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The responsiveness of self-employment income to tax rate changes

Bradley T. Heim *

Office of Tax Analysis, U.S. Department of the Treasury, Room 4036B, 1500, Pennsylvania Ave NW, Washington, DC 20220, United States

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ABSTRACT

This paper estimates the extent to which self-employment income responds to changes in the net-of-tax share using a panel of tax returns that spans 1987–1996. The results suggest that the elasticity of reported self-employment income to the net-of-tax share is approximately .9, implying a real elasticity (net of any reporting response) of around .4. Estimated elasticities tend to be larger for higher income taxpayers, married males, and females. In addition, the elasticity of self-employment income is considerably larger than the elasticity wage and salary income estimated using the same methodology.

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1. Introduction

Knowledge of the extent to which the work behavior of taxpayers responds to changes in tax rates is a vital element in understanding the efficiency costs of raising revenue and the revenue effects of changes in tax rates. As a result, numerous studies have examined the effect of changes in tax rates on labor supply behavior. Further, a sizable literature has developed attempting to estimate a parameter that reflects the responsiveness of all sources of income together (or of taxable income, which comprises income less deductions and exclusions) to changes in tax rates.[1] This paper adds to both of these literatures by using a panel of tax returns to examine the extent to which the income of a particular segment of the population, the self-employed, responds to changes in tax rates.

Numerous studies have estimated the responsiveness of wage and salary workers' labor supplies to changes in wages and nonlabor income. This is likely due to the fact that the vast majority of individuals are wage and salary employees, and as Blow and Preston (2002) note, the hours and participation margins are the predominant margins along which work behavior of these individuals are likely to respond.[2] This literature has tended to find very small hours elasticities for men and larger though still modest hours elasticities for women, with participation elasticities for women that tend to be larger than the hours elasticities.[3]

Much less attention has focused on the behavior of the self-employed, even though the self-employed are not a trivial share of workers in the United States. As an illustration, the Internal Revenue Service (IRS) reported that 12.7 million tax returns in 1994 paid some amount of self-employment tax, which amounted to 11% of all returns filed that year.[4] In addition, the Small Business Administration reports that 60–80% of net new jobs are created by small businesses, and that small businesses create more than half of the non-farm private gross domestic product.[5] As a result, small businesses are often viewed as the engines of innovation, job creation, and future growth in the economy.

Despite this, papers that study labor supply tend to exclude the self-employed, and most of the papers that have examined self-employment behavior have limited their focus to whether tax rates affect the decision of whether or not to be self-employed.[6] Several of these papers, including Long (1982), Moore (1983), Blau (1987), Parker (1996), and Scheutze (1998) find that higher marginal tax rates lead to self-employment. However, Fairlie and Meyer (1999) find that levels of self-employment are unrelated to marginal tax rates over the period 1910–90, and Moore (2003) finds that tax changes in the late 1980s and 1990s do not appear to have had a consistent significant effect on the self-employment decision. Gentry and Hubbard (2000) find that the level of marginal tax rates does not have a consistent effect on entry into self-employment, but that more progressive taxation tends to decrease entry into self-employment. In two papers, Bruce (2000, 2001) examines the response of entering into and exiting out of self-employment to differences in the tax rates that would be faced in wage work and self-employment, and finds

* Tel.: +1 202 622 1316; fax: +1 202 622 4369.
E-mail address: Bradley.Heim@do.treas.gov.

[1] For a recent comprehensive survey of this literature, see Saez et al. (2009). See also surveys in Gruber and Saez (2002) and Giertz (2004).

[2] Other possible responses include changes in jobs and changes in the form of compensation between taxable wages and nontaxable fringe benefits.

[3] For good surveys of this literature, see Hausman (1985), Killingsworth and Heckman (1986), Pencavel (1986), and Blundell and MaCurdy (1999).

[4] See Internal Revenue Service, Statistics of Income Division (1994), Table A.

[5] See http://www.sba.gov/advo/stats/sbfaq.pdf.

[6] For a survey of studies that have examined other determinants of self-employment in several countries, see Le (1999).

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that workers who switched into self-employment tended to be those who faced higher tax rates in self-employment than they would at a wage earning job.

Compared to the large literature estimating the responsiveness of self-employment to taxes on the extensive margin, relatively little is known about the extent to which the incomes of self-employed individuals respond to changes in tax rates on the intensive margin.

