. The limited available evidence suggests that younger workers have more elastic labor supply than prime-age workers. Clark and Summers [1981] find that a macroeconomic shock that causes a 1 percent decline in prime-age male unemployment is associated with approximately a 4 percent increase in the proportion of teenagers employed. Under the

assumption that this reflects a change in labor demand with a constant labor supply function, and that the change in labor demand is not biased towards particular age groups, this would suggest that labor supply elasticity for youth is much higher than that for prime-age workers. There are a number of reasons, however, why this may not be an accurate guide to the relative labor response of youth and prime age workers to changes in taxes. The greater fluctuation in employment of youth with the business cycle may be due not only to differences in labor supply elasticities, but also due to differential labor demand shifts; coverage by minimum wage legislation, or insulation from the market by specific human capital. Moreover, workers may respond differently to changes in tax rates than to favorable labor market conditions created by macroeconomic booms. Nonetheless, it seems likely that young workers have more elastic labor supply than most prime-age workers.[10]

**C. Distributional Impact**

The distributional effect of changes in marginal tax rates with age on the distribution of permanent income depends on the correlation between income when young and permanent income.

Figure 3 illustrates that if the correlation between income when young and permanent income is perfect and the distribution of earnings shifts up or spreads out over time, then reducing taxes for people with earnings above a certain level when young benefits people with high lifetime earnings. Raising marginal tax rates at the same earnings level for prime-age workers reduces the income of a larger group that also includes people further down the lifetime earnings distribution.

In contrast, if the correlation between income when young and permanent income is zero, then reductions in marginal tax rates for youth benefit a representative cross section of the population, whereas increases in marginal tax rates at a particular income x for prime-age

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10 Married women and older workers probably have elastic labor supply. (See Section V.)

workers reduce income for people with higher permanent income. Thus lowering marginal tax rates for youth and raising them for prime-age workers would equalize the distribution of lifetime income.

In fact, earnings when young and permanent income are only weakly correlated. Data from the National Longitudinal Survey of Youth indicate that the correlation between average earnings when age 18 to age 21 and average earnings when age 26 to age 29 was only 0.094.[11] Table 2, taken from Diamond et al. [1976], shows the correlation between log earnings of men at various ages, as reported to the Social Security Administration from 1956 to 1972.[12] Correlations were calculated based only on men with positive earnings at each of the ages under consideration.[13] The number of observations used to construct each correlation is approximately (500)(17-|age difference|). Log earnings are standardized relative to mean log earnings in that year. The upper left-hand entry shows that the correlation between earnings when age 33 and age 32 is 0.75. Reading down this column, the correlation between earnings when age 33 and earnings when age 31 is 0.67. Reading across, the correlation between earnings when age 53 and when age 51 is 0.73. The correlation is much lower at younger ages. For example, the correlation between earnings when age 40 and age 53 is 0.51, and the correlation between earnings when age 30 and age 43 is 0.4, but the correlation between earnings when age 20 and when age 33 is only 0.15.

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11 The sample size for the set of people for whom earning data were available between age 18 and 21 and between age 26 and 29 was 2,422. All earnings were calculated in real terms. People with zero earnings are included. The correlations were somewhat higher between the income of people in the single year of 1979 and their income in 1993. The correlation between the earnings of people who were age 18 in 1979 and their earnings in 1993 was only 0.13. The correlation between earnings of those who were age 19 and their earnings in 1993 was 0.11. The correlations at ages 20 and 21 were 0.13 and 0.21 respectively. The sample sizes for 18, 19, 20, and 21 year olds are 697, 585, 530, and 520 respectively. It was impossible to obtain figures for younger workers, since sample sizes for these younger workers would have been under age 50. I thank Jacob Vigdor for these calculations.

12 It is impossible to update the analysis because the micro-data is no longer available due to privacy concerns. Income is imputed for those above the taxable maximum based on the quarter in which the taxpayer hit the maximum. Since the taxable maximum was low relative to average wages in the 1960's, the estimated correlations may be off.

13 Note that this analysis differs from the NLSY analysis because of the earlier time period and the restriction of the analysis to males with positive earnings at each age.

## D. Credit Constraints

The standard optimal tax framework is static, and thus excludes credit constraints. Reducing taxes on youth may alleviate credit constraints that prevent youth from smoothing consumption and taking advantage of investment opportunities, including education. Hubbard and Judd [1987] find that exempting the first 15 years of earnings from social security taxes would create major welfare improvements — under some specifications, equivalent to those from a 5 percent increase in lifetime income -- by mitigating credit constraints.

As Section I discussed, credit constraints could be alleviated through lump-sum grants to young people financed by lump-sum taxes on prime-age workers. However, if one takes the intercept of the tax schedule as fixed, (for example because the constraint that T(0) œ 0 binds) then reducing marginal rates for the young will mitigate credit constraints.

## E. Crime

Crime is another factor outside the Mirrlees model which militates towards lower marginal tax rates for youth. To the extent that people face a tradeoff between labor and crime, rather than between labor and leisure, increasing the attractiveness of work may help reduce negative externalities from crime. Young people are particularly likely to face such a tradeoff: one-third of all Californian men born in 1956 were arrested between the ages of 18 and 30 [Tillman, 1987; cited in Grogger, 1998.] People under 21 constituted almost 60 percent of those arrested for Index property crimes, 37 percent of those arrested for Index violent crimes, and 33 percent of those arrested for non-Index crimes[14] [Herrnstein and Wilson 1985]. The arrest rate for property crimes among 15 to 19 year-olds is twenty times that among 50-54 year olds [Herrnstein and Wilson 1985, Figure 2].

