CONFERENCE DRAFT

TAXES AND JOB SEARCH

William M. Gentry and R. Glenn Hubbard*

April 15, 2002

* Graduate School of Business, Columbia University, Uris Hall, 3022 Broadway, New York, NY 10027; and National Bureau of Economic Research, 1050 Massachusetts Avenue, Cambridge, MA 02138. We are grateful to Anne Jones and Manuel Lobato Osorio for excellent research assistance.

TAXES AND JOB SEARCH

ABSTRACT

We examine whether the level of the income tax rate and the convexity of the income tax schedule affect job search behavior and labor market mobility. While the predicted effect of the level of the tax rate is ambiguous, we predict that an increase in the convexity of the tax schedule will decrease job search activity by taxing away some of the benefits of a successful job search. Using data from 1979 through 1993 from the Panel Study of Income Dynamics, we estimate that an increase in the convexity of the income tax system reduces job search behavior and the probability that a head of household will change to a better job during the coming year.

William M. Gentry
602 Uris Hall
Graduate School of Business
Columbia University
New York, NY 10027
and NBER
wmg6@columbia.edu

R. Glenn Hubbard
609 Uris Hall
Graduate School of Business
Columbia University
New York, NY 10027
NBER
and Council of Economic Advisors,
rgh1@columbia.edu

TAXES AND JOB SEARCH

I. Introduction

A variety of models predict that nonlinear payoffs create incentives for labor market effort – including models of promotion, efficiency wages, and job search. Existing empirical work on these models often focuses on specific groups of individuals, such as corporate executives, rather than the general population. Differences across households in the nonlinearities in the tax system that they face provide a source of variation for measuring the responsiveness of labor market behavior to nonlinear payoffs using the general population. In this paper, we analyze effects of nonlinear payoffs on job search behavior and job turnover. In particular, we focus on how non-linearities in the tax system affect job search; we use the variation in tax incentives as a source of econometric identification for the general question of the strength of the link between search and the rewards to search. Methodologically, our focus on how the level and convexity of the tax system affects individual behavior builds on our analysis (Gentry and Hubbard, 2001) of how tax incentives affect entry into entrepreneurship.

Our focus on the decision whether to search for another job inherently leads us to concentrate on on-the-job search. In contrast, much of the previous literature on job search has focused on the unemployed;[1] however, one expects that the unemployed will engage in some level of search activity.[2] Despite the previous emphasis on the search behavior of the

[1] This literature has examined how the duration of search, the methods of search, the intensity of search (*e.g.*, number of contacts), and the accepted wage are related to characteristics of the searchers and the search environment (see, *e.g.*, Blau and Robbins, 1990).

[2] Even amongst the unemployed, the tax system could affect the parameters of the search process. For example, the decision to refuse an offer and continue search depends on comparing the after-tax rewards to the offer and continued search. We do not pursue these questions because our methodology for calculating the relevant convexity of the tax system depends on understanding the characteristics of

unemployed, a substantial fraction of new employees come from switching jobs instead of from the unemployment so the determinants of who engages in on-the-job search are important from the perspective of overall job turnover (see Pissarides and Wadsworth, 1994, for previous empirical evidence on on-the-job search). Moreover, as documented by Topel and Ward (1992), job mobility is an important determinant of wage growth, especially early in workers' careers.

The importance of job mobility for wage growth suggests that our analysis will help go inside the "black box" of the recent literature on the responsiveness of taxable income to marginal tax rates. As pioneered by Feldstein (1995), this research focuses on how tax rates affect the elasticity of taxable income, which summarizes a wide variety of possible behavioral responses to the tax system. This elasticity is an important policy parameter for both revenue estimates and the efficiency of the tax system. Feldstein and subsequent work by Auten and Carroll (1999) and Gruber and Saez (2000) analyze tax returns to focus specifically on taxable income. In contrast, we examine a specific behavior that should contribute to overall income growth, even if traditional measures of labor supply (*i.e.*, hours worked) are unresponsive to tax rates. Moreover, we allow for both the level of tax rates and the convexity of the tax system to affect behavior.

Despite the importance of search theory in the analysis of government policies towards unemployment,[3] little research has been done on the effects on income taxes and job search behavior. For unemployed job searchers, the effects of social insurance programs and

---

the current job offer (in which we assume that an employed person may remain unless a better alternative becomes available) and the distribution of alternative offers.

[3] For surveys of the literature on job search, see Mortensen (1986) and Mortensen and Pissarides (1999).

unemployment benefits are critical for determining the reservation wage in the job search process and the intensity of job search.[4] While the income tax plays a smaller role than other government policies aimed toward unemployment, it does affect the replacement rate of unemployment benefits and the after-tax distribution of offers. In contrast, for on-the-job search, social insurance programs are less relevant for job search decisions than they are for the unemployed searchers and the effects of the income tax on the offer distribution are relatively more important.

There are several exceptions to the general claim that the theory of job search has ignored income taxation. Kesselman (1976) shows in a simple one-period model of job search that the effect of a proportional income tax on the incentive for job search depends on the slope of the labor supply curve; with a positively-sloped labor supply curve, a proportional income tax reduces the incentive for job search. He also shows that a move from a proportional income tax to a progressive income tax unambiguously decreases the incentive for job search.

Manning (2001) analyzes the effect of income taxes on job search in a model in which individuals do not have flexibility over hours worked within a job. He finds that "an increase in the marginal tax rate on wages above the reservation wage with overall tax revenue from employment unchanged must reduce the reservation wage and increase incentives to work." The intuition is that this change in the tax system makes employment at low wages relatively more attractive than unemployment despite the higher marginal tax rate reducing the attractiveness of employment at high wages. While much of his focus is on how taxes affect reservation wages

[4] For example, Meyer (1990) estimates the effects of the level and length of unemployment insurance benefits on unemployment durations.

for job searchers, he does conjecture that increasing the marginal tax rate is "likely to have an adverse impact on search intensity as it reduces the reward from higher-wage jobs."

Recent research in a variety of areas has pointed out that convexities in tax and transfer programs can have strong (and sometimes unintended) behavioral effects. For example, using simulation models, Hubbard, Skinner, and Zeldes (1995) find that non-linearities introduced by asset-based, means-test social insurance programs help explain the low saving of low-income households. In the context of unemployment, Meyer (1990) finds that discontinuities in unemployment insurance benefits (*e.g.*, the expiration of benefits) has large effects on the duration of unemployment. Gruber and Yelowitz (1999) find strong empirical evidence of these affects using data on Medicaid eligibility. Feldstein (1995a) and Dick and Edlin (1997) point out that a non-government program – means-tested college financial aid rules – can have substantial effects on household saving behavior. The link between these studies and our work is that they emphasize the behavioral consequences of tax policy when uncertain returns to investments face a convex tax schedule.[5]

Outside the context of public policy, nonlinearities in rewards play a major role in incentive contracting models (see, *e.g.*, Holmstrom and Milgrom, 1987; and the survey in Prendergast, 1999). In these models, principals offer managers (agents) a nonlinear compensation schedule to help align the manager's incentives with those of the principal. With an incentive contract, the agent's income increases when outcomes are good; in contrast, an

[5] Our model of the effects of nonlinearities in the tax system departs from the traditional approach to analyzing effects of taxes on labor supply (see Hausman, 1985) that emphasizes how workers choose the number of hours to work when facing a nonlinear budget constraint. In addition to these traditional labor supply effects, our point is that when the "wage rate" is uncertain, a nonlinear tax system can affect employment choices even for a given number of hours.

increase in tax progressivity implies the opposite – the return to success is lower than it would be with less progressive taxes. While the theory of such contracts is well developed, empirical tests of these models have been limited (see, *e.g.*, Prendergast, 1999; and Himmelberg and Hubbard, 2000). By analogy, our analysis tests whether behavior responds to the extent to which returns are nonlinear.

Using time-series and cross-sectional variation in tax schedules faced by households in the Panel Study on Income Dynamics (PSID) over the period from 1979 to 1993, our results imply that job search activity increases when tax rates are less progressive. For example, we estimate that a one standard deviation decrease in "upside convexity" (our measure of the progressivity of the tax system over the relevant range of outcomes) would increase the probability that an employed head of household reports some on-the-job search activity by roughly five percent (an increase in the search propensity of 0.36 percentage points) evaluated at the mean of the household characteristics. Similarly, this change would increase the probability that an employed head of household moves to a better job during the coming year by 11.2 percent (a 0.86 percentage point increase in turnover). In contrast, we do not find support for the hypothesis that the level of the tax rate affects job search activity but higher tax rates reduce the probability of moving to a better job.

The remainder of the paper is organized as follows. Section II discusses theoretical predictions of how income taxes may affect job search with particular attention on the effects of progressive taxation. In section III, we discuss our empirical strategy for measuring the effects of tax progressivity on job search activity. Section IV presents our results based on self-reported job search effort and section V reports results based on measuring search behavior with *ex post*

job turnover. Section VI concludes with a discussion of the implications of our research and possible extensions.

II. Theoretical Predictions of How Taxes Affect Job Search

Our focus on on-the-job search and job changes leads us to concentrate on different aspects of job search than are common in the search literature. Much of the search literature focuses on how individuals set reservation wages and the impact of these decisions on the duration of search. That is, a central concern of the search literature is, given that an individual is searching, when will he or she accept a job? Our empirical analysis is ill-suited to study the search duration or reservation wages so we focus on the decision whether to search. In a sense, "job search" in our context is just one particular example of effort that an individual can exert to improve his or her future labor market opportunities. Given this broader context, we are drawn to models of job search that resemble more general issues in human capital investment.

Kesselman's (1976) model of tax effects on job search provides a useful starting point. He assumes that individuals divide their time between leisure, working and searching. The search component can be interpreted as search or networking effort for workers who frequently change jobs or, more generally, as a form of off-the-job training. Search effort increases the wage rate for the time spent working and these returns to search effort are assumed to be certain. Kesselman assumes a utility function over leisure and consumption that has equal disutility on working or searching so the time allocation problem can be broken into two stages. For any given amount of leisure, the individual allocates time between working and searching; given these allocations, the individual chooses the optimal bundle of leisure and consumption. The

income tax system is assumed to be linear.

In this model, an increase in the marginal tax rate decreases the after-tax wage. The effect on search effort depends on whether labor supply decreases or increases with the change in the wage. For positively-sloped labor supply curves, the increase in the tax rate decreases search effort because the rewards to search (i.e., the higher wage) are used less intensively. This decrease in search effort reduces the pre-tax wage rate. For the backward-bending portion of the labor supply curve, an increase in the marginal tax rate would increase labor supply and search intensity. Kesselman also compares moving from a proportional income tax to a progressive income tax, defined as a flat marginal tax rate but with an income grant, holding revenue constant. This experiment is a compensated increase in the marginal tax rate. The substitution effect from the decrease in the after-tax wage unambiguously reduces search effort.