The responsiveness of self-employment income to marginal tax rates could take several forms. First and most importantly, there could be a real effect, in that higher tax rates might induce the self-employed to consumer more leisure and work fewer hours, exert less effort within a given set of hours, and invest less in their business given that the after-tax return to earning the marginal dollar has gone down. Second, there could be a reporting effect, in that the gap between the income of the self-employed individual (net of expenses) and the amount reported to the Internal Revenue Service may increase when tax rates are higher and the payoff from such tax avoidance is greater. Third, there could be a tax base effect, in which higher tax rates might lead a self-employed person to change their business form to a corporation (that is subject to the corporate income tax) if the resulting taxes would be lower.[7]

Recent papers that have examined the behavior of the self-employed have generally focused on one of these margins in isolation. In two papers, Carroll et al. (2000a,b), find that a higher net-of-tax share (one minus the marginal tax rate) increases the probability that an entrepreneur invests, the probability of hiring of outside help, and the total wage payments to workers. Carroll et al. (2001) find that a higher net-of-tax share increases the growth rate of gross receipts. Clotfelter (1983) and Joulfaian and Rider (1998) examine the extent to which higher marginal tax rates increase the underreporting of self-employment income. This study attempts to synthesize this literature by examining the extent to which the response along these and other margins aggregate up to an overall effect on reported self-employment income.

Most closely related to this study are those of Blow and Preston (2002) and Wu (2005). Blow and Preston (2002) use a grouping estimator on repeated cross-sectional tax return data from the 1985–86 and 1995–96 UK Surveys of Personal Incomes to examine the responsiveness of self-employment income to tax rates. In OLS regressions, they find a negative effect of the net-of-tax share on self-employment income, but this turns positive and significant when instrumental variables are used. Wu (2005) uses data from the 1983 and 1989 Survey of Consumer Finances to estimate the responsiveness of rates of return to changes in tax rates, and estimates an elasticity in excess of 5. In contrast to these studies, this paper uses panel data, making it possible to include fixed effects to control for unobserved characteristics of individuals (such as tolerance for risk) that might affect both the amount of self-employment income and the marginal tax rate. In addition, those papers examined the effect of income tax rate decreases, whereas the major policy changes during the sample period in this paper (the Omnibus Budget Reconciliation Acts of 1990 and 1993) involved tax rate increases.

Though estimates of the taxable income elasticity implicitly incorporate within them the responsiveness of the self-employment income to changes in tax rates, policymakers are interested in the extent to which entrepreneurial behavior in particular is affected by taxation. The estimation of an overall elasticity of self-employment income to marginal tax rates provides policymakers with a useful summary parameter to evaluate the effects of potential tax changes on all of the margins on which the self-employed can respond.

Using a panel of tax returns that spans 1987–96, this paper applies estimation methods that have been used in estimating the overall elasticity of taxable income to the estimation of self-employment income in particular. The results suggest that the elasticity of reported self-employment income to the net-of-tax share is approximately .9, implying a real elasticity (net of any reporting response) of around .4. The results suggest that the responsiveness to taxes tends to be larger for higher income taxpayers, married males, and females. In addition, the elasticity of self-employment income is considerably larger than the elasticity of wage and salary income estimated using the same methodology.

The paper proceeds as follow. Section 2 describes tax policy in the United States toward self-employment income. Section 3 presents the estimation methodology, Section 4 describes the dataset used, and Section 5 presents the estimation results. Section 6 concludes.

2. Tax policy toward self-employment income

In the United States, a tax unit may consist of an individual or a married couple, along with any dependents. Married couples may file jointly or separately, but the vast majority of married couples file jointly. For married taxpayers filing jointly, the first person listed on the tax return is called the primary filer, while the second person is called the secondary filer. All single taxpayers are considered to be primary filers.

Income from a self-employed individual's business is reported on the form that corresponds to their type of business. Sole proprietorships report business income on Schedule C, partnerships and S corporations[8] report income on Schedule E, and farms report income on schedule F. Income from each of these types of business are then added to income from other sources (such as from wages and salaries) on a taxpayer's Form 1040, and are subject to individual income tax.[9]

During the period examined in this study, three major federal tax law changes, including the Tax Reform Act of 1986 (TRA86) and the Omnibus Budget Reconciliation Acts of 1990 and 1993 (OBRA90 and OBRA93) altered the tax rates that applied to individual income. In 1987 and 1988, TRA86 was phasing in, so that in 1987, there were five brackets with rates increasing from 11% to 38.5%, while in 1988 there were effectively four tax brackets with rates increasing from 15% to 33% and then decreasing to 28% in the highest income bracket. OBRA90 effectively increased the top bracket to 31% in 1990, and then combined the 33% and 31% brackets into a 31% bracket in 1991. Finally, OBRA93 broke the previous 31% bracket into three brackets in 1993, with rates of 31%, 36%, and 39.6%. Federal tax rates remained at this level through the rest of the sample period. During the sample period, there were also a number of tax changes at the state level.