The evidence on the effect of labor market conditions on crime is mixed, but Freeman [1995] summarizes it as indicating that improvements in labor market conditions typically

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14 Index crimes are homicide, rape, robbery, aggravated assault, larceny, burglary, and auto theft.

modestly reduce crime. For example, Lee [1993] finds that a one point increase in unemployment raises property crimes by 1.1 to 1.4 percent. Grogger [1998] finds that a 10 percent decline in wages increases criminal participation by 1.5 to 2 percentage points.

## IV. Age-Specific Taxation and Human Capital Investment

Section II argued that under the Mirrlees model, the optimal marginal tax rate for youth is likely to be smaller than that for prime-age workers, and that at the margin, the deadweight loss of taxation could be cut dramatically by reductions in marginal tax rates for the young, coupled with revenue-neutral increases in marginal tax rates on prime-age workers.

This section examines the effect of lower taxes for youth on human capital investment, an issue that cannot be addressed under the Mirrlees model, with its single time period. Reductions on taxes on youth could either increase or decrease human capital investment. To the extent that young people under-invest in education due to credit constraints, reductions in taxes on youth will make it easier for them to finance their education, either by working part time while in school or by working full time to save money for school. On the other hand, conditioning tax rates on age also creates incentives for people to move income from ages at which they face high marginal taxes to ages at which they face low marginal taxes. This implies that reducing tax rates for youth could lead people to choose jobs with less on-the-job training or to substitute work for education. Sub-Section IV.A. argues that distortions of education are not likely to be too serious. Sub-Section IV.B. argues that potential distortions could be minimized through targeting tax cuts at earnings levels characteristic of part-time students and could be counteracted by combining tax reductions on the young with educations subsidies designed to preserve incentives for education relative to work.

### A. Would Reductions in Taxes for Youth Seriously Distort Education?

Increasing incentives for work relative to education will reduce distortions if education subsidies outweigh positive externalities to education; create only second-order welfare effects if

the two are of similar magnitude; and will lead to serious distortions if positive externalities outweigh education subsidies.

A conservative estimate based on Gladieux and Hauptman [1995] is that federal, state, and local government subsidies and gifts and endowment for higher education are $4,900 per student per year.[15] Tax distortions may increase the cost of college by about $944 per year, so the after-tax subsidy for attending college may be approximately $3,955 per year.[16] There is little empirical evidence of positive externalities from education, let alone externalities of this magnitude. Acemoglu and Angrist [1999] for example, find that estimated social returns to education are less than one percent and insignificantly different from zero.

Even if positive externalities of education outweigh current subsidies for education, then the desirability of reducing marginal tax rates for youth would depend on the relative number of people who will be drawn into work from leisure and from education. There is limited evidence on this subject, but extending the Clark-Summers analysis discussed above sheds light on whether youth drawn into employment by higher wages are likely to be drawn primarily out of education or out of inactivity. The top entry in each cell of Table 3 shows the change in the employment-population ratio and the enrollment-population ratio associated with a one percent change in the employment-population ratio among 35-44 year-old males. These figures are based on the estimated elasticities of the employment-population ratio and enrollment rates among various age groups to the employment-population ratio among 35 to 44 year-old males,

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15 This excludes the value of land and buildings owned by colleges and universities and government grants and contracts, which may further subsidize education.

16 The pre-tax return on education is generally higher than the post-tax return, since under progressive taxation, marginal taxes are typically lower on the income foregone by not working as a college-student than on the extra income earned later due to education, and since out-of-pocket education costs are not deductible. According to CPS data, 17-21 year-olds with high school diplomas earned an average of $3,772 more if they were not students. The earnings foregone by students may be greater, if their earning ability is larger than that of non-students. Suppose foregone earnings are 1.5 times $3,772, or $5,658. Since the average marginal income tax rate for people with at least some college and positive earnings is 13 percent, whereas that for 17-21 year-old non-students with positive earnings and high school diplomas is 7 percent, differential taxation raises the opportunity cost of attending college by 0.06 * $5,658 = $340. Out-of-pocket educational expenditures averaged $2,017 in 1990-91, and assuming a 30 percent marginal tax rate (including social security and state and local taxes), non-deductibility of educational expenditures therefore increases the marginal cost of education by an additional $605 annually, for a total tax distortion of $944 annually.

the two are of similar magnitude; and will lead to serious distortions if positive externalities outweigh education subsidies.

A conservative estimate based on Gladieux and Hauptman [1995] is that federal, state, and local government subsidies and gifts and endowment for higher education are $4,900 per student per year.[15] Tax distortions may increase the cost of college by about $944 per year, so the after-tax subsidy for attending college may be approximately $3,955 per year.[16] There is little empirical evidence of positive externalities from education, let alone externalities of this magnitude. Acemoglu and Angrist [1999] for example, find that estimated social returns to education are less than one percent and insignificantly different from zero.