The negative effect of a progressive income tax on job search predicted by Kesselman is ambiguous when the returns to search effort are uncertain. Eaton and Rosen (1980) discuss the effects of taxation on human capital accumulation when the returns to investment are uncertain. Interpreting job search as a form of human capital investment, an increase in the marginal wage tax rate can affect human capital investment through two channels. First, an increase in the tax rate reduces the riskiness of human capital investment which tends to increase human capital investment. Second, the income effect from the tax change can affect individuals' willingness to bear risk; this effect depends on the preferences of the individuals. Eaton and Rosen show that it is possible that replacing a lump sum tax with a wage tax can both increase efficiency and human capital investment through the insurance effect of the tax. Thus, with uncertain returns, a move from a proportional income tax to a progressive income tax (again, defined as an income grant

with a single marginal tax rate) may increase job search effort, which contradicts Kesselman's result for the certainty case.

The literature on taxation and human capital formation (see, *e.g.*, Eaton and Rosen) emphasizes the importance of considering the tax treatment of both the returns to human capital investment and the costs of the investment. A standard result in this literature is that a proportional tax will not affect human capital investment when the returns to the investment are certain if the cost of investment is deductible from the tax base, as would be the case when the cost of the investment is foregone wage income at the time of the investment.[6] With uncertain returns, as pointed out by Eaton and Rosen, the effects of a change in the marginal tax rate are ambiguous due to the insurance effect and the effect on risk tolerance.

A tax system with progressive tax rates (*i.e.*, marginal tax rates that increase with income) complicate the analysis of human capital investment. With certain returns, the after-tax cost of the investment depends on the foregone after-tax earnings which depend on the non-linearities in the tax system and the returns depend on the increased earnings after accounting for the potential increases in marginal tax rates. Progressive tax rates typically reduce the government's share of the cost of the human capital investment and increase its share of the returns. Hence, the common presumption is that, relative to a constant marginal tax rate, progressive tax rates reduce the incentive for human capital investment.[7] Uncertainty exacerbates the problem in that while it may be relatively straightforward to calculate the after-

[6] This result also assumes that the income tax rate does not affect the after-tax discount rate.

[7] This comparative static starts from a given marginal tax rate and adds progressivity. In a population of taxpayers, however, a non-linear tax schedule implies that some individuals start with low marginal tax rates while others start with high marginal tax rates.

tax cost of the investment, the after-tax return depends on the uncertain return on the investment. For job search, the return may be zero if the search fails to find a better job or it may be large if the search provides a substantially better job match.

To fix ideas about the role of tax rates than increase with income, consider the following stylized example of an employed risk-neutral individual deciding whether to search for a new job. The decision to search is a discrete choice with both a tax-deductible cost (*e.g.*, foregone wages in the current period) of c_D and a non-tax-deductible cost of c_N; by modeling the search decision as a discrete choice, we are abstracting from the decision over search intensity. With a probability of π the job search is successful and with a probability of $(1 - \pi)$ the search is unsuccessful. We assume that if the individual does not find a better job, then he can continue in his current job and earn wage income, $w_{i,t+1}$. A successful job search results in a higher wage income by a percentage θ so that wage income increases to $(1 + \theta)w_{i,t+1}$. We model jobs as yielding wage income instead of allowing for a wage rate with flexible hours to reflect salaried jobs. A tax rate of τ applies to income at the level of earnings for the current job but the tax rate increases to $(1 + \beta)\tau$ with $\beta > 0$ if the job search is successful.[8] We assume that the discount rate is zero to simplify the comparison of costs and benefits. We also ignore any non-monetary attributes that may vary across jobs.

Without taxes, the expected return to job search is positive if $\pi\theta w_{i,t+1} > c_D + c_N$. If the tax rate is constant (*i.e.,* $\beta = 0$) and all of the costs of search are tax deductible (*i.e.,* $c_N = 0$), then the decision rule is to search for a new job if $\pi\theta w_{i,t+1} > c_D$, which implies that a constant tax

[8] For tractability, the tax rate is an average tax rate. We have in mind that the average tax rate changes because the marginal tax rates increase for higher levels of income rather than exemptions that would affect the average tax rate but would not affect the marginal return to job search.

rate would not affect the search decisions of a risk neutral individual.[9] This result differs from Kesselman's results because we do not allow for a labor market response that would affect the intensity with which the gains from search are employed (*i.e.,* if search results in a higher wage rate, then the tax rate affects the returns to search by affecting the hours worked decision). The result differs from Eaton and Rosen because we assume risk neutrality. If some of the costs of search are not tax deductible, then the decision rule is $\pi\theta w_{i,t+1} > c_D + c_N/(1 - \tau)$, so that even a proportional income tax would lower probability of job search.

Our main interest is for the case of progressive tax rates. The general decision rule is to search if $\pi[(1 - \tau)\theta w_{i,t+1} - (1 + \theta)\beta\tau)w_{i,t+1}] > (1 - \tau)c_D + c_N$. An increase in the degree of progressivity (*i.e.,* a higher β) reduces the benefits of job search without affecting the cost of job search. In a sense, the appropriate "marginal" tax rate for evaluating job search incentives depends on the tax rates at all of the possible income levels that will result from job search.

III. Empirical Specification and Data

To discriminate among potential effects of tax rates on job search, one would ideally like to have household-level panel data, with information on employment, job search activity, and sufficient information to estimate measures of income tax convexity across households and time. For a household, the relevant convexity of the income tax depends upon provisions of the tax code and a description of the *ex ante* distribution of payoffs to possible new jobs. While households face a common tax code, they may have access to different distributions of job

[9] Implicitly, we are assuming that the tax deductible costs of search do not drive the individual into a lower tax bracket. If these costs are relatively large, then with a progressive tax schedule, the government would share less in the costs of job search due to the lower marginal tax rate caused by the deductions for job search. This effect would reduce the probability of job search.

opportunities. Furthermore, the marginal tax incentives for job search depend on a household's location on the tax schedule.

The PSID provides information on employment, household income, and household characteristics. More importantly, it asks whether currently employed individuals are thinking about finding a new job and, if so, what activities they have undertaken as part of their job search.[10] One potential problem with survey responses to job search questions is that it is difficult to measure the intensity with which someone is searching for a new job.

In addition to these direct measures of job search, the longitudinal aspect of the PSID allows us to observe job changes, and to a limited extent, the reasons for observed job changes. As a measure of search activity, this *ex post* measure is useful to confirm the results based on job search; however, job changes are an imperfect measure of job search for several reasons. First, only successful job searches result in job changes. While relying on job changes as a measure of search activity obviously censors the unsuccessful searches, individuals who search harder are more likely to switch jobs so some of the censored searches are arguably less intense than the successful searches. In contrast, one goal of a job search may be to increase leverage in bargaining with a current employer so some "successful" job searches may end without a change in employer (though they result in a raise). Second, not all job changes result from job searches.

[10] The precise PSID questions on job search vary over the sample period. Between 1979 and 1987, the questions were: "Have you been thinking about getting a new job, or will you keep the job you have now?" and "Have you been doing anything in particular about it?" From 1988 to 1993, the first question was: "Have you been looking for another job during the past four weeks?" In these years, the follow up question was: "What have you been doing in the last four weeks to find another job?" This question was followed by a number of specific questions about activities, such as checking with current employer or checking with an employment agency.

For example, some job changes are driven from involuntary separations;[11] in other cases, a job change may occur despite the survey respondents reporting no job search activity. To deal with these issues, we attempt to define job changes that involve moving to a better job.

We use data over the period from 1979-1993. While the PSID starts in 1968, two factors limit our starting date. First, the job search questions start in 1979. Second, the NBER TAXSIM model (our source for creating tax variables) includes state tax code information starting in the late 1970s. We end with 1993 because it is the last year for which final-release PSID data are available. We use both the representative national sample and the sample of low-income families; our analysis uses sample weights to avoid overweighting the low-income households.

Our sample conditions on being a head of household between the ages of 18 and 60 who is in the workforce in consecutive years with positive income in year *t*. The sample pools single men and women (and single parents) and married heads of households (almost always men); in our sensitivity analysis, we examine whether this pooling matters. We exclude married women to avoid issues of the endogeneity of labor force participation. Because we are interested in on-the-job search, our sample conditions on working for someone else (without any self employment) in the first of the consecutive years used to create each observation.

Abstracting from tax considerations, we estimate probit models for job search activity (defined as having made some effort in a recent job search), *SEARCH*, by the head of household *i* at time *t*:

[11] Under some models of employment, tax convexity may also be relevant for involuntary separations. For example, under an efficiency wage model, the convexity of the tax system affects the worker's valuation of the current job relative to the lower-paying alternative that would result from getting fired.

$$SEARCH_{i,t} = f(x_{it}, z_{it}, \gamma_t) \quad (1)$$

where x_{it} are job characteristics of the individual's current job, z_{it} are household characteristics, and γ_t are year effects common to all households.

Alternatively, in using observed job changes, we estimate probit models of changing jobs between year t and year $t + 1$, *TURNOVER*, by the head of household i during year $t + 1$:

$$TURNOVER_{i,t+1} = f(x_{it}, z_{it}, \gamma_t). \quad (2)$$

These job changes may or may not involve a change in employer. For 1979 through 1987, we define moving to a new job based on having a job in year t and the respondent being in his or her present position for less than 12 months in year $t + 1$. For 1988 through 1992, we use a question based on whether tenure in the year $t + 1$ job is less than one year.[12] To focus on voluntary job changes, we define turnover conditional on the new job being better than the old job. For the years 1979 through 1984, the PSID asks individuals who change jobs during the year whether new job is better than the old job; for years 1985 through 1992, we define "better" as an increase in labor earnings.[13] In estimating the probability of changing jobs, we use explanatory variables from year t to predict whether a head of household changes jobs during the coming year.

Controlling for the job and family characteristics is important for two reasons. First, these variables may capture factors, such as job stability or attachment, that affect the decision to look for another job. Second, as discussed below, our measure of the tax convexity that is

---

[12] This tenure variable is not available in the 1993 survey year. In addition creating the job change variable requires data from a subsequent survey. Therefore, our sample of job changes is two years shorter than our job search sample.

[13] To explore whether focusing on job changes to "better" jobs affects our results, we also estimate models with *TURNOVER* defined as all job changes. Unless otherwise noted, the results from this alternative dependent variable are broadly similar with the results from focusing on job improvements.

relevant for the decision whether to look for a new job depends on many factors, including household characteristics. Controlling for these characteristics reduces the probability of our estimated results being driven by a spurious correlation between household characteristics, tax convexity, and the job search propensity.