Income from self-employment is also subject to Self-Employment Contributions Act (SECA) taxes, which are calculated on Schedule SE. These constitute a self-employed individual's contributions to the Social Security and Medicare programs, and are similar to Federal Insurance Contributions Act (FICA) taxes that are paid on wage and salary income (which are also contributions for Social Security and Medicare), with two differences. First, the SECA tax rate of 15.3% is levied on 92.35% of self-employment income,[10] while for FICA taxes the employee and employer each pay 7.65% of the employee's wages

[7] This is related to a point made in Slemrod and Kopczuk (2002), that the elasticity of taxable income is a function of institutional features of the tax code. Because different tax rates are levied on different bases of income, the elasticity of self-employment income may be higher because of the ability to shift income to (or from) bases with lower (or higher) tax rates.

[8] The IRS defines an S corporation as a corporation that elects to pass corporate income, losses, deductions and credit through to their shareholders for federal tax purposes. An S corporation must have only one class of stock and must have less than 100 shareholders.

[9] A taxpayer may also elect to incorporate their business as a C corporation, in which case the income from the corporation would be taxed at the corporate level, and any wages from the corporation would be subject to individual income tax.

[10] Up to a threshold, beyond which the rate was 0% in 1993 and before and 2.9% starting in 1994.

and salaries.[11] Second, self-employed taxpayers are allowed a deduction of one half of their SECA taxes. When both income and FICA or SECA taxes are added together, the net-of-tax share for wage and salary income is almost (but not exactly) the same as on self-employment income.[12]

One important difference between wage and salary income and self-employment income is that taxes on wage and salary income are withheld by employers, and the amount of income is reported by employers to the IRS, while the self-employed are responsible for reporting their own income and paying their own taxes.[13] As a result, individuals may be able to evade some taxes on self-employment income by reporting less than they actually earned. Indeed, several studies have demonstrated that self-employment income is frequently misreported or not reported to the IRS, particularly when compared to wage and salary income that is subject to withholding and information reporting. Kahn (1964) estimated that during the period 1939–60, approximately 70% of estimated self-employment income was reported to the IRS, while 96% of wage and salary income was reported. In Internal Revenue Service (1979) it was estimated that in 1976, 60–64% of self-employment income was reported on federal tax returns, while the comparable figure for wage and salary income was 97–98%. Since these studies, several others have been published that find compliance for self-employment income is lower than that for wage income, including Clotfelter (1983), Klepper and Nagin (1989), Feinstein (1991), Erard (1992), and Feldman and Slemrod (2007).

3. Estimation method

In a typical labor supply estimation, hours of work are specified as a function of the wage (either gross or after taxes), nonlabor income, and demographic characteristics. Applying this directly to the present study of self-employment income runs into some problems, however. First, hours of work (either in self-employment or at a wage and salary job) are not observed, which implies that we must resort to income earned in self-employment as the dependent variable. Second, since no wage is reported, and none can be imputed using an hours of work variable, the independent variable of interest is instead the net-of-tax share, $(1-\tau)$, which is the share of the marginal dollar that the self-employed would be able to keep after taxes. Third, some self-employment income may not be reported to the IRS.

Since this estimation setting is directly analogous to papers that have attempted to estimate the overall elasticity of taxable income to the net of tax share,[14] the estimation equation in this study is similar to that used in those papers. The initial estimation specification that is used is[15]

$$\ln\left(\frac{I^{SE}_{R,it'}}{I^{SE}_{R,it}}\right) = \alpha + \beta \ln\left(\frac{1-\tau_{it'}}{1-\tau_{it}}\right) + \gamma Z_{it} + \varepsilon_{it}. \quad (1)$$

In this specification, i denotes a particular tax unit (either a single individual or a married couple filing jointly), t denotes a base year, t' denotes the year three years subsequent to the base year, $I^{SE}_{R,it}$ denotes reported self-employment income in year t, $1-\tau_{it}$ denotes the net-of-tax share, and Z_{it} denotes other factors that might affect a taxpaying unit's income.