Even if positive externalities of education outweigh current subsidies for education, then the desirability of reducing marginal tax rates for youth would depend on the relative number of people who will be drawn into work from leisure and from education. There is limited evidence on this subject, but extending the Clark-Summers analysis discussed above sheds light on whether youth drawn into employment by higher wages are likely to be drawn primarily out of education or out of inactivity. The top entry in each cell of Table 3 shows the change in the employment-population ratio and the enrollment-population ratio associated with a one percent change in the employment-population ratio among 35-44 year-old males. These figures are based on the estimated elasticities of the employment-population ratio and enrollment rates among various age groups to the employment-population ratio among 35 to 44 year-old males,

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15 This excludes the value of land and buildings owned by colleges and universities and government grants and contracts, which may further subsidize education.

16 The pre-tax return on education is generally higher than the post-tax return, since under progressive taxation, marginal taxes are typically lower on the income foregone by not working as a college-student than on the extra income earned later due to education, and since out-of-pocket education costs are not deductible. According to CPS data, 17-21 year-olds with high school diplomas earned an average of $3,772 more if they were not students. The earnings foregone by students may be greater, if their earning ability is larger than that of non-students. Suppose foregone earnings are 1.5 times $3,772, or $5,658. Since the average marginal income tax rate for people with at least some college and positive earnings is 13 percent, whereas that for 17-21 year-old non-students with positive earnings and high school diplomas is 7 percent, differential taxation raises the opportunity cost of attending college by 0.06 * $5,658 = $340. Out-of-pocket educational expenditures averaged $2,017 in 1990-91, and assuming a 30 percent marginal tax rate (including social security and state and local taxes), non-deductibility of educational expenditures therefore increases the marginal cost of education by an additional $605 annually, for a total tax distortion of $944 annually.

movements in employment dwarf the movements in enrollment, suggesting that most of the people who are pulled into employment by lower taxes will be pulled out of inactivity, rather than education. For example, a one percent change in the employment ratio of 35-44 year-old males is associated with a 1.91 percent increase in employment among 16-19 year-olds, and a (statistically insignificant) fall in enrollment of 0.15 percent among 16-17 year-olds.

Previous research on the effect of labor market conditions on enrollment is mixed. Grubb [1988] and Manski and Wise [1983] find little relationship between labor market conditions and enrollment. Betts and McFarland [1995] and Dellas and Sekellaris [1995], however, find a strong relationship. Venti and Wise [1983] do not find a relationship between the state unemployment rate and the decision to apply to college, although they do find that higher local wages deter application to college. Kane [1994] finds that the state unemployment rate is not significantly related to enrollment decisions in any of his specifications for blacks, and is significantly related to enrollment in only one of his specifications for whites. Card and Lemieux [1997] find that labor market conditions have a strong impact on school attendance by men, but not women. Note that enrollment rates are likely to vary more in response to a temporary macroeconomic boom than a permanent change in taxes, because people may well choose the *timing* of their education based in part on available job opportunities.

In summary, distortions of education due to tax reductions on youth are a potentially serious problem only if three conditions are met: 1) education is under-provided due to positive externalities rather than due to credit constraints; 2) each year of education creates positive externalities of substantially more than the net subsidy of approximately $3,955; *and* 3)

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where "EP" stands for the Employment-Population or Enrollment-Population ratio for a particular age group X, and t stands for time. The analysis is based on that of Clark and Summers, but differs in several ways. This analysis incorporates data from 1951 through 1993, whereas Clark and Summers used data only through 1976. It allows for a cubic time trend for each demographic group, whereas Clark and Summers allow for two linear time trends, one beginning in 1967; the independent variables are the current and one-year lagged annual employment-population ratio for 35-44 year-old men, rather than the current and lagged quarterly unemployment rates; and in this analysis we estimate the regression using both the dependent and independent variables in levels as well as in logs, whereas Clark and Summers measure the dependent variable in logs and the independent variable in levels. We use the sum of the $\delta_i$ coefficients to generate elasticities.

education is elastic to wages. All three propositions are open to doubt.

**B. Policies to Reduce Educational Distortions**

If distortions of education were considered potentially serious, they could be minimized by targeting marginal tax reductions to students or to low income levels characteristic of students with part-time jobs, or by combining marginal tax reductions for youth with education subsidies.

The Youth Incentive Entitlement Pilot Project (YIEPP) subsidized employers who offered full-time summer jobs and part-time school year jobs to disadvantaged youth between 16 to 19 in certain cities, but restricted eligibility to students who stayed in school. In a review of the literature on YIEPP, Katz [1998] finds that the YIEPP increased employment, but had no effect on school enrollment rates.

Another, less administration-intensive option would be to reduce marginal tax rates for youth only at low earnings levels characteristic of students working part-time. For example, the first $5,000 of earnings could be exempted from social security taxes. $5,000 is approximately what students would earn if they worked at the minimum wage of $5.15 full-time during the three summer months and 15 hours per week during the school year, while taking 9 weeks off for school breaks and finals. Since any earnings from additional hours of work would be taxed at the full rate, such a tax exemption would not tempt students to quit school in order to work full time.[18]

Reductions in marginal tax rates for the young could be combined with education subsidies, so as to keep the overall incentives for education neutral while increasing incentives for people to substitute work for leisure. Some simple back-of-the-envelope calculations