As job characteristics, we include dummy variables for the worker's occupation, industry (both at the two-digit classification level in the PSID), and union membership status in year t and the level and square of the labor earnings of the head of household in year t. For z, we include the number of children in the household and dummy variables for five-year age ranges for the head, whether the head is nonwhite, female, single, a homeowner, whether the household lives in a rural area (not resident in a Standard Metropolitan Statistical Area), and whether the head experienced a marital transition during the year (using separate variables for marriages, divorces, or the death of a spouse). We approximate educational status with indicator variables for "less than high school education," "some college," "college," and "some post-college education" (with the omitted category being a high school education). We control for the level and square of the spouse's labor earnings in year t, assigning values of zero to non-married households. We also include property income and dividend and interest income as proxies for wealth, which is not available on an annual basis in the PSID. Finally, we include Census-region-specific year dummy variables to capture regional-specific effects of macroeconomic conditions; that is, we allow the year effects, γ_t, to vary by Census region. Table 1 provides summary statistics for the control variables.

In addition to measuring these job and household characteristics, we face the more complicated task of adding empirical measures of the tax incentives for the job search decision.

While the *current tax rate* facing a worker is a relatively easy concept to model, the *convexity* of the tax system that a worker faces is much harder to measure. The model above highlights the importance of the asymmetry in the variation of tax rates. Neither the average tax rate at various outcomes nor the variance in tax rates faced over the distribution of outcomes are useful measures of the asymmetry in tax rates faced by potential job changers. Instead, we require a measure of the spread in tax rates across the distribution of possible outcomes.

Some previous research provides some guidance on the potential returns to search. Topel and Ward's (1992) work on job mobility indicates that job changes of young mean are associated with an average wage increase of ten percent.[14] Similarly, using stochastic frontier regression techniques, Hofler and Murphy (1992) estimate that, on average, workers earn wages that are approximately ten percent less than what they would earn if labor market information was perfect and costless.

To characterize how changing jobs affects a worker's relatively long-term earnings prospects, we examine the distribution of real earnings growth over a three-year period.[15] This

[14] One could directly examine the effect of job search or changing jobs on wage growth as indicators of the value of job search. However, conditioning on either of these variables has some disadvantages relative to just examining the overall distribution of wage growth. Conditioning on job search may select workers who perceive their current job to have low growth prospects; if their search does not yield a new job, then the low wage growth in their current job may downwardly bias the conditional distribution of wage growth relative to the distribution perceived when workers decide whether to search for a new job. Conditioning on an observed job change may conflate the effects of voluntary job changes (which tend to increase income) and involuntary job changes (which may reduce labor income). Thus, it is unclear whether these conditional wage growth distributions provide better information on the distribution of job prospects than the unconditional distribution does.

[15] The choice of focusing on the three-year wage growth is inherently arbitrary. We use these calculations merely to illustrate what changes in income potential job changers might reasonably expect to face. A short time horizon may suffer from income being low if the worker has some time between jobs or it may be high if the worker earns extra money during the transition (*e.g.*, suppose changing firms carries a signing bonus); however, longer horizons reduce the amount of available data. We selected three years as an attempt to balance these competing concerns.

distribution does not condition on changing jobs; it merely captures the distribution in the growth of wage income. We examine heads of households that did not enter self employment between year *t* and year *t+1* but were in the workforce in year *t*; calculating wage growth also conditions on household heads having labor income of at least $1,000 in the first year (to avoid unreasonably large growth rates) and non-negative labor income in year *t+3*, as well as being between the ages of 18 and 60 in the first year.

This observed distribution of wage growth guides our construction of measures of the tax schedule facing people who look for new jobs. Overall, the median three-year growth in real wage income is 2.65 percent and mean three-year growth in real wage income is 10.1 percent. In calculating our benchmark tax rate (*i.e.*, the tax rate that will be relevant if the worker remains in his or her job), we allow for five percent wage income growth.

To measure the relevant spread in tax rates faced by people who potentially look for new jobs, we calculate tax rates that someone who changes jobs would face at various levels of success. As discussed above, search theory predicts that someone will only accept a job offer if the new job is better than the old job so we base our measure of the relevant nonlinearities in the tax code on the distribution of wage growth conditional on wage growth being positive, which we define as a "successful job search." Based on the distribution of observed wage growth, we form a weighted average of these tax rates for "successful job searches." Our basic measure of tax convexity is the difference in the weighted average of the marginal tax rates in the various successful states and the marginal tax rate in the benchmark outcome of five percent wage growth. That is, how does the marginal tax rate change between good outcomes and the benchmark outcome? For someone facing a constant marginal tax rate over the range of possible

outcomes, this measure of convexity is zero. If success changes the household's tax bracket, then the convexity measure is non-zero (and typically positive).[16]

We use the observed wage growth experience of all workers in formulating a spread between successful job search and the benchmark. Among households with more than five percent real three-year wage growth, the 25th percentile of wage growth is 12.8 percent, the median is 24.0 percent, the 75th percentile is 48.9 percent, the 90th percentile is 97.6 percent, and the 95th percentile is 156.8 percent. We consider five possible "successful" outcomes from job search; labor income increases by 10, 25, 50, 100, or 200 percent. The distribution of wage growth indicates that these outcomes are not equally likely so we assign probabilities of 0.3, 0.3, 0.25, 0.10, and 0.05, respectively, to the five cases. To simulate the tax rate faced at different levels of success, we compute tax rates after replacing the head's labor income with income that is a multiple of the head's current labor income.

Implicitly, we link the distribution of job search outcomes to current income by expressing the opportunities as percentage increases in current wage income. The convexity measure assumes that each head of household with a given current labor earnings has the same potential distribution of job offers. That is, other household characteristics do not affect the variance of the outcomes. The variability of the distribution of payoffs is constant in percentage

[16] Our construction of the relevant tax convexity facing an individual depends on the household's location on the tax schedule. If households bunch just below kink points in the piecewise-linear tax schedule, then relatively small improvements in income would imply higher marginal tax rates. Saez (1999) finds support for bunching but the effect is concentrated at low-income levels. If this bunching is intentional, then one might argue that our measure of convexity is endogenous to household behavior. Alternatively, evidence on deliberate bunching would suggest that households have some information about the location of kink points, though some of this behavior might be more consistent with *ex post* tax reporting phenomenon rather than *ex ante* behavioral changes. Without deliberate bunching, the distance from a kink point is a fairly random household characteristic.

terms across households. As an alternative, one could consider job search as affecting wages by the same absolute dollar amount across households. Unfortunately, this alternative would lead to either very large percentage changes for low-income households or very small percentage changes for high-income households.[17] We also assume that other types of income and demographics do not change with the decision to change jobs. For example, the wife's labor supply does not change when her husband changes jobs.

To construct tax variables, we use the TAXSIM model of the National Bureau of Economic Research (see Feenberg and Coutts, 1993). From the PSID, we use household characteristics on family size, family structure, age, labor earnings, dividends, interest received, income from other sources (*e.g.*, rental income), and state for residence.[18] To construct the household's predicted future marginal tax rate, we use household characteristics in year t and project the tax rate using the year $t + 1$ tax code;[19] to capture the effects of future wages exceeding current wages, we allow earnings to grow by five percent in constructing our benchmark tax rate. The decision to look for a new job depends on longer run consequences

[17] A key part of our convexity measure is whether households change marginal tax rate brackets. In the early years of the sample, the tax code had many different tax brackets but the income range within a bracket increased with income. Thus using a constant percentage variance in outcomes makes the probability of changing marginal tax brackets similar across income groups.

[18] We restrict our analysis to PSID observations that have these data items. Actual tax returns incorporate variables that are not available from the PSID. For example, without interest payments and charitable contributions, we understate the number of households that itemize their deductions; similarly, we do not have information on contributions to tax-advantaged retirement savings. Lastly, we do not have data on realized capital gains; however, because many capital gains realizations are transitory phenomena, excluding realized capital gains probably better captures the incentives to change employment status.

[19] By using the t +1 tax code, we are assuming that households have information about future tax rates. As alternative measures of the tax-related incentives, we could assume households have either less or more foresight about future tax law by constructing the tax measures with either the year t or $t + 2$ tax code, respectively.

rather than just income over a short horizon. We use the near-term tax code for forming tax rates because households probably have a better idea of the near-term tax structure (either explicitly or implicitly through observing the after-tax living standards of households with differing levels of success) than of the actual future tax code when the steady-state outcome will be realized.

The TAXSIM model processes the PSID data by incrementing non-wage income by $100 to calculate federal and state income tax payments and marginal income tax rates; we also construct average tax rates using family income. Because the tax rate schedules can have notches, TAXSIM occasionally produces unrealistic marginal tax rates; we exclude observations for which TAXSIM produces marginal or average tax rates that are below -20 or above 75 percent. To compute our convexity measures, we repeat this process for alternative levels of income by replacing the head of household's labor income with some multiple of the original labor income (*e.g.,* 110, 125, 150, 200, and 300 percent of labor income for the five levels of being successful). Our convexity measure is the difference between the weighted average of the marginal tax rates for successful search and the benchmark marginal tax rate.

Even focusing on income taxes, it is not obvious how to measure the convexity of the tax system. By using marginal tax rates at specific income levels, our measure focuses on the shape of the tax rate schedule over the relevant range of outcomes associated with job changes; for example, if a household remains in the same marginal tax bracket regardless of the job change, our measure of convexity will be zero. As an alternative measure of convexity, we replace our marginal tax rate measures with average tax rate measures. The level of the average tax rate replaces the level of the marginal tax rate; the spread between average tax rates for successful search and the benchmark income level replaces the marginal tax rate measure of convexity.

This alternative measure of convexity incorporates features of the tax code that apply to incomes below the income associated with unsuccessful search; for example, reducing every household's tax liability (irrespective of income or employment status) by $500 would affect average tax rates but not marginal tax rates.[20]

Before presenting results on how convexity affects job search behavior and job turnover, some simple examples help illustrate our measure of convexity. These examples also help clarify the sources of econometric identification for the convexity effects. Consider a family with one child that lives in a state without a state income tax; the husband earns $25,000 and the wife earns $15,000 as employees. In the 1986 tax code, this family faced a marginal tax rate of 28 percent and our convexity measure based on marginal tax rates for this household is 10.09 percentage points; in 1992, this family's marginal tax rate was 15 percent and their convexity measure was 7.17 percentage points. Alternatively, consider a family in which the husband earns $90,000 and the wife earns $50,000. For the years 1986, 1988, 1992, and 1993, working as employees, this family would face marginal tax rates of 49, 33, 31, and 31 percent, respectively; however, the spread between successful and unsuccessful entry would be 3.06, -0.75, 2.00, and 7.24 percentage points, respectively.