Several studies, however, (including Moffitt and Wilhelm (2000), Gruber and Saez (2002), Kopczuk (2005), and Giertz (2004, 2006)) have noted that estimates resulting from such an equation can be biased for at least two reasons. First, there may be exogenous trends in income that are correlated with but not caused by the changes in the tax rate.[16,17] Second, transitory income shocks may cause an individual's income to deviate from a longer run trend, and income may revert back to the mean at the same time that tax rates are changing. As a result, it is likely to be important to control for exogenous income trends by income class and for mean reversion when estimating the response of self-employment income to changes in tax rates. So, equations of the form

$$\ln\left(\frac{I^{SE}_{R,it'}}{I^{SE}_{R,it}}\right) = \alpha + \beta \ln\left(\frac{1-\tau_{it'}}{1-\tau_{it}}\right) + \delta g\left(I^{SE}_{R,it-1}, I^{SE}_{R,it}\right) + \gamma Z_{it} + \varepsilon_{it} \quad (2)$$

were also estimated, where the $g(I^{SE}_{R,it}, I^{SE}_{R,it-1})$ term contains variables meant to control for exogenous trends in income and mean reversion. Two different specifications were tried. In the first, following Gruber and Saez (2002), $g(I^{SE}_{R,it}, I^{SE}_{R,it-1})$ includes a ten piece spline in year t income is included to control for these trends. In the second, following Kopczuk (2005), $g(I^{SE}_{R,it}, I^{SE}_{R,it-1})$ includes ten piece splines in the log of lagged income and the deviation of base year log income from the log of lagged income.

To account for the possible endogeneity of the change in net-of-tax rates to the change in self-employment income between t and t',[18] following Gruber and Saez (2002) and others, the actual change in tax rates is instrumented for using the variable $\ln\left(\frac{1-\tau^{t}_{t'}}{1-\tau_{t}}\right)$, where $\tau^{t}_{t'}$ denotes the marginal tax rate observation i would have faced in year t' if all of the components of income had been the amounts in year t inflated by increases in the CPI. As such, the instrument reflects a difference in tax rates that is due solely to changes in tax law, and not due to taxpayer behavior.[19]

Note that, in this specification, estimates of β cannot be interpreted as the elasticity of self-employed income for all self-employed individuals as a whole, because I am using a selected sample of taxpayers who reported self-employment income in both years. If the self-employed individuals that were the most responsive to tax changes tended to be more likely to leave self-employment after the tax increases in the 1990s, then the estimates in this paper would be downward biased estimates of the elasticity of self-employment income among all the self-employed.[20] Estimates of the elasticity of

[11] Up to a threshold, beyond which the rate was 0% in 1993 and before and 1.45% starting in 1994.

[12] The exact net-of-tax share on before payroll tax wage and salary income is $(1-\tau^{P}-\tau^{I})/(1+\tau^{P})$, where τ^{P} is the marginal payroll tax rate and τ^{I} is the marginal income tax rate, while the exact net-of-tax share on pre-tax self-employment income is $(1-2\tau^{P}+2(\tau^{P})^2-\tau^{I}+\tau^{P}\tau^{I}-(\tau^{P})^2\tau^{I})$, which equals $(1-\tau^{P}-\tau^{I}-2(\tau^{P})^3-(\tau^{P})^3\tau^{I})/(1+\tau^{P})$.

[13] This is noted in Andreoni et al. (1998).

[14] See, for example, Gruber and Saez (2002), Kopczuk (2005), Giertz (2007) and Heim (2009), among others.

[15] In Appendix A, a model is presented in which the first order conditions imply that reported self-employment income will be a function of the net of tax share, as well as taste and tax enforcement parameters. In addition, the share of self-employment income reported will be a function of these same parameters.

[16] For example, if incomes among high income taxpayers ware increasing at the same time tax rates were increasing for this group, then β would be biased downward. Piketty and Saez (2003) present evidence that the share of income at among high income taxpayers (for whom tax rates increased) increased substantially during this period.

[17] Since the increase in tax rates during the sample period were larger for higher income taxpayers, different trends in income for different income classes would also bias a simple difference-in-differences estimate of the effect of tax rates on self-employment income.

[18] Note that, unlike in taxable income studies, marginal tax rates are not directly a function of self-employment income. This is because self-employment income is only a portion of total taxable income, and other sources of income or deductions also determine the marginal tax rate. However, endogeneity of the marginal tax rate is still possible in this setting, particularly for observations with only (or predominantly) self-employment income.

[19] Note that this instrument will also capture tax changes that result from individuals crossing unindexed thresholds, even if the tax law hasn't changed.

[20] Estimates from a selection-corrected regression (e.g. Heckman (1979)) would be preferable, as they would apply to the whole population of self-employed. Unfortunately, they would be unconvincing in the current setting, because the dataset used in this study contains no variables that can plausibly be thought of as affecting the decision to stay self-employed but not the decision of how much income to earn and report, and so identification would come solely from functional form restrictions.

self-employment income among those who stay self-employed are interesting in their own right, however, because they reflect the responsiveness to tax rate changes among those who are consistently self-employed.