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18 There is little evidence that working while in school is harmful. Using data from the National Longitudinal Survey of Youth, Ruhm [1997] found that 6 to 9 years after graduation, people who worked 20 hours per week as high school seniors earn 21 percent more annually than people who were not employed as high school seniors. His results are robust to estimating an equation for selection into the workforce and controlling for co-variates including whether the student smoked or used drugs, family income, and scores on the Armed Forces Qualification Test. Further evidence that work often substitutes for leisure rather than for education is provided by Turner [1996], who finds that working 20 hours per week reduces time spent doing homework by only 3.2 percent (7.3 minutes per week), but reduces time spent watching television by 19.9 percent (3.6 hours per week).

discussed in more detail in an earlier version of this paper [Kremer 1997] suggest that since reducing marginal tax rates for the young does not greatly reduce government revenue, taxes on prime-age workers could finance both reductions in marginal tax rates for youth and the education subsidies required to keep the work-school tradeoff unchanged, while still reducing average distortions of the labor-leisure tradeoff. For example, at age twenty and an earnings level of $10,000, the ratio of hazard rates is 6.5. This implies that 6.5 times as many workers would face improved work incentives as reduced work incentives if marginal tax cuts on twenty-year olds at $10,000 of earnings were combined with revenue-neutral marginal tax increases on prime-age workers at $10,000 of earnings. Approximately equal numbers of twenty-year olds are in work and school, so that if each 20-year old in school received an education subsidy equal to the average value of the tax cut for working 20-year olds, the total subsidies required to maintain the relative attractiveness of education and work for the young would be comparable to the total tax revenue lost from youth. A slight additional subsidy would be needed to preserve incentives for education, since prime-age workers would pay higher marginal taxes at $10,000 of earnings, and going to school increases the likelihood of earning more than $10,000 as a prime-age worker. Overall, if it were necessary to pay for subsidies to maintain incentives for education relative to work, the increase in incentives among young workers from a revenue-neutral tax change would still be 3.1 times larger than the reduction in work incentives among older workers.

It is important to note that reductions in taxes on youth could create a number of other distortions besides those involving formal education. First, they may distort on-the-job training for those who would have had a job in any case. Because on-the-job training is difficult to observe, it would be difficult to provide compensating subsidies. However, reducing taxation on young workers could as easily increase as decrease on-the-job training, because reductions in taxes are likely to increase youth employment, and on-the-job training is impossible without a job. Second, low tax rates for youth will encourage people to work more when young and less in their prime-age years. However, the consensus view is that inter-temporal elasticities of labor

hours are fairly low [MaCurdy 1981].[19] Finally, lower marginal tax rates on youth may induce young people living at home to work more hours, and their parents to work fewer. To the extent that the young face lower marginal tax rates than prime-age workers, this intra-household substitution is inefficient. The earnings of young people living at home are typically counted in the household's earnings for the purpose of income taxes. However, as discussed in the conclusion, young people currently face higher effective marginal social security tax rates than prime-age workers with the same earnings, so reducing marginal taxes on them may actually equalize various family members' work incentives.

## V. Applying the Analysis to Other Groups

This section discusses how a similar analysis might be applied to other demographic groups, such as senior citizens, women, and minorities.

Like the young, the elderly have high hazard rates and elastic labor supply. Based on data from the March 1992-95 CPS, the ratio of the hazard rate of the distribution of labor income for 65-70 year-olds to the hazard rate for 25-61 year-olds is between three and four at earnings less than $11,000. (Sixty percent of 65 to 70 year olds who work make less than $11,000 annually.) At higher earnings the ratio of hazard rates is smaller, and the ratio falls below one for earnings greater than $26,000. Similarly, for workers older than 70, the ratio of hazard rates is more than five for the sixty percent of the population who earn less than $8,000, but is much smaller at higher earnings.[20] However, the ratio of hazard rates of the *wage* distribution drops from about 2.25 at four dollars an hour to below one at wages above ten dollars an hour. (This hazard rate of the wage distribution may be more relevant, since the social security earnings test, which implicitly creates a very high marginal tax rate on labor income for the elderly, is likely to dramatically affect earnings of the elderly.) The labor supply elasticity of the elderly is high.

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19 See Mulligan [1995], however, for an alternative view.

20 Since the elderly have relatively more capital income, the ratio of the hazard rates of the distribution of taxable income are much closer to one.

Using data on changes in the social security earnings test, Friedberg [2000] finds a labor supply elasticity for older workers of 0.343, substantially above the level of 0.2 typically found for the workforce as a whole.[21] Income when old is likely to be more correlated with permanent income than income when young, so distributional considerations suggest a stronger case for marginal tax reductions for youth than for the elderly.[22]

The analysis also suggests that a tax system which maximizes a standard social welfare function would have low marginal tax rates for women and minorities. Hazard rates are 1.5 to 2 times greater among women than men, and 1.2 to 1.5 times higher among blacks than among whites. Married women have substantially greater labor supply elasticity than their husbands [Triest 1990a; Eissa 1994]. Low marginal tax rates for women and minorities would equalize income distribution. To see this, note that reductions in marginal tax rates at an income x for group A financed by increases in marginal rates at income x for group B will shift income from members of group B earning more than x to members of group A earning more than x. Such tax changes will equalize income distribution, for any level of x, if the distribution of earnings for group B first-order stochastically dominates the distribution for group A. We therefore need to check for conditional first-order stochastic dominance. Conditioning taxes on sex or race is likely to create smaller distortions than conditioning taxes on age, since it does not create incentives to shift income across time.[23]

Empirically, the distributions of earnings for men and whites conditionally first-order stochastically dominate the distributions for women and blacks, respectively.[24] Using labor

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21 Note, however, that Burtless and Moffitt [1985] and Gustman and Steinmeier [1986] find little impact of the earnings test on labor supply. However, their papers were not able to take advantage of the changes in the earnings test exploited by Friedberg.