These examples reveal that convexity need not be positively correlated with the level of the tax rate or with income. Table 1 includes the basic summary statistics on the tax rate and convexity measures. The mean of the marginal tax rate spread is 3.48 percentage points and the median is 3.09 percentage points. The fifth, 25th, 75th, and 95th percentiles of the distribution of

[20] For most job searches, changing jobs is a discrete choice, one could argue that average tax rates are relevant for the search decision. While the average tax rate captures the discrete nature of the choice, as illustrated by the example in the text, it also depends on features of the tax code that do not vary with the income level or job choice.

this measure of convexity are -0.054, 0.95, 5.32, and 9.23, respectively.[21] Figure 1 provides a histogram of the median upside convexity measure by income deciles (computed on an annual basis). Middle-income households face the most convexity; for example, the sixth income decile has a median convexity measure of 7.12 percent. While the figure indicates that convexity varies with income, convexity also varies within each income decile. For example, for the overall sample, the standard deviation of the convexity measure is 3.11 percentage points but within income deciles the standard deviation of the convexity measure ranges from 3.05 to 5.45 percentage points indicating that income is only one of the determinants of convexity.[22] Overall, the convexity depends on tax provisions that vary across households within a state, across similar households in different states, across time, and the distribution of income within the family.

Figures 2 illustrates the relationship between job search and convexity; it is a histogram of job search probabilities by the marginal tax rate measure of upside convexity. The numbers along the x-axis are the percentage of the distribution of households that is in each range of the convexity measure. The numbers at the top of each bar are the percentage of households in the range of convexity that report on-the-job search activity. For example, of the 16.2 percent of the sample that had a convexity measure of greater than 4 percent but less than or equal to 6 percent,

---

[21] The average tax rate measure of convexity has a mean of 2.91 percentage points and a median of 2.89 percentage points. The distribution of this measure of convexity is much tighter, with a fifth to 95th percentile range of 1.31 to 4.63 percentage points.

[22] To get a sense of the variation within subgroups of the sample, as opposed to variation across groups, consider the percentage of the variation in convexity explained by grouping the data. Income deciles, year and state effects explain 7.1, 8.6, and 1.0 percent, respectively, of the variation in convexity. Simultaneously controlling for these three characteristics explains 16.9 percent of the variation in convexity.

9.79 percent of households report search activity. In contrast, among the 12.4 percent of the sample with a convexity measure of greater than 8 percent but less than or equal to 12 percent, the entry probability is only 8.95 percent. Overall, the univariate relationship between job search and convexity is non-monotonic with an inverted u-shape. While this pattern is not consistent with the tax hypothesis, other factors affect the search decision. For example, Figure 3 plots the search probability by income decile. Consistent with previous research (*e.g.*, Blau and Robbins, 1990), search activity decreases with income, suggesting that it is important to control for other determinants of search as we do in the multivariate analysis in the next section.

Figures 4 and 5 repeat the analysis from Figures 2 and 3 except for the propensity to change to a better job. As with job search, the univariate relationship between turnover and tax convexity does not reveal a strong pattern. Consistent with mean reversion in job quality and the pattern in Figure 3 on job search, the probability of moving to a better job decreases with income.

IV. Estimated Effects of the Income Tax on Job Search

In this section, we present empirical results based on measuring job search activity with self-reported job search data. Table 2 presents the results for our base specifications on the determinants of the discrete choice of whether an employed person looks for another job. The first two columns have results for specifications that include all households; these specifications pool single men or women and married men as heads of households. The third and fourth columns report results restricting the sample to married men. Focusing on married men removes the possibility that tax convexity differs between married and single households because they file

different tax returns; this difference could create spurious results if these differences in convexity were correlated with different propensities of single and married people to look for new jobs. For each sample, we present results that use the convexity measure based on marginal tax rates and the convexity measure based on average tax rates.

The first column of Table 2 presents results using the marginal tax rate measures of the tax variables. The estimated coefficient on the level of the tax rate is negative but not statistically different than zero at conventional confidence levels. In general, across specifications, the estimated coefficient on the level of the tax rate is negative but not statistically significant.

The estimated coefficient on the convexity of the tax system is −0.00117 and is statistically different from zero at the 99 percent confidence level. In terms of economic significance, this estimate suggest a relatively modest effect of tax convexity on the discrete choice of whether to look for a new job. A one standard deviation reduction in the marginal tax convexity measure (3.11 percentage points) would increase the search propensity by 0.36 percentage points. The average search propensity is 7.51 percent so this effect is a 4.9 percent increase along the extensive search margin from a one standard deviation reduction in convexity.

The second column of Table 2 presents the results for the average tax rate measures of the tax variables for all households. The estimated coefficient on the average tax rate convexity measure is −0.00253 and statistically different from zero at the 90 percent confidence level. The point estimate is larger when using the average tax rate measure of convexity; however, since the average tax rate measure has a lower standard deviation, the estimated effect of a one standard

deviation reduction in convexity implies a slightly smaller effect on the expected rate of job search. A one standard deviation reduction in the average tax convexity measure (1.04 percentage points) would increase the probability by search by 0.26 percentage points, or 3.5 percent of the average search propensity.

The results from focusing on married men are similar to those reported for the overall sample except that the point estimates are slightly larger in size. For the sample of married men, a 3.11 percentage point reduction in convexity would increase the average propensity to search by 0.47 percentage points, which is an 7.5 percent increase in the average search propensity of married men (which is 6.27 percent). Using the average tax measure of convexity implies that a one standard deviation reduction in convexity would increase the search propensity by 0.50 percentage points, which is a 8.0 percent increase relative to the average search propensity.

In terms of the other variables, the head of household's income is highly statistically significant. Over most incomes in our sample, an increase in income (holding other household characteristics constant) reduces the probability of search; for the first column, the positive coefficient on the quadratic term does not outweigh the negative coefficient on the linear term until $279,000 of labor income. In general, the other income variables are not statistically significant. Education beyond high school is positively correlated with the search propensity; the education variables should be interpreted with caution since the regression also controls for occupation and industry. Union members are less likely to search, consistent with union members being attached to their jobs. Heads of households living in rural areas are less likely to search for a new job, consistent with rural areas having relatively thin labor markets. In unreported results, the estimates on the age range dummy variables are statistically significant

and indicate that search propensities decrease with age, consistent with older people being more attached to their jobs.

A number of statistical issues merit further investigation. First, interstate variation in income taxes is one source of econometric identification in our base specification. It is possible that this variation in income taxes is correlated with other, omitted interstate variation in the search environment across states. Including state fixed effects removes the average time-invariant state-specific component to the search environment (but still allows intertemporal differences in state tax policy and cross-sectional intrastate variation in tax incentives to affect the estimated coefficients on the tax variables). Including state fixed effects to the specifications reported in Table 2 increases the magnitude (and associated statistical significance) of the estimated tax convexity coefficients relative to the results without state fixed effects by roughly 20 percent. Thus, it seems unlikely that the results in Table 2 are an artifact of spurious correlation with omitted state-specific characteristics of the job search environment.

Second, the intertemporal variation in income tax provisions is another source of variation that we use to identify the model.[23] To examine the importance of intertemporal variation in tax incentives as a source of econometric identification, we estimate specifications of the first and third columns of Table 2 that allow the estimated tax effects to vary by year. For these specifications econometric identification comes from differences in location on each year's tax schedule from both the head's earnings and other family-specific information (*e.g.,* spousal

[23] A separate question about intertemporal variation involves our assumption that individuals have foresight about the future tax code. To explore the sensitivity of our results to this assumption, we estimate specifications for which the tax variables are defined using either the year t or year $t + 2$ tax codes. These alternative assumptions about how individuals form expectations about the tax code yield very similar results to the specifications using tax variables based on the year $t + 1$ tax code.

income) and in the variation in state tax policy. We find no strong pattern in the estimated effects of the level of the tax rate. While the majority of the estimates of the convexity effect are negative, statistical significance is limited. Thus, pooling the years is important for estimating the effects of convexity; however, this pooling may be important because it increases the sample size or because it increases the variation in tax incentives.

Third, a common statistical problem in estimating the effects of tax policy is that the parameters of the tax system are correlated with income. Thus, it is difficult to disentangle the effects of the tax system from non-linearities in income effects. This problem is especially severe for the level of the tax rate since tax rates have a direct relationship with income. We expect the problem to be less severe for the convexity effect because convexity is not a simple function of income. Nonetheless, we examine the importance of how we control for income in two ways. First, we estimate models with alternative functional forms for earnings controls. Second, we estimate the model with interactions between the tax parameters and a household's income quintile in the year of the observation. This second method attempts to identify the tax effects using the variation in the tax incentives for families within the same income quintile without using the variation across different parts of the income distribution.

Table 3 provides results for estimating the job search probits for four alternative methods of controlling for labor income of the household head and the spouse. The first column controls for linear terms in the earnings of the husband and wife (instead of quadratic controls). The results using linear controls for earnings are quite similar to the results using quadratic controls. The results in the second column use the logarithm of labor income for the husband and wife. In contrast to the quadratic specification, the estimated tax effects are not statistically significant

from zero; for the level of the tax rate, the estimated coefficient is positive. The third column reports results with a cubic function of labor earnings. The cubic specification yields results that are similar to the logarithmic specification; the estimated effect of the level of the tax rate is positive and statistically significant at the 95 percent confidence level. In the fourth column, the quadratic specification is supplemented with dummy variables for the household's income decile formed from annual data. Allowing separate search propensities for each income decile reduces the estimated effect of tax convexity to -0.000704 which is marginally statistically significant (at the 87 percent confidence level). Overall, these alternative specifications suggest that the estimated effect of tax convexity on job search is sensitive to the form of the earnings control.

The first panel of Table 4 presents an alternative identification strategy that focuses on the variation in tax incentives within each income quintile by allowing the estimated tax effects vary by income quintile. The specification controls for labor earnings using a quadratic specification. For the level of the tax rate, the point estimates suggest that high tax rates discourage search among low income households but encourage search among higher income groups. The estimated effect of convexity is negative for four out of the five quintiles and is statistically different from zero at the 95 percent confidence level for the middle quintile. The negative effects within income quintiles suggests that the overall negative effect may not be driven by a spurious correlation between tax convexity and income; however, given the relatively low statistical significance for some of the coefficients, it is difficult to draw definitive conclusions from this test.