In addition, the equation above estimates the elasticity of reported self-employment income, while we wish to recover the responsiveness of actual or real, and not just reported, self-employment income. To see what effect misreporting of income may have on the estimated coefficients, denote the share of income not reported to the IRS as $n((1-\tau), Z, \eta)$, where η denotes the taxpayer's taste for misreporting. In this case, $I_R^{SE} = I^{SE}[1-n(\cdot)]$, where I^{SE} denotes the actual or real amount of self-employment income (not just the amount reported), and taking logs yields

$$\ln(I_R^{SE}) = \ln\left(I^{SE}\right) + \ln[1-n(\cdot)] \tag{3}$$

If $n(\cdot)$does not depend on $(1-\tau)$, then the elasticities of reported and actual income are equivalent. Otherwise, the reported income elasticity will equal the actual income elasticity plus the elasticity of the reported share. Although the data used in this study cannot be used to directly estimate this non-reporting response, a back of the envelope calculation of the evasion effect can be performed using estimates in Clotfelter (1983) and Joulfaian and Rider (1998).[21] Results from these papers suggest that the elasticity of the share of non-reported business income to the net-of-tax share is around .4 to .6. Thus, the extent to which the estimated reported self-employment income elasticity exceeds this range can be thought of as the response of actual self-employment income to changes in tax rates.

Because the dataset used in this study highly oversamples high income taxpayers, I weight observations by their sampling importance. In addition, following much of the taxable income elasticity literature, I multiply these weights by reported self-employment income in the base year, so that elasticities reflect the change that would occur to the overall amount of reported self-employment income. The resulting elasticities will be referred to as "income weighted" elasticities. Following Gruber and Saez (2002), to prevent any ultra-high income individual observation from having undue influence on the resulting estimates, the base year self-employment income amounts are truncated at $1 million when calculating weights. However, the results are robust to relaxing this truncation.[22]

4. Data

The data used in this study come from a ten-year panel of tax returns known as the Family Panel.[23] This panel consists of two segments — a "cohort" segment and a "refreshment segment."

The cohort segment started with a stratified random sample of tax returns for 1987 that were filed with the IRS in 1988 and sampled by the IRS's Statistics of Income Division in that year, where the sampling probability increased sharply at high income levels. This sample consisted of approximately 85,000 tax returns. All taxpayers represented on the return of a member of this cross section, including secondary taxpayers on joint returns and dependents, were pulled into the sample. Then, over the following nine years, through returns filed in 1997 for tax year 1996, the SOI division included in the panel any return filed that reported any panel member as a primary or secondary taxpayer, including tax returns filed by panel members who were dependents of another taxpayer.

Because some members of the cohort panel dropped out of the tax-filing U.S. population due to death, emigration, or falling below the tax-filing thresholds, while others entered because of immigration or becoming filers, over time this cohort panel represents a declining portion of the population. To keep the panel representative required an additional "refreshment" segment that represented individuals who became non-dependent tax return filers after 1987, and their dependents. This segment was created from the returns in the SOI cross section samples for 1988 through 1996 filed by CWHS primary filers who were not filers in 1987.[24]

The dataset contains information reported on Form 1040, including total wages and salaries, business income, and investment income, as well as amounts deducted from income (such as IRA contributions, moving expenses, and others). In addition, the data contains information from a number of supporting schedules, including Schedule SE, Schedule C, Schedule F, and many other schedules. Finally, information was merged in on each taxpayer's gender and date of birth, as well as date of death for those who died during the panel period. Overall, the Family Panel consists of 1.26 million returns

Numerous sample cuts that are standard in the literature were made before the estimation is performed.[25] The sample was cut to include only those observations in which the primary filer was not a dependent at any point during the panel. In addition, observations in which there is a change in filing status at some point in the panel were dropped. These cuts are done to eliminate changes in income and tax rates that could be due to changes in filing status. Also cut were all returns in which the primary filer is under the age of 25, to eliminate changes in income due to the completion of schooling. Finally, observations for which no self-employment income was reported in either year of the three year difference were excluded from the sample. After these cuts, 77,389 observations remained.[26]

The dependent variable in this study is total self-employment income, which comes from the sum of line 1 (farm income)[27] and line 2 (non-farm income) of the primary filer's Schedule SE, which in turn reflect the sum of the taxpayer's Schedule C, Schedule F, and partnership income.[28]

To control for demographic characteristics of the filers in the panel, information is used on the primary filer's age, gender, marital status, itemizer status, number of children, whether one or more children lived outside of the filer's house, and region of the country.

Marginal tax rates in this study were calculated using tax calculators provided by Jon Bakija.[29] Tax rates were calculated by

[21] Feinstein (1991) finds a negative effect of the marginal tax rate on misreporting overall, but does not break his results out by type of taxpayer.