22 One problem with lowering marginal tax rates for senior citizens is that workers just below the age of eligibility might arrange with their employers to postpone receiving income until after they are eligible for the program. The analogous problem of young workers shifting forward their labor income seems much less severe, since the young workers would have to commit to remain with their current employer. It is likely to be much harder for young workers to commit to stay with their firm than for firms to commit to retain their old workers.

23 If wives faced lower marginal taxes than their husbands, relative labor supply decisions within the household would be distorted.

24 Note that this analysis takes the intercept of the tax system as given. Under the optimal tax system, the sex-specific intercepts of the tax system would be set so as to equalize the value of an additional dollar to men and

earnings data for adults (people aged between 18 and 65 years, inclusive), I estimate the cumulative earnings distributions for men, women, whites, and blacks. Using these distributions, I then construct cumulative distributions for these groups conditional on earnings being above $1000, $2000, and so on to $50,000. The difference of the conditional distribution for men over that of women was everywhere positive for each of the fifty conditional earnings levels; the same was true for whites over blacks except for one conditional earnings level ($5000). (This is not entirely true—the difference between whites and blacks became negative for some earnings values over $150,000; however, this is likely due to the very small number of observations, particularly for blacks, in the CPS at these earnings levels) This suggests that conditional first-order stochastic dominance holds for men over women and whites over blacks for the types of budget-neutral tax reforms I consider in this paper.

The contradiction between the principles of maximizing a race- and sex-independent concave social welfare function and having a race- and sex-independent tax code implies that either the tax code should not be independent of race, or that economists' concept of the social welfare function is an inadequate representation of standard ethical beliefs. One indication that the social welfare function is not sufficiently flexible to represent our ethical beliefs is that many people who support affirmative action would oppose conditioning taxes on race and sex, even though affirmative action is often thought of as sacrificing efficiency for equity, while conditioning taxes on race would reduce conventional measures of deadweight loss.

Conditioning social security taxes on age is likely to be much more acceptable than conditioning taxes on race or sex. Everyone is 19 at some point in their lives, but not everyone is black or female.

## VI. Conclusion and Policy Implications

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women. Lower marginal taxes for women at an income x would be distributionally desirable if the distribution of after tax income for men earning more that x first-order stochastically dominates the distribution of after-tax income for women earning more than x.

This paper has argued that reductions in marginal tax rates on the young, combined with revenue-neutral increases in marginal tax rates on prime-age workers, would increase work incentives for young people by many times as much as they would reduce work incentives for prime-age workers. This is primarily because the tax reductions on the young would typically be reductions in marginal taxes, whereas the tax increases on prime-age workers would typically be infra-marginal. Moreover, the improvement in work incentives would be targeted to the most responsive workers, since young people probably have more elastic labor supply than prime-age workers. Finally, because income when young is not strongly correlated with permanent income, these revenue-neutral tax changes would equalize the distribution of lifetime income. Based on the analysis above, it seems likely that the marginal deadweight loss of taxation is at least five times greater for youth than for prime-age workers, suggesting that revenue-neutral reductions in taxes on youth, financed by increases in marginal taxes on prime-age workers, would reduce the deadweight burden of the shifted taxes to less than one-fifth its current level. How large an absolute gain this represents depends on the absolute deadweight loss of taxation. Estimates of the average deadweight loss of taxation vary, but to the extent that there is a consensus estimate, it is probably Jorgenson and Yun's [1991] estimate of $0.30 in deadweight losses per dollar of revenue raised. Given this estimate, a reasonable guess might be that the marginal deadweight loss of taxation is $0.20 per dollar of revenue for prime-age workers and $1.00 for youth, implying $0.80 in deadweight losses could be avoided for every dollar of taxes transferred from youth to prime-age workers.

The model suggests marginal tax rates should be low for the young and the elderly. The actual tax system in the United States implicitly conditions taxes on demographic status in almost the opposite way from that suggested by theory. Since social security benefits are based on the thirty-five years of highest earnings, the 12.4 percent old age component of the social security contribution is effectively a pure tax for people under 30, but the net tax rate is much smaller for older workers, and is negative for some workers close to retirement (Feldstein and

Samwick, 1992).[25]

The social security earnings test, alluded to in section V, reduces social security benefits by one dollar for every two dollars in earnings over a $7,680 threshold for workers between 62 and 65 years old, and by one dollar for every three dollars of earnings over a $10,560 threshold for workers between 65 and 69 [Department of Health and Human Services 1994].[26]

The current social security system also implicitly taxes many married women at a higher marginal rate. This is because people can choose to have their social security benefits based either on the sum of the earning of both spouses, or on 1.5 times the earnings of the spouse with higher earnings. For many couples, it is more advantageous to base benefits on the husband's earnings. Feldstein and Samwick [1992] calculate that for middle-class couples in their forties, the net social security payroll tax was equal to the full statutory rate for wives, but only 3.8 percent for husbands [Feldstein and Feenberg 1996].