The second and third panels of Table 4 provide estimates for the tax effects within education and age groups, respectively. The specifications also control for the other variables in

the main specification. These specifications test whether the tax effects are concentrated among particular demographic groups. For the level of the tax rate, as with income interactions, lower education groups have a negative response to higher tax rates but higher education groups have a positive response to higher tax rates. The estimated effect of convexity is uniformly negative but none of the individual education groups has an estimated coefficient that is statistically different from zero; by estimating effects for separate groups, the statistical tests have less power due to the smaller sample sizes.

V. Estimated Effects of the Income Tax on Job Changes

In contrast to defining job search activity based on survey questions about whether the employed head of household is looking for a new job, this section presents estimates of the effects of the tax system on job search by examining *ex post* job changes. As described above, we focus on job changes that result in the individual moving to a "better" job. The raw correlation between reporting searching for a job in one year and switching to a better job during the next year is only 0.07 which is surprisingly low.

Tables 5 through 7 repeat the analysis of Tables 2 through 4 with *TURNOVER* as the dependent variable instead of *SEARCH*. The specifications in Table 5 compare the results for all households and married men and the difference between using marginal and average tax rates to define the tax variables. The estimated effects of both the level of the tax rate and the convexity of the tax schedule on job changes are larger in magnitude and more statistically significant than their counterparts for job search. For the level of the tax rate, the estimated effect is consistently negative and statistically significant at the 95 percent confidence level. Individuals are less

likely to move to a better job when they face higher income tax rates.

Based on the specification for all households using the marginal tax rate variables, a one standard deviation reduction in tax convexity (3.11 percentage points) implies a 0.86 percentage point increase in job turnover. Evaluated at the mean turnover propensity of 7.69 percent, this increase represents an 11.2 percent increase in job turnover to better jobs. For married men, the estimated effect is larger with a one standard deviation reduction in tax convexity increasing job turnover by 1.33 percentage points or a 20.9 percent increase in the average rate of turnover for married men. As with the job search specifications, including state fixed effects slightly increases the estimated effects of convexity which suggests that a spurious correlation between the interstate variation in tax incentives and unobservable features of the state's economic environment are not driving the results.[24]

The estimated effects of the non-tax variables on moves to better jobs are broadly consistent with the results on job search. The probability of moving to a better job falls with age, union membership, being married, having children, being a homeowner, and living in a rural area. Conditional on the other variables, higher levels of education increase the probability of moving to a better job; however, the relationship between moving to a better job and the current labor earnings of the head of household is relatively weak.

Table 6 examines the sensitivity of the estimated effects of the tax system on job turnover to the functional form of the earnings control. Unlike the results on self-reported job search, the estimated effects of both the level of the tax rate and the convexity of the tax schedule are

[24] Examining the intertemporal variation issues discussed above for the job search yields similar qualitative conclusions for job turnover, except for job turnover more of the year-specific estimates of the convexity effect are negative and statistically significant at the 95 percent confidence level.

consistently negative and statistically significant in most instances. Controlling for either the logarithm of earnings or a cubic function of labor earnings, however, reduces the magnitude of the estimated tax effects. However, the estimated effect of convexity increases in the specification that includes income decile controls. Overall, these results suggest that the estimated effects of the tax system on whether an individual moves to a better job are not driven by a correlation between income and the tax variables.

The first panel of Table 7 presents the results of interacting the tax variables with the household's income quintile so that the estimated effects are identified using variation within each income quintile. The results for the level of the tax rate indicate that the effect is negative and statistically different from zero at the 95 percent for the top four income quintiles. The estimated negative effect of tax convexity on job turnover is statistically different from zero at the 99 percent confidence level for the top two income quintiles. The estimated negative effects of convexity are larger for higher income households. Furthermore, the ability to estimate statistically significant effects within income quintiles reduces the chance that the results are driven by a relationship between convexity and income.

Across education groups (see Panel B of Table 7), the estimated effects of the tax system on job turnover are consistently negative. For the level of the tax rate, the estimated coefficients are of similar size across education groups. For the convexity of the tax system, the estimated negative effect is somewhat larger for college graduates than for less educated individuals.

VI. Implications and Possible Extensions

This paper examines the effects of income taxes, both the level of the tax rate and the

convexity of the tax schedule, on job search behavior and job changes. We find that individuals respond to differences in the convexity of the tax schedule. We estimate that a decrease in our convexity measure of 3.11 percentage points (a one standard deviation decrease) would reduce self-reported job search activity by roughly five percent for the overall sample and would reduce the probability of moving to a better job by 11 percent. Focusing on married men, these effects are slightly larger. For moving to a better job, we also find that a reduction in the level of the tax rate would increase the probability of a job change. A five percentage point reduction in marginal tax rates would increase the chance of moving to a better job by 1.1 percentage points, which is a 14 percent increase in the probability of a job change.

The effects of the convexity of the tax system on individual behavior are consistent with the findings of our work on the effects of the tax system on entry into entrepreneurship (Gentry and Hubbard, 2001) and wage growth (Gentry and Hubbard, 2002). For entry into entrepreneurship, which arguably represent a much riskier decision with a broader spectrum of possible outcomes, we find that the convexity of the tax system has a relatively large, negative effect on the entry probability. Our work on wage growth is more closely related to the setting of job search. Job search and, to some extent, job changes are one possible observable form of labor market effort. However, there are other types of labor market, many of which are unobservable. We take the three-year real growth rate in wage income as a proxy for the cumulative effects of these various sorts of wage growth. Consistent with our job search and turnover results, we find that a one percentage point decrease in upside tax convexity increases the three-year real growth rate in wages from 9.1 percent to 10.5 percent (a 15 percent increase). Job search behavior as one mechanism that explains these differences in wage growth rates.

Our results suggest an avenue, beyond the marginal tax rate, by which tax policy can affect individual behavior. A substantial literature, mentioned in the introduction, has focused on the elasticity of taxable income with respect to changes in the marginal tax rate. We contribute to this literature by suggesting that the measurement of the appropriate marginal tax rate for some types of behavior may incorporate elements of the tax schedule (e.g., marginal tax rates) other than the marginal tax rate at an initial income level. One possible direction for future research is to integrate the effects of tax convexity more directly into the elasticity of taxable income literature. The added complications of behavior that responds to tax rates over a broad spectrum of incomes also raises issues in calculating the deadweight loss of the tax system.

Our emphasis on the effects of non-linearities in the tax system on behavior is consistent with labor market theories that non-linear payoffs affect the effort decisions of individuals. When individuals keep a larger fraction of the rewards to a better job match, they are more likely to search for another job or move to a better job.

Our current statistical analysis focuses on the decision whether to search for another job, which only captures the extensive job search margin. Alternative dependent variables would allow us to expand the analysis to capture at least some aspects of the intensive margin for job search. For example, the PSID includes questions on whether someone is looking for another job and whether they are doing something to look for another job.

References

Anderson, Patricia M., and Bruce D. Meyer. "Unemployment Insurance Takeup Rates and the After-tax Value of Benefits." *Quarterly Journal of Economics*, 112:3, 1997, pp. 913-937.

Auten, Gerald and Robert Carroll. "The Effect of Income Taxes on Household Income." *Review of Economics and Statistics*, 1999, 81:4, pp. 681-693.

Blau, David M. and Philip K. Robins. "Job Search Outcomes for the Employed and Unemployed." *Journal of Political Economy*, 1990, 98, pp. 637-655.

Dick, Andrew W., and Aaron S. Edlin. "The Implicit Taxes from College Financial Aid." *Journal of Public Economics*, 65:3, September 1997, pp. 295-322.

Domar, Evsey, and Richard Musgrave. "Effects of Proportional Taxes on Risk-Taking." *Quarterly Journal of Economics,* 59, 1944.

Eaton, Jonathan, and Harvey S. Rosen. "Taxation, Human Capital, and Uncertainty." *American Economic Review*, 70:4, September 1980, pp. 705-715.

Feenberg, Daniel, and Elisabeth Coutts. "An Introduction to the TAXSIM Model." *Journal of Policy Analysis and Management ,* 12, 1993, pp.189-194.

Feldstein, Martin. "College Scholarship Rules and Private Saving," *American Economic Review*, 85:3, June 1995a, pp. 552-566.

Feldstein, Martin. "The Effect of Marginal Tax Rates on Taxable Income: A Panel Study of the 1986 Tax Reform Act." *Journal of Political Economy,* 103(3), June 1995b, pp. 551-572.

Gentry, William M., and R. Glenn Hubbard. "Tax Policy and Entry into Entrepreneurship." Mimeograph, Columbia University, August 2001.

Gentry, William M., and R. Glenn Hubbard. "Taxes and Wage Growth." Mimeograph, Columbia University, January 2002.

Gruber, Jonathan, and Emmanuel Saez. "The Elasticity of Taxable Income: Evidence and Implications." Working Paper No. 7512, National Bureau of Economic Research, January 2000.

Gruber, Jonathan, and Aaron Yelowitz. "Public Health Insurance and Private Savings." *Journal of Political Economy*, 107(6), Part 1 December 1999, pp. 1249-1274.

Hausman, Jerry A. "Taxes and Labor Supply." In Alan J. Auerbach and Martin Feldstein, eds., *The Handbook of Public Economics*, New York: North Holland, 1985.

Himmelberg, Charles P., and R. Glenn Hubbard. "Incentive Pay and the Market for CEOs: An Analysis of Pay-Performance Sensitivity." Mimeograph, Columbia University, 2000.

Hofler, Richard A. and Kevin J. Murphy. "Underpaid and Overworked: Measuring the Effect of Imperfect Information on Wages." *Economic Inquiry*, 30, July 1992, pp. 511-529.

Homstrom, Bengt, and Paul Milgrom. "Aggregation and Linearity in the Provision of Intertemporal Incentives." *Econometrica*, 55, March 1987, 303-328.

Hubbard, R. Glenn, Jonathan Skinner, and Stephen P. Zeldes. "Precautionary Saving and Social Insurance." *Journal of Political Economy*, 103:2, April 1995, pp. 360-399.

Kesselman, Jonathan R. "Tax Effects on Job Search, Training, and Work Effort." *Journal of Public Economics*, 1976, 6, pp. 255-272.

Lazear, Edward P. "Performance Pay and Productivity." *American Economic Review*, 90:5, 2000, pp. 1346-1361.

Manning, Alan. "Labour Supply, Search and Taxes." *Journal of Public Economics*, 2001, 80:3, pp. 409-434.

Meyer, Bruce D. "Unemployment Insurance and Unemployment Spells." *Econometrica*, 58:4, pp. 757-782.