[22] As a robustness check, in Table 4 I estimate a specification in which observations are only weighted by their sampling importance. This will be referred to as a "population weighted" elasticity.

[23] For more information on the Family Panel of tax returns, see Cilke et al. (2000, 2001). This section borrows heavily from those papers' description of the data.

[24] The full dataset also includes a number of imputed tax returns that represent permanent non-filers and non-filers who filed in at least one year between 1987 and 1996, and a few returns of panel member filers that were not included in the SOI sample. These imputed returns are not used in the analysis in this paper, however.

[25] Sample sizes after each of these cuts are presented in Appendix B. In the entire sample (including dependents, those who changed filing status, and those under 25), 100,824 observations reported positive self-employment income in both years of a three year difference.

[26] In addition, when a ten piece spline in lagged income is included as a regressor, those who report no self-employment income in the prior year are excluded from the estimation sample. When this is done, the sample size decreases to 57,142 observations.

[27] One might be concerned that those with farm income respond differently to changes in taxes than those with non-farm income, perhaps because of the regulatory environment that farmers operate under. However, when only those with non-farm income were included in the sample and the dependent variable was the difference in log non-farm income, the estimated coefficient on the net-of-tax share (.941) was very close to that in the base specification presented here.

[28] Taxpayers that have net operating losses are generally able to carry those losses back two years and forward up to twenty years (though there are a number of exceptions). However, the variables used in this study reflect self-employment income prior to any net operating loss deduction.

[29] Documentation for these tax calculators is detailed in Bakija (2008).

incrementing business income by $100 and calculating the marginal increase in taxes owed, taking into account self-employment (SECA) taxes and the interaction between federal and state income taxes for those who itemize.[30]

Sample statistics for the relevant variables in the resulting sample are presented in Table 1, both for the unweighted sample, and for the sample when population weights are applied.

In the unweighted sample, the average amount of self-employment income is $322,615. The mean of the three year difference in the log of self-employment income is −.189. Because the Family Panel oversampled high income taxpayers in 1987, it seems plausible that some of this decline in self-employment incomes reflects mean reversion. As a result, it will likely be important to include income controls for mean reversion, as noted above.

Examining the columns with population weighted means demonstrates the extent to which higher income returns were oversampled. For example, when returns are population weighted, the mean amount of self-employment income drops to $27,246, and the three year difference in the log of self-employment income drops to −.065.

Table 2 presents the means and standard deviations in the change in net-of-tax share instrument by year. To examine the identifying variation in this variable by income group, the sample is also split according to the amount of self-employment income reported in the first year of the three year difference. In this table, the increase in the net-of-tax share resulting from TRA86 is apparent in the 1987–90 pair, while the decreases in the net-of-tax share that resulted from the OBRA90 and OBRA93 are particularly apparent in the 1990–93, 1991–94, and 1992–95 pairs. As would be expected, given the nature of these tax changes, the change in the net-of-tax share is generally larger for higher income groups than for lower income groups. However, the standard deviation in the net-of-tax share instrument among the group of taxpayers with up to $50,000 in self-employment income is still nontrivial, reflecting changes in tax rates at the state level, suggesting that individuals with all levels of income will contribute to the identification of the overall elasticity.

Table 1
Sample statistics.

	Unweighted		Population weighted	
	Mean	Std. dev.	Mean	Std. dev.
Income variables				
Self-employment income	$322,615	$1,859,953	$27,246	$111,295
Three year difference in ln (Self-employment income)	−0.189	1.314	−0.065	1.070
Demographic variables				
Age/100	0.516	0.120	0.478	0.123
Age squared/1000	2.804	1.300	2.438	1.256
Married	0.919	0.273	0.845	0.362
Number of children	1.120	1.276	1.084	1.237
Child away from home	0.008	0.090	0.006	0.079
Itemizer	0.836	0.370	0.539	0.499
Sex of primary filer (1 = Female)	0.167	0.373	0.211	0.408
Census Division				
New England	0.066	0.249	0.053	0.224
Mid-Atlantic	0.192	0.394	0.136	0.343
East North Central	0.137	0.344	0.145	0.352
West North Central	0.065	0.247	0.108	0.311
South Atlantic	0.153	0.360	0.155	0.362
East South Central	0.048	0.214	0.059	0.235
West South Central	0.121	0.326	0.114	0.317
Mountain	0.046	0.210	0.061	0.240
Pacific	0.170	0.376	0.168	0.374
Total number of observations	77,389			

5. Results

5.1. Base specification

Table 3 presents results from instrumental variables regressions where the dependent variable is the three year difference in the log of self-employment income. In Column 1, no controls are included to account for mean reversion and exogenous trends in income. The estimated self-employment elasticity is 1.267 (with a standard error of .293) and is highly significant. However, as noted above, papers examining the elasticity of taxable income found that controlling for mean reversion and exogenous trends in income has a marked effect on the estimated elasticity. So, in the next two columns, different variables are included to attempt to control for these factors.