A first step in improving the tax system would be to by equalize effective marginal tax rates, by eliminating the Social Security Earnings test, calculating benefits based on lifetime earnings, rather than the 35 years of highest earnings, and restoring the secondary earner deduction, as suggested by Feldstein and Feenberg [1996]. While the main problem with conditioning taxes on age was that it might create intertemporal distortions, equalizing tax rates across age will actually eliminate one source of intertemporal distortions.

Going beyond equalizing marginal tax rates by age to a system in which youth and the elderly have lower marginal tax rates than prime-age workers would be worthwhile if the benefits discussed in this paper outweighed the administrative costs involved and the risk that conditioning the tax system on age would set a precedent for conditioning the tax system on other, less appropriate variables.[27] As noted in the introduction, this paper has simply argued

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25 Marginal tax rates faced by college students may be even higher, because scholarship support may be reduced in response to increased outside income. On the other hand, work-study programs may subsidize work.

26 Threshold levels are given for 1993, the same year for which the earnings distribution data was taken.

27 It is sometimes argued that allowing one change in the tax code will open the floodgates for more, but the theory behind this assertion is unclear.

that the first order conditions for maximizing a concave social welfare function will be violated if marginal tax rates are equal across ages. It has not estimated the optimal tax system, or the difference in social welfare between the current system and such an optimal system. This would depend on the details of the elasticity of the labor supply and social welfare function. Assessing the magnitude of the welfare gains from particular tax changes is an important topic for future work.

In any case, if marginal tax rates for youth were to be reduced, they could be reduced either directly, or through tax credits for employers. Tax credits to employers may be preferable if the minimum wage is binding, so that increases in the incentive of the young to work will not necessarily increase employment. It might also be administratively easier to restrict reductions in marginal tax rates to students employed in part-time and summer jobs if the program were implemented through employers.

A precedent for tax incentives for youth employment is provided by the experience of the Targeted Jobs Tax Credit (TJTC). The TJTC, which was in operation throughout most of the period from 1979-1994, offered tax credits to employers hiring qualified economically disadvantaged youth, as well as a few other targeted groups. Originally, disadvantaged youths between 18-24 were eligible, but in 1989, eligibility was restricted to those between 18 and 22 years old. Using this change in eligibility, Katz [1998] estimates that the TJTC increased employment by 3.4 percentage points, or 7.7 percent. Since wage costs were reduced approximately 15 percent by the program, this suggests an elasticity of 0.5 [Katz 1998].[28]

Further precedent is provided by the example of Switzerland, where social security taxes are explicitly conditioned on age [Social Security Administration 1995]. France reduces its payroll tax for employers who hire workers in certain categories, which are defined partly on the

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28 The main problem with the TJTC was that take-up was low -- approximately 9 percent among eligible employed economically disadvantaged youth. This may have been partially due to the stigma associated with being categorized as an economically disadvantaged youth. Burtless [1995] found that a group of workers who received vouchers and were trained to inform potential employers about the vouchers were less likely to find jobs than a control group which did not. This stigma would presumably disappear if the program were extended to all young workers.

basis of age. Reductions in payroll taxes of this sort may be particularly politically appealing as a way of fighting unemployment, and in particular, youth unemployment. In 1991 in France, the unemployment rate for 25 to 64 year-old males was only 6 percent, but among 20 to 24 year-old males it was 15.6 percent, OECD [1993].

Tax credits for employers hiring youth are not likely to displace other workers from their jobs in the long run. Under a model with two factors, capital and homogeneous labor, an increase in the number of young people working will reduce the marginal product of labor in the short run, causing some older workers to drop out of the labor force. In the long run, however, the capital stock will increase in order to accommodate the increase in the working population. If capital is the only fixed factor and the labor of young and old are perfect substitutes, there will be no long-run change in employment among the old. If the labor of young and old workers are imperfect substitutes, then the increase in the supply of young workers will actually increase employment of older workers.

Conditioning social security tax rates on age need not alter the distribution of income across cohorts. One way of keeping the system revenue neutral, cohort by cohort, would be to lower marginal tax rates for the young, but raise the intercept by raising taxes (or reducing benefits) for young people with zero income. Alternatively, the system could be made revenue-neutral on a cohort-by-cohort basis if it were introduced with a particular cohort. Each cohort would face lower marginal tax rates when it was young, and then pay back the lost revenue with higher marginal tax rates when old. For example, the system could be introduced for people born in 1980, and taxes for all people born before 1980 could be left unchanged.

Most people would find it unpalatable for the government to condition taxes on observable characteristics other than age, even if an efficient tax system would do so. People might not want government officials to have this power, and might fear that conditioning taxes on such attributes might stimulate considerable rent-seeking. Kremer [1996] proposes a system through which firms could assume individuals' tax obligations in exchange for lump-sum payments that would be determined by the market. The firms would be responsible for paying

the taxes that the individuals would have paid, had the taxes not been bought out. In order to determine how much taxes people would have paid if their taxes had not been bought out, a small sample of applicants for the program would be denied the opportunity to participate in the program, and would be taxed according to the existing tax schedule. This system would create some of the efficiency benefits of conditioning taxes on observable attributes, without requiring the government to differentiate between people.