Mortensen, Dale T. "Job Search and Labor Market Analysis." In Orley Ashenfelter and Richard Layard, eds., *The Handbook of Labor Economics*, vol. 2, New York: North Holland, 1986.

Mortensen, Dale T. and Christopher A. Pissarides. "New Developments in Models of Search in the Labor Market." In Orley Ashenfelter and David Card, eds., *The Handbook of Labor Economics*, vol. 3, New York:; North Holland, 1999.

Pissarides, Christopher A. and Jonathan Wadsworth. "On-the-job Search: Some Empirical Evidence from Britain." *European Economic Review*, 1994, 38, pp. 385-401.

Poterba, James M. "Taxation, Risk-taking, and Household Portfolio Behavior." Working Paper No. 8340, National Bureau of Economic Research, June 2001.

Prendergast, Canice. "The Provision of Incentives in Firms." *Journal of Economic Literature*, 37, March 1999, 7-63.

Saez, Emmanuel. "Do Taxpayers Bunch at Kink Points?" Working Paper No. 7366, National Bureau of Economic Research, September 1999.

Topel, Robert H. and Michael P. Ward. "Job Mobility and the Careers of Young Men." *Quarterly Journal of Economics*, 107:2, pp. 439-479.

Table 1: Summary Statistics				
	Mean	Standard Deviation	Min	Max
Job search	0.0751	0.264	0	1
Job Turnover to a Better Job	0.0769	0.266	0	1
Marginal tax rate	28.30	11.03	-18.85	69.45
Marginal tax rate convexity measure	3.49	3.11	-13.75	30.30
Average tax rate	16.23	7.51	-19.98	67.24
Average tax rate convexity measure	2.92	1.04	-24.70	11.31
Head's labor earnings	26.203.90	19,756.46	50.00	550,000
Spouse's labor earnings	5,890.69	10,040.05	0	200,000
Dividend and interest income	763.16	2,927.67	0	145,000
Other property income	627.99	4,376.58	-111,000	250,000
Age	36.07	10.24	18	60
Minority (non-white = 1)	0.15	0.35	0	1
Female head	0.23	0.42	0	1
Married (single = 1)	0.40	0.49	0	9
Number of kids	0.93	1.15	0	1
Union Member	0.26	0.44	0	1
Homeowner	0.60	0.49	0	1
Rural	0.39	0.49	0	1
Less than high school	0.15	0.36	0	1
High school	0.38	0.48	0	1
Some college	0.21	0.41	0	1
College	0.18	0.39	0	1
Some post-college education	0.079	0.27	0	1

Source: Authors' calculations based on data from the PSID. Our sample pools data from 1979 to 1993. The number of observations is 44,516 except for job turnover that has 41,024 observations. The sample includes households for which the head works for someone else in year t and is not out of the labor force in $t + 1$. We include only those households whose age is between 18 and 60 and whose labor income is positive in t. We drop all observations with average or marginal tax rates larger than 75 percent or smaller than -20 percent. We also drop observations with average or marginal tax rates for the successful or the unsuccessful case larger than 75 percent or smaller than –20 percent. The sample is weighted to reflect oversampling of low-income households.

Table 2: Marginal Effects from Probits on Job Search				
	All Households		Married Men	
	(1): Marginal tax rate measure of convexity	(2): Average tax rate measure of convexity	(3): Marginal tax rate measure of convexity	(4): Average tax rate measure of convexity
Tax rate on employment	-0.000207 (0.000224)	-0.000397 (0.000327)	-0.000232 (0.000310)	-0.000477 (0.000466)
Convexity in tax rate (spread)	-0.000117 (0.000435)	-0.00253 (0.00134)	-0.00152 (0.000594)	-0.00479 (0.00180)
Head's labor earnings	-14.6 (2.13)	-12.9 (2.39)	-13.0 (2.66)	-10.3 (2.97)
Head's labor earnings squared	2.62 (0.437)	2.32 (0.470)	2.25 (0.496)	1.76 (0.540)
Spouse's labor earnings	8.57 (3.74)	8.41 (3.85)	9.24 (4.53)	8.32 (4.67)
Spouse's labor earnings squared	-28.4 (11.8)	-27.5 (11.6)	-24.7 (12.9)	-23.0 (12.6)
Dividend and interest income	0.00224 (0.0530)	0.00695 (0.0540)	-0.198 (0.592)	-0.211 (0.605)
Other property income	0.288 (0.332)	0.261 (0.341)	0.389 (0.310)	0.298 (0.321)
Union Member	-0.0116 (0.00309)	-0.0116 (0.00310)	-0.0115 (0.00376)	-0.0114 (0.00378)
Female head	0.00782 (0.00494)	0.00813 (0.00499)		
Single (single = 1)	0.00402 (0.00418)	0.00506 (0.00423)		
Number of kids	0.000105 (0.00128)	-0.00030 (0.00139)	0.00223 (0.00154)	0.00215 (0.00166)
Less than high school	-0.00349 (0.00384)	-0.00360 (0.00384)	-0.00185 (0.00499)	-0.00202 (0.00502)
Some college	0.0236 (0.00456)	0.0235 (0.00456)	0.0270 (0.00630)	0.0273 (0.00634)
College	0.0380 (0.00653)	0.0380 (0.00655)	0.0461 (0.00902)	0.0468 (0.0910)
Some post-college education	0.0652 (0.0128)	0.0650 (0.0128)	0.0764 (0.0181)	0.0763 (0.0181)
Number of obs.	44,516	44,516	26,127	26,127
Pseudo-R^2	0.155	0.155	0.135	0.136

Source: Authors' calculations, as described in the text. Estimated models include census region effects by year, age dummies for 5 year age ranges for the head of household, dummy variables for homeowners minority status, marital tranistions, and rural residents (not reported). The sample pools data from 1978 to 1993. We drop observations with average or marginal tax rates larger than 75 percent or smaller than -20 percent. The estimated coefficients and standard errors for labor earnings are multiplied by 10^7 and for labor earnings squared are multiplied by 10^{12}. The estimated coefficients and standard errors for capital income and property income are multiplied by 10^6. The marginal effects are evaluated at the mean values of the variables; for the dichotomous variables, marginal effects are for changes from zero to one. Robust standard errors are in parentheses. The regressions are weighted by sample weights.

Table 3: Sensitivity of Job Search Model to Controlling for Earnings				
	(1): Linear earnings controls	(2): Cubic earnings controls	(3): Log earnings controls	(4): Include income decile controls
Tax rate on employment	-0.000239 (0.000216)	0.000538 (0.000207)	0.000372 (0.000239)	0.000044 (0.000253)
Upside tax rate convexity	-0.00127 (0.000434)	0.000190 (0.000388)	-0.000077 (0.000457)	-0.000704 (0.000470)
Head's labor earnings	-12.6 (1.86)	-43.2 (4.37)		-14.7 (2.45)
Head's labor earnings squared		66.5 (10.1)		2.59 (0.481)
Head's labor earnings cubed		-351.0 (81.4		
Log (Head's labor earnings)			-0.0311 (0.00351)	
Spouse's labor earnings	0.549 (1.80)	4.50 (5.15)		9.25 (4.34)
Spouse's labor earnings squared		-18.8 (32.4)		-33.5 (12.5)
Spouse's labor earnings cubed		-43.5 (463.0)		
Log (Spouse's labor earnings)			0.000555 (0.000343)	
Dividend and interest income	0.0185 (0.521)	-0.309 (0.478)	-0.472 (0.572)	-0.108 (0.546)
Other property income	0.297 (0.335)	0.117 (0.267)	0.128 (0.335)	0.262 (0.328)
Dummy variables for family income deciles	No	No	No	Yes
Number of obs.	44,516	44,516	44,516	44,516
Pseudo-R^2	0.154	0.158	0.156	0.156

Source: Authors' calculations as described in the text. See also the notes for Table 2. We multiplied the estimated coefficients and standard errors for labor earnings by 10^7; we multiplied those for labor earnings squared by 10^{12}; and we multiplied those for labor earnings cubed by 10^{18}. For dividend and interest income and for age squared, we multiplied the estimated coefficients and standard errors by 10^6. Robust standard errors are in parentheses. The regressions are weighted by sample weights.

Table 4: Tax Variables Interacted with Family Characteristics on Job Search		
	Marginal tax rate	Upside convexity
Panel A: Income quintiles		
Lowest quintile	-0.000556 (0.000351)	-0.000587 (0.000711)
2nd quintile	-0.0000012 (0.000452)	0.000253 (0.000854)
3rd quintile	-0.000176 (0.000425)	-0.00285 (0.00104)
4th quintile	0.000766 (0.000463)	-0.00141 (0.000963)
Top quintile	0.000906 (0.000594)	-0.00118 (0.00132)
Panel B: Educational attainment		
Less than high school	-0.00760 (0.000380)	-0.00148 (0.000898)
High school graduate	-0.000349 (0.000271)	-0.000790 (0.000617)
Some college experience	0.000235 (0.000317)	-0.00154 (0.000878)
College graduate	0.000440 (0.000382)	-0.000862 (0.000942)
Post-college experience	0.000756 (0.000706)	-0.00134 (0.00174)
Panel C: Age of head of household		
Less than 35	-0.000321 (0.000235)	-0.000810 (0.000489)
35 ≤ age ≤ 50	-0.000135 (0.000338)	-0.00221 (0.00169)
Greater than 50	0.000253 (0.000528)	-0.00125 (0.00169)

Source: Authors' calculations, as described in the text. Each panel is a separate regression. The models also include the other covariates from the specifications in Table 2. The coefficients are marginal effects from probit estimated. Robust standard errors are in parentheses. The regressions are weighted by sample weights. See also the notes for Table 2.