In Column 2, following Gruber and Saez (2002), a ten piece spline in the income from the first year of the three year difference is included. When this is done, the estimated elasticity falls to .777 (with a standard error of .249), but it is still strongly significant. In Column 3, following Kopczuk (2005), a ten piece spline in lagged log income and a ten piece spline in the deviation of the log of base year income from the log of lagged income are included. The first of these splines attempts to control for exogenous trends in income, while the second of these is included to control for mean reversion. When this is done, the estimated elasticity of self-employment income is between the other two estimates, with a coefficient of .907 (and a standard error of .340). Again, the estimate is highly significant.[31]

Looking across these columns, it appears that not controlling for other trends in income biases the estimated elasticity of self-employment income upwards. However, comparing the results in Column 2 to Column 3, it appears that the particular method of controlling for these trends has a small effect on the estimated elasticity, with the difference between the two estimates being statistically insignificant. Since the specification that includes splines in both lagged income and deviations of base year income from lagged income accounts in a more comprehensive way for changes in income that are unrelated to changes in taxes, this specification is used in the remainder of the paper, and will be referred to as the base specification.

As noted above, the estimates may be picking up two effects — a real effect and an evasion effect, and that the results in the literature are consistent with the evasion effect alone yielding an elasticity of around .5. Given this, the results in the base specification suggest a real effect (net of any reporting response) of around .4.

Turning to demographic characteristics, only age squared and an indicator variable for itemizing deductions enter significantly, and only in the latter two specifications. However, an *F*-test rejects the null

[30] The federal tax rates from this calculator were benchmarked against the rates calculated by the Treasury Department's internal tax calculator for the Family Panel.

[31] The coefficients on the lagged income spline imply that higher lagged income was followed by a smaller increase (or larger decrease) in income over the three year difference, albeit at a slower rate as lagged income increased. This suggests that, absent any other changes, the distribution of self-employment income would have compressed over these years. The coefficients on the deviation of log income from lagged log income spline imply that having income in the first year of the three year difference substantially higher (lower) than in the previous year led to a smaller (larger) increase or larger (smaller) decrease in income over the three year difference. This suggests that income tended to revert to the mean.

Table 2
Sample statistics for change in net of tax share instrument: three year difference.

Year	Above $0	$0 to $50 K	$50 K to $100 K	$100 K to $500 K	$500 K to $1 M	$1 M and above
1987–90	0.089	0.042	0.046	0.122	0.153	0.154
	(0.093)	(0.096)	(0.093)	(0.061)	(0.048)	(0.047)
	10,977	4802	869	2554	2005	747
1988–91	−0.032	−0.011	−0.040	−0.043	−0.059	−0.057
	(0.006)	(0.061)	(0.070)	(0.043)	(0.044)	(0.060)
	11,025	4947	961	2648	1713	756
1989–92	−0.030	−0.009	−0.033	−0.043	−0.062	−0.063
	(0.082)	(0.105)	(0.082)	(0.040)	(0.020)	(0.027)
	10,931	5077	1035	2701	1399	719
1990–93	−0.094	−0.041	−0.056	−0.135	−0.197	−0.198
	(0.104)	(0.084)	(0.096)	(0.098)	(0.049)	(0.037)
	10,633	5072	999	2571	1324	667
1991–94	−0.077	−0.036	−0.042	−0.117	−0.169	−0.159
	(0.101)	(0.096)	(0.065)	(0.080)	(0.064)	(0.102)
	11,520	5763	1079	2860	1229	589
1992–95	−0.076	−0.039	−0.039	−0.113	−0.166	−0.163
	(0.096)	(0.098)	(0.063)	(0.068)	(0.059)	(0.068)
	11,329	5735	1111	2824	1083	576
1993–96	−0.014	−0.010	−0.003	−0.022	−0.025	−0.011
	(0.067)	(0.073)	(0.069)	(0.033)	(0.019)	(0.142)
	10,974	5714	1097	2753	914	496

Note: Data from the 1987–96 Family Panel of tax returns. Means, standard deviations, and number of observations reported. Income cuts are based on self-employment income in the first year of the difference.

hypothesis that all coefficients on the demographic variables are zero with a p-value of less than .01 for all three of these specifications.[32]