## Table II

### Correlation between Wage-Indexed Earnings at Different Ages

| Age | 33 | 43 | 53 | Age | 33 | 43 | 53 |
|---|---|---|---|---|---|---|---|
| Age Difference | | | | Age Difference | | | |
| -1 | .75 | .80 | .79 | +1 | .75 | .80 | .80 |
| -2 | .67 | .72 | .73 | +2 | .70 | .72 | .75 |
| -3 | .60 | .68 | .70 | +3 | .64 | .68 | .70 |
| -4 | .54 | .66 | .67 | +4 | .61 | .67 | .67 |
| -5 | .50 | .63 | .64 | +5 | .57 | .63 | .64 |
| -6 | .46 | .59 | .61 | +6 | .56 | .62 | .62 |
| -7 | .38 | .58 | .61 | +7 | .55 | .59 | .58 |
| -8 | .32 | .54 | .58 | +8 | .53 | .58 | .56 |
| -9 | .29 | .52 | .54 | +9 | .51 | .58 | .54 |
| -10 | .25 | .50 | .55 | +10 | .50 | .55 | .47 |
| -11 | .20 | .48 | .54 | +11 | .49 | .53 | .45 |
| -12 | .17 | .45 | .51 | +12 | .44 | .52 | ---- |
| -13 | .15 | .40 | .51 | +13 | .45 | .46 | ---- |
| -14 | ---- | .40 | .50 | +14 | .45 | .48 | ---- |
| -15 | ---- | .39 | .44 | +15 | .43 | .41 | ---- |
| -16 | ---- | .31 | .50 | +16 | .45 | .38 | ---- |

Source: U.S. Joint Committee Report, 1976.

**Table III**

**Employment-Population Ratio and Enrollment-Population Ratio. Changes Corresponding to a One Percent Increase in the Employment-Population Ratio Among 35-44 Year-Old Males.**

Top entry in each cell shows change in Employment-Population and Enrollment-Population Ratios in response to one percentage point change in Employment-Population Ratio among 35-44 year-old males, based on calculated elasticities from a regression in levels, evaluated at the means. Second entry shows the elasticity calculated from a regression in logarithms, with its standard error immediately below in parentheses. Regression specifications are described in the text, and include a cubic time trend.

| | **Change in Employment** | | **Age Group** | **Change in Enrollment** | |
|---|---|---|---|---|---|
| **Age Group** | **Men** | **Women** | | **Men** | **Women** |
| **16-19** | 1.91 | 1.14 | **16-17** | -0.15 | 0.06 |
| | 3.69 | 2.70 | | -0.16 | 0.07 |
| | (0.27) | (0.39) | | (0.19) | (0.25) |
| | | | **18-19** | -0.23 | 0.31 |
| | | | | -0.43 | 0.71 |
| | | | | (0.71) | (0.70) |
| **20-24** | 2.09 | 0.76 | **20-21** | 0.60 | 0.65 |
| | 2.49 | 1.29 | | 1.66 | 2.51 |
| | (0.17) | (0.22) | | (1.16) | (1.37) |
| | | | **22-24** | 0.09 | -0.02 |
| | | | | 0.41 | -0.21 |
| | | | | (1.66) | (2.20) |
| **25-34** | 1.41 | 0.50 | **25-29** | -0.13 | -0.29 |
| | 1.43 | 0.92 | | -1.27 | -4.90 |
| | (0.06) | (0.20) | | (1.36) | (2.97) |
| | | | **30-34** | 0.01 | -0.01 |
| | | | | 0.18 | -0.12 |
| | | | | (1.42) | (2.29) |
| **35-44** | 1.00 | 0.58 | | | |
| | - | 0.98 | | | |
| | | (0.15) | | | |
| **45-54** | 0.84 | 0.51 | | | |
| | 0.86 | 0.86 | | | |
| | (0.05) | (0.20) | | | |
| **55-64** | 0.61 | 0.48 | | | |
| | 0.75 | 1.15 | | | |
| | (0.12) | (0.23) | | | |

Note: Employment data are seasonally adjusted and based on the civilian population from 1951-1993. They are taken from the Bureau of Labor Statistics publication "Employment and Earnings". Enrollment data are from the Current Population Survey publication B20-479, "School Enrollment -- Social and Economic Characteristics of Students: October 1993". School enrollment includes anyone who is enrolled at any time during the term or school year in any public or private regular school. It does not include students at trade schools, business colleges, or other schools which do not advance students to regular degrees.

**References**


Acemoglu, Daron, and Joshua Angrist, "How Large are the Social Returns to Education? Evidence from Compulsory Schooling Laws," NBER Working Paper No.7444, 1999.

Akerlof, George, "The Economics of 'Tagging' as Applied to the Optimal Income Tax, Welfare Programs, and Manpower Planning," American Economic Review, LXVIII (1978), 8-19.

Betts, Julian, and Laurel McFarland, "Safe Port in a Storm: The Impact of Labor Market Conditions on Community College Enrollments," Journal of Human Resources, XXX (1995), 765.

Burtless, Gary, "Are Targeted Wage Subsidies Harmful? Evidence from a Wage Voucher Experiment," Industrial and Labor Relations Review, XXXIX (1985), 105-14.

Burtless, Gary, and Robert A. Moffitt, "The Joint Choice of Retirement Age and Post-Retirement Hours of Work," Journal of Labor Economics, III (1985), 209-236.

Card, David, and Thomas Lemieux, "Adapting to Circumstances: The Evolution of Work, School, and Living Arrangements among North American Youth," NBER Working Paper No. 6142, 1997.