Table 5: Marginal Effects from Probits on Job Turnover				
	All Households		Married Men	
	(1): Marginal tax rate measure of convexity	(2): Average tax rate measure of convexity	(3): Marginal tax rate measure of convexity	(4): Average tax rate measure of convexity
Tax rate on employment	-0.00202 (0.000268)	-0.00262 (0.000402)	-0.00203 (0.000309)	-0.00279 (0.000476)
Convexity in tax rate (spread)	-0.00277 (0.000566)	-0.0100 (0.00159)	-0.00428 (0.000614)	-0.0111 (0.00170)
Head's labor earnings	-0.977 (2.24)	3.47 (2.74)	1.46 (2.13)	6.43 (2.82)
Head's labor earnings squared	-0.0505 (0.555)	-1.11 (0.921)	-0.551 (0.517)	-1.68 (0.966)
Spouse's labor earnings	9.86 (3.31)	6.04 (3.24)	12.4 (3.82)	9.90 (3.87)
Spouse's labor earnings squared	-9.39 (5.42)	-4.94 (4.24)	-18.1 (7.32)	-13.6 (6.56)
Dividend and interest income	1.00 (0.662)	0.852 (0.667)	0.678 (0.583)	0.704 (0.586)
Other property income	-1.03 (0.484)	-1.19 (0.511)	-0.546 (0.363)	-0.606 (0.380)
Union Member	-0.0199 (0.00387)	-0.0194 (0.00388)	-0.0161 (0.00396)	-0.0161 (0.00398)
Female head	0.00162 (0.00637)	0.00131 (0.00642)		
Single (single = 1)	0.0119 (0.00545)	0.0145 (0.00552)		
Number of kids	-0.00381 (0.00166)	-0.00593 (0.00178)	-0.00174 (0.00160)	-0.00286 (0.00170)
Less than high school	-0.000861 (0.00522)	-0.00128 (0.00522)	0.00109 (0.00542)	0.000840 (0.00542)
Some college	0.0120 (0.00514)	0.0117 (0.00513)	0.00768 (0.00524)	0.00717 (0.00523)
College	0.0139 (0.00654)	0.0139 (0.00653)	0.0119 (0.00701)	0.0125 (0.00706)
Some post-college education	0.0398 (0.0106)	0.0392 (0.0106)	0.0349 (0.0117)	0.0349 (0.0117)
Number of obs.	41,024	41,024	26,697	26,697
Pseudo-R^2	0.0830	0.0845	0.0889	0.0898

Source: Authors' calculations, as described in the text. Estimated models include census region effects by year, age dummies for 5 year age ranges for the head of household, dummy variables for homeowners, minority status, marital tranistions, and rural residents (not reported). The sample pools data from 1978 to 1993. We drop observations with average or marginal tax rates larger than 75 percent or smaller than -20 percent. The estimated coefficients and standard errors for labor earnings are multiplied by 10^7 and for labor earnings squared are multiplied by 10^{12}. The estimated coefficients and standard errors for capital income and property income are multiplied by 10^6. The marginal effects are evaluated at the mean values of the variables; for the dichotomous variables, marginal effects are for changes from zero to one. Robust standard errors are in parentheses. The regressions are weighted by sample weights.

Table 6: Sensitivity of Job Turnover Model to Controlling for Earnings				
	(1): Linear earnings controls	(2): Cubic earnings controls	(3): Log earnings controls	(4): Include income decile controls
Tax rate on employment	-0.00197 (0.000237)	-0.000798 (0.000308)	-0.00118 (0.000330)	-0.00290 (0.000522)
Upside tax rate convexity	-0.00275 (0.000553)	-0.000944 (0.000593)	-0.00189 (0.000629)	-0.00487 (0.000983)
Head's labor earnings	-1.41 (1.41)	3.90 (0.630)		7.55 (5.42)
Head's labor earnings squared		64.6 (10.7)		-3.27 (2.61)
Head's labor earnings cubed		-279.0 (53.4)		
Log (Head's labor earnings)			-0.0162 (0.00481)	
Spouse's labor earnings	6.13 (2.05)	-6.63 (6.98)		21.8 (6.06)
Spouse's labor earnings squared		77.4 (42.0)		15.6 (8.94)
Spouse's labor earnings cubed		-1,140.0 (593.0)		
Log (Spouse's labor earnings)			0.000868 (0.000440)	
Dividend and interest income	0.998 (0.662)	0.449 (0.620)	0.919 (0.646)	2.39 (1.01)
Other property income	-1.02 (0.484)	-1.04 (0.436)	-1.03 (0.487)	-1.32 (0.705)
Dummy variables for family income deciles	No	No	No	Yes
Number of obs.	41,024	41,024	41,024	41,064
Pseudo-R^2	0.0829	0.0863	0.0835	0.0994

Source: Authors' calculations as described in the text. See also the notes for Table 2. We multiplied the estimated coefficients and standard errors for labor earnings by 10^7; we multiplied those for labor earnings squared by 10^{12}; and we multiplied those for labor earnings cubed by 10^{18}. For dividend and interest income and for age squared, we multiplied the estimated coefficients and standard errors by 10^6. Robust standard errors are in parentheses. The regressions are weighted by sample weights.

Table 7: Tax Variables Interacted with Family Characteristics on Job Turnover		
	Marginal tax rate	Upside convexity
Panel A: Income quintiles		
Lowest quintile	-0.000770 (0.000419)	-0.00130 (0.000999)
2nd quintile	-0.00233 (0.000656)	0.000289 (0.00116)
3rd quintile	-0.00115 (0.000560)	-0.00150 (0.00135)
4th quintile	-0.00249 (0.000629)	-0.00474 (0.00130)
Top quintile	-0.00282 (0.000517)	-0.00670 (0.00145)
Panel B: Educational attainment		
Less than high school	-0.00168 (0.000405)	-0.00232 (0.00117)
High school graduate	-0.00211 (0.000358)	-0.00214 (0.000798)
Some college experience	-0.00203 (0.000427)	-0.00185 (0.00121)
College graduate	-0.00220 (0.000493)	-0.00345 (0.00231)
Post-college experience	-0.00138 (0.000783)	-0.00345 (0.00231)
Panel C: Age of head of household		
Less than 35	-0.00218 (0.000299)	-0.00254 (0.000715)
35 ≤ age ≤ 50	-0.00207 (0.000391)	-0.00329 (0.000912)
Greater than 50	-0.00234 (0.000483)	-0.00185 (0.00191)

Source: Authors' calculations, as described in the text. Each panel is a separate regression. The models also include the other covariates from the specifications in Table 2. The coefficients are marginal effects from probit estimated. Robust standard errors are in parentheses. The regressions are weighted by sample weights. See also the notes for Table 2.

Figure 1: Upside Tax Spread vs. Income

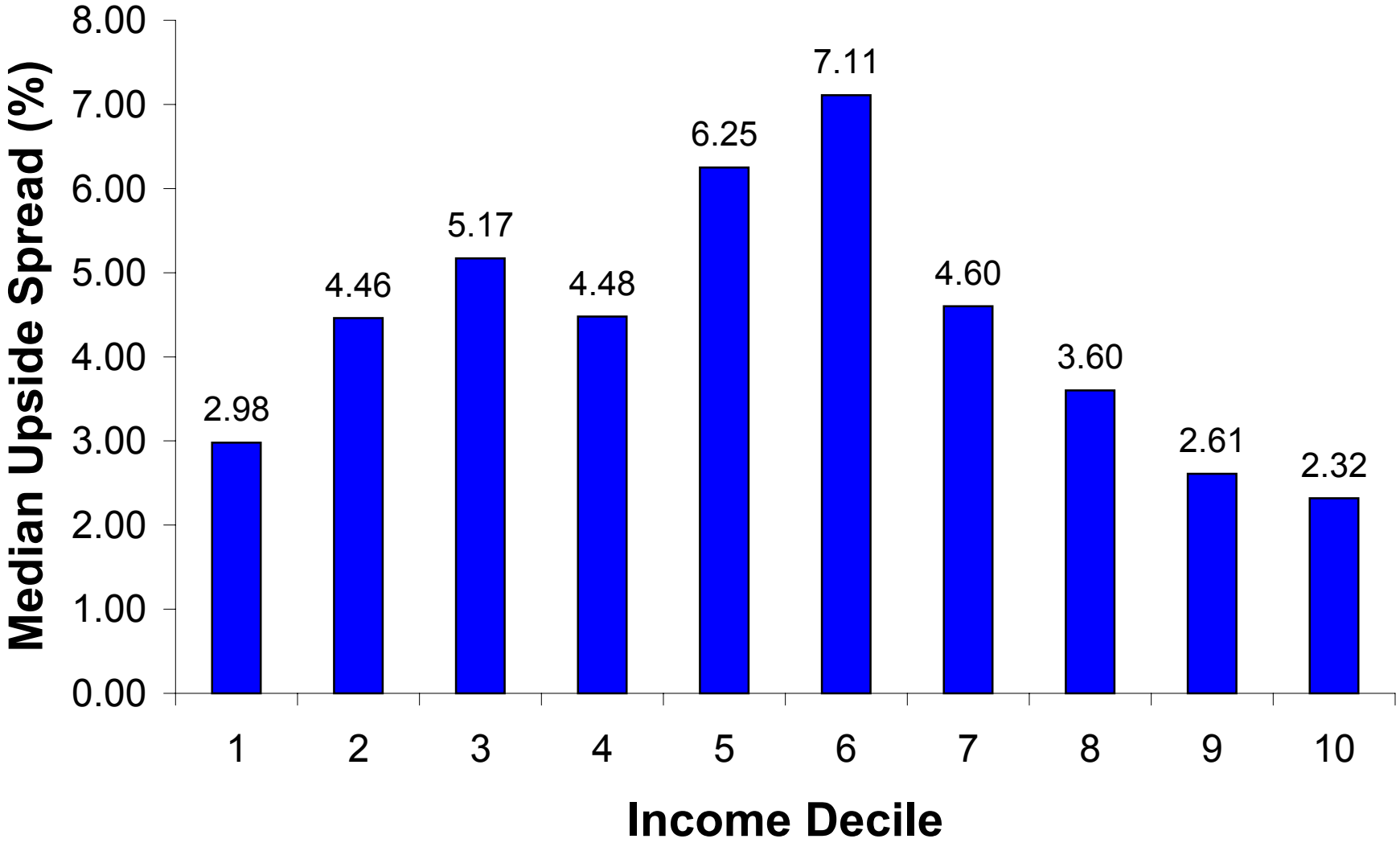

Figure 2: Job Search Probability vs. Tax Spread

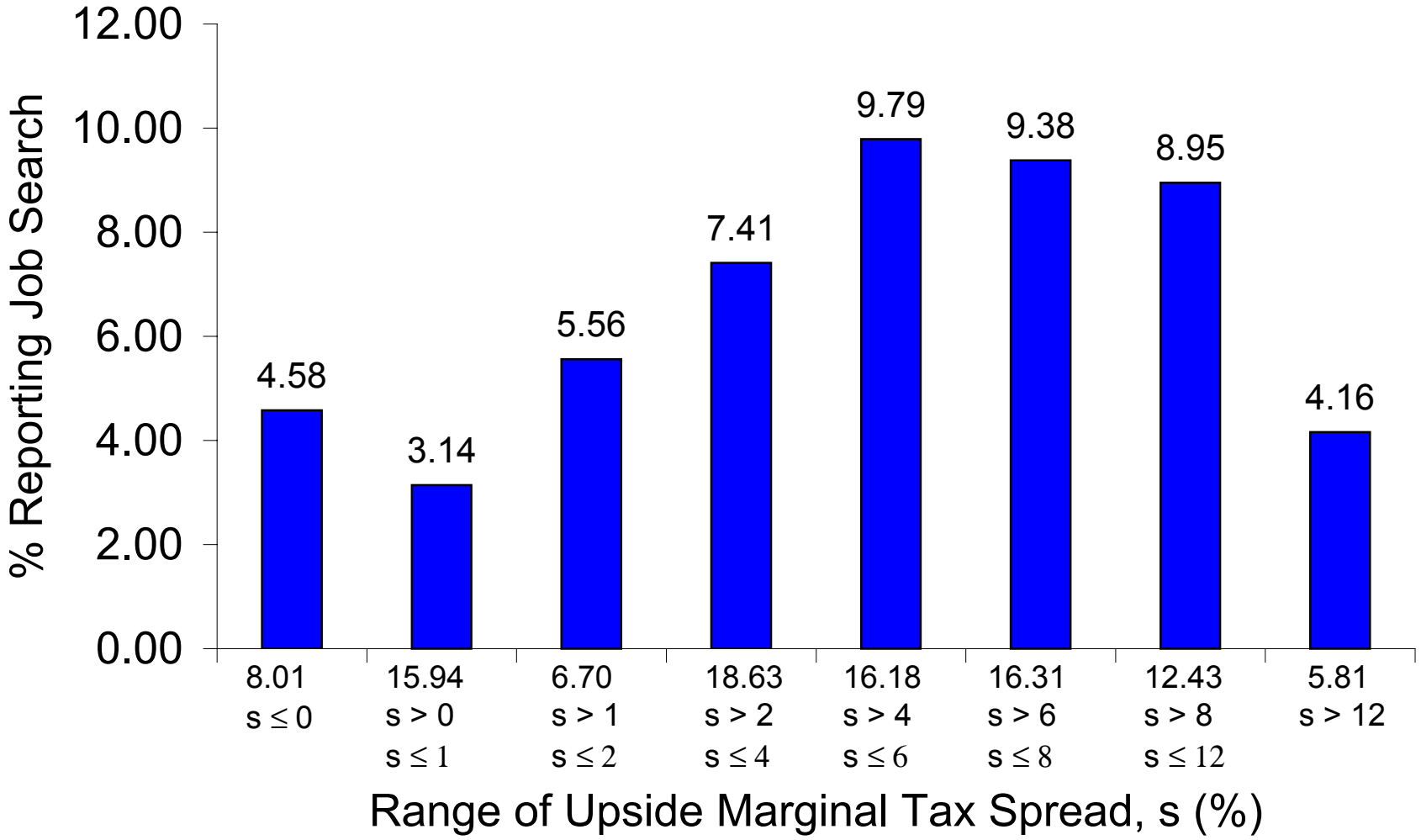

Figure 3: Job Search Probability vs. Income

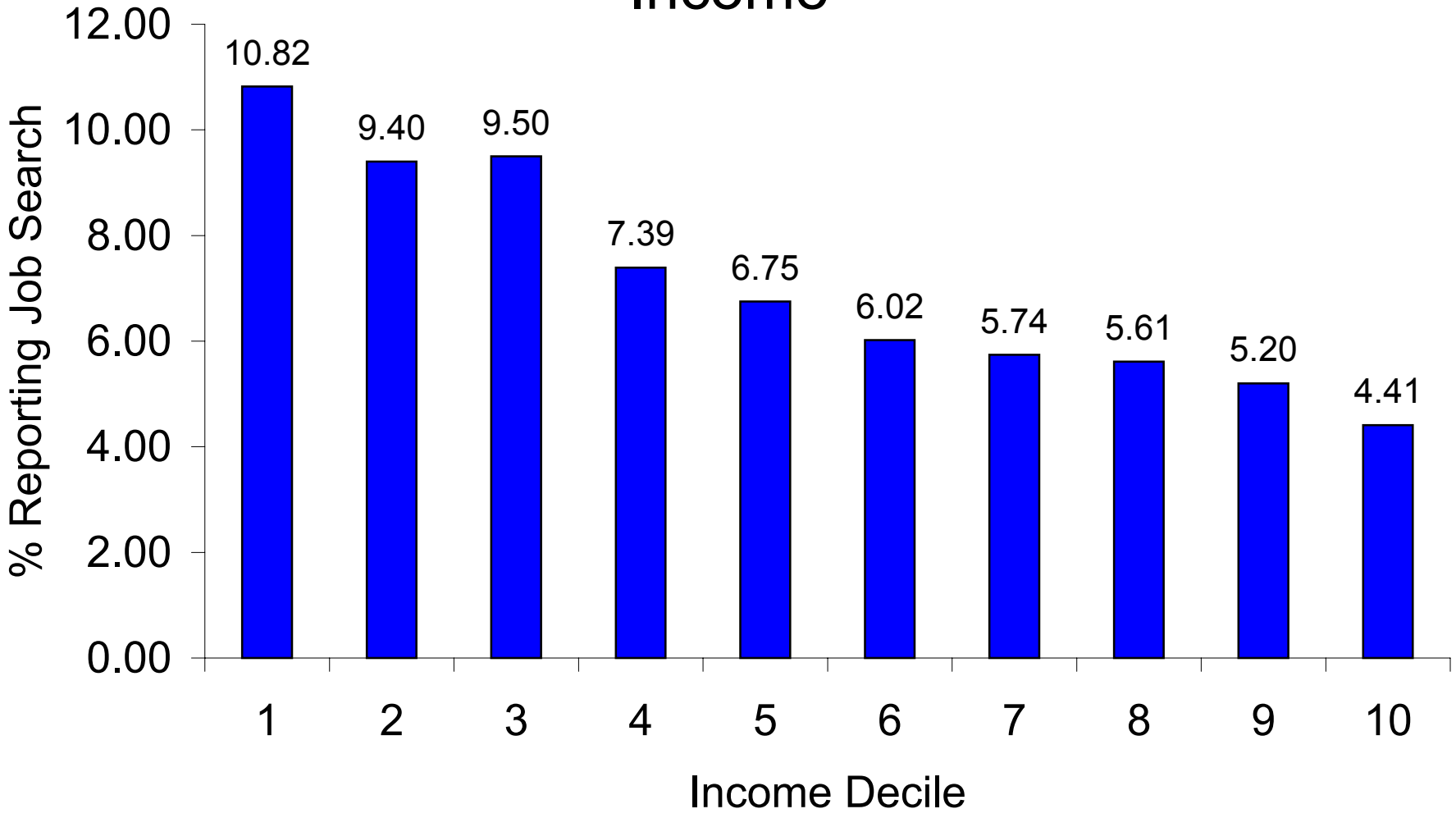

Figure 4: Job Turnover Probability vs. Tax Spread

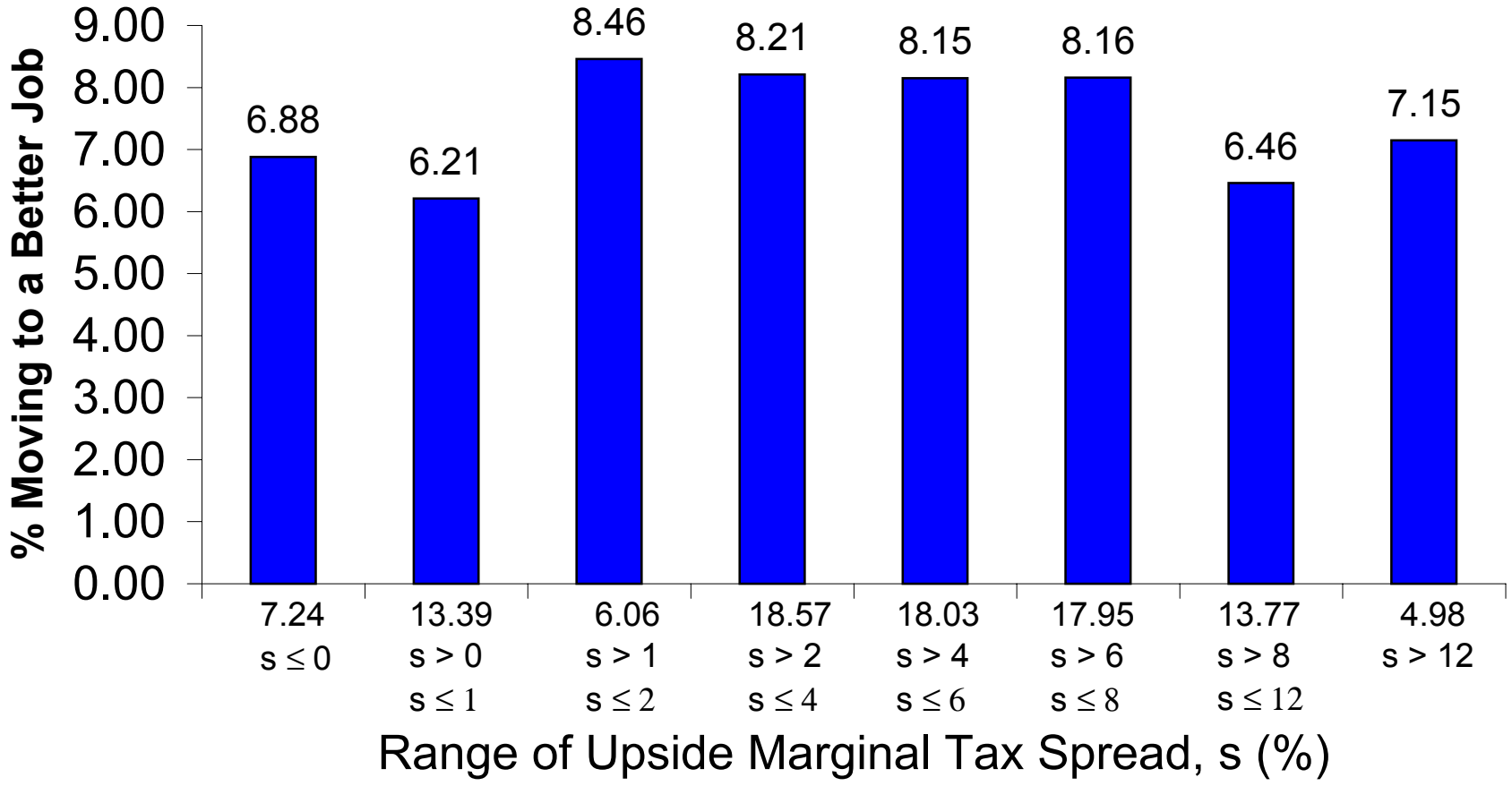

Figure 5: Job Change Probability vs. Income