5.2. Robustness checks

To examine the robustness of the above results to some of the key specification choices that were made, several robustness checks to the specifications presented above are performed. The results from these specifications are presented in Table 4. For ease of comparison, Column 1 repeats the results from the base specification.[33]

In Column 2, to examine whether the results differ depending on the set of years used, a specification was estimated with a one year difference between t and t'. In the base specification, to be included a taxpayer would have to report self-employment income in years $t-1$, t, and $t+3$, effectively requiring them to be self-employed for five years. If more established self-employed taxpayers tend to be more responsive to taxes, perhaps because they have more margins on which they can adjust, the resulting elasticities could be biased upward. Using a one year difference, then, cuts the required number of years being self-employed to three ($t-1$, t, and $t+1$). In this specification, the estimated coefficient only falls slightly to .846, and is still highly significant, suggesting that cutting the sample to include only longer term self-employed does not significantly impact the estimated elasticities.

As noted above, in this study, each observation is weighted by the product of their sampling weight and the reported amount of self-employment income (as is common in the taxable income elasticity literature) so that these income weighted estimates reflect the change that would occur to the overall amount of reported self-employment income. However, in the labor supply literature, observations are generally not weighted in this manner. To examine the effect of this weighting on the estimated elasticity, in Column 3, observations are weighted only by their sampling weights, so that a population weighted elasticity is estimated. Because higher income taxpayers do not receive proportionately higher weight in this specification, the resulting elasticity will be more representative of the responsiveness of taxpayers with lower amounts of self-employment income. When this is done, the estimated elasticity drops to .456 and is insignificant, suggesting that the bulk of the responsiveness of self-employment income to taxes is to be found among those with higher income.

To examine whether this is indeed the case, in Column 4, the difference in the net-of-tax share is interacted with indicator variables for the amount of self-employment income of the taxpayer in the first year of the three year difference. For this specification, indicator variables were created that indicated base year self-employment income being below $50,000, between $50,000 and $100,000, between $100,000 and $500,000, between $500,000 and $1 million, or above $1 million. Although the significance of the estimated coefficients is dampened in this specification, it is apparent that the responsiveness to changes in tax rates increases strongly with income, as the estimated elasticity increases from .251 to those with income below $50,000 to 2.477 for those with income above $1 million. This finding is consistent with that in Gruber and Saez (2002) and Heim (2009), who found greater taxable income responsiveness to tax rates among higher income taxpayers. It also helps to explain the much smaller and insignificant results when the sample was population weighted.

Finally, in Columns 5 and 6, an attempt is made to control for shifting across tax bases and across years.

First, consider shifting across tax bases. As noted by Gordon and Slemrod (2000), given sufficient planning, it may be possible for self-employed individuals to shift some of their income either to or from the corporate sector, to take advantage of differences in the marginal tax rates between these two sectors. In this case, the self-employment income supply equation would also depend on the marginal corporate income tax rate. Their results imply that, holding personal tax rates fixed, a one percentage point increase in the corporate rates would increase reported personal labor income by 3.2%. Fortunately, corporate tax rates were relatively stable during most years of this study, with two exceptions. First, in 1988, marginal tax rates fell for all levels of corporate income above $25,000.[34] Second, in 1993, marginal tax rates increased on corporate income above $10 million. To attempt to net out these

[32] An F-test also rejects the null that the coefficients on all demographic, region, and year variables are zero with a p-value of less than .01.

[33] Most of the demographic characteristics enter insignificantly in these specifications. However, an F-test rejects the null hypothesis that all coefficients on these variables are zero with a p-value of less than .01 for all of these specifications.

[34] Of course, at the same time there was a considerable amount of base broadening.

Table 3
Estimation results: three year difference in the log of self-employment income.

	(1)	(2)	(3)	
$\Delta\ln(1-\tau)$	1.267*** (0.293)	0.777*** (0.249)	0.907*** (0.340)	
Married	0.021 (0.042)	0.042 (0.043)	0.043 (0.048)	
Age/100	0.292 (0.805)	1.210 (0.861)	0.410 (0.877)	
Age squared/1000	−0.132 (0.081)	−0.220** (0.087)	−0.146* (0.087)	
Sex of primary filer	0.007 (0.030)	−0.003 (0.030)	0.016 (0.033)	
Itemizer	0.011 (0.024)	0.165*** (0.026)	0.102*** (0.028)	
Number of children	0.012 (0.011)	0.019* (0.011)	0.015 (0.011)	
Child away from home	0.031 (0.074)	0.038 (0.075)	0.021 (0.095)	
Spline variables		ln(Income)	ln(Lagged income)	Deviation of ln(