Clark, Kim and Lawrence Summers, "Demographic Differences in Cyclical Employment Variation," Journal of Human Resources, XVI (1981), 61-77.

Dellas, Harris, and Plutarchose Sakellaris, "On the Cyclicality of the Demand for Education: Theory and Evidence," June 22, 1996.

Diamond, Peter, "Optimal income Taxation: An Example with a U-shaped Pattern of Optimal Marginal Tax Rates," American Economic Review, LXXXVIII (March 1998), 83-95.

Diamond, Peter; Anderson, Richard; and Yves Balces. Report of the Consultant Panel on Social Security to the Congressional Research Service. (Washington, DC: U.S. Government Printing Office, 1976), Appendix B.

Eissa, Nada, "Taxation and the Labor Supply of Married Women: The Tax Reform Act of 1986 as a Natural Experiment," NBER Working Paper No. 5023, 1995.

Feldstein, Martin, and Andrew Samwick, "Social Security Rules and Marginal Tax Rates," ____ National T

Feldstein, Martin, and Daniel Feenberg. "The Taxation of Two Earner Families," in M. Feldstein and J. Poterba, eds. Empirical Foundations of Household Taxation. (Chicago, IL: University of Chicago Press, 1996), 39-74.

Freeman, Richard B. "The Labor Market" In Crime, ed. James Q. Wilson and Joan Peterson. (San Francisco, CA: Institute for Contemporary Studies, 1995), pp..

Friedberg, Leora, "The Labor Supply Effects of the Social Security Earnings Test," Review of Economics and Statistics, LXXXII, (2000), 48-63.

Gladieux, Lawrence E., and Arthur M. Hauptman, The College Aid Quandary: Access, Quality and the Fec

Grogger, Jeff, "Market Wages and Youth Crime," Journal of Labor Economics, XVI (October 1998), 756-791.

Grubb, W. Norton, "Vocationalizing Higher Education: The Causes of Enrollment and Completion in Public Two-Year Colleges, 1970-1980," Economics of Education Review, VII (1988), 301-19.

Gustman, Alan L., and Thomas L. Steinmeier, "A Structural Retirement Model," Econometrica, LIV (1986), 555-584.

Hubbard, R. Glenn and Kenneth L. Judd, "Social Security and Individual Welfare: Precautionary Saving, Borrowing Constraints, and the Payroll Tax," American Economic Review, LXXVII (1987) 630-646.

Jorgenson, D.W., and K. Yun, "The Excess Burden of Taxation in the United States," Journal of Accounting, Auditing & Finance, VI (1991), 487-508.

Kane, Thomas J, "College Entry by Blacks Since 1970: The Role of College Costs, Family Background, and the Returns to Education," Journal of Political Economy, CII (1995), 878-911.

Katz, Lawrence F, "Wage Subsidies For The Disadvantaged," in *Generating Jobs*, R. Freeman and P. Gottschalk, eds., (New York, NY: Russell Sage Foundation, 1998), pp.21-53.

Kremer, Michael, "Pareto-Improving Tax Reform," 1996.

Kremer, Michael, "Should Taxes Be Independent of Age?" NBER Working Paper 6304, 1997.

Lee, David Sang-Yoon, "An Empirical Investigation of the Economic Incentives for Criminal Behavior," B.A. thesis in economics, Harvard University, March 1993.

MaCurdy, Thomas E., "An Empirical Model of Labor Supply in a Life-Cycle Setting," Journal of Political Economy, LXXXIX (1981), 1059-1085.

Manski, Charles, and David Wise, College Choice in America, Cambridge, MA: Harvard University Press, 1983.

Mirrlees, J. A, "An Exploration in the Theory of Optimum Income Taxation," Review of Economic S

Mulligan, Casey B, "The Intertemporal Substitution of Work -- What Does the Evidence Say?"

University of Chicago, Population Research Center Discussion Paper Series #95-11, June 1995.

OECD, Employment Outlook, Paris: OECD, 1993.

Ruhm, Christopher J, "Is High School Employment Consumption or Investment?" Journal of Labor Ecor

Social Security Administration, Office of Research and Statistics, Social Security Programs Throughou

Triest, Robert, "The Effect of Income Taxation on Labor Supply in the United States," Journal of Human Resources, XXV (1990a), 491-516.

Triest, Robert, "The Relationship Between the Marginal Cost of Public Funds and Marginal Excess Burden," American Economic Review, LXXX (1990b), 557-566.

Turner, Mark D, "The Effects of Part-Time Work on High School Students Academic Achievement," Ph. D. dissertation, University of Maryland, 1996.

U.S. Department of Health and Human Services, Office of the Actuary, History of the Provisions of Old-Age, Survivors, Disability, and Health Insurance 1935-1993, June 1994.

U.S. Senate Committee on Finance and U.S. House of Representatives Committee on Ways and Means, Report of the Consultant Panel on Social Security to the Congressional Research Service, Washington, DC: U.S. GPO, 1976.

Venti, S. And D. Wise, "Individual Attributes and Self Selection of Higher Education," Journal of Public E

Wilson, James Q. and Richard J. Herrnstein, *Crime & Human Nature: The Definitive Study of the Causes of Crime*, Simon and Schuster, New York: 1985.

Zeckhauser, Richard, "Medical Insurance: A Case Study of the Tradeoff between Risk Spreading and Appropriate Incentives," Journal of Economic Theory, II (1970), 10-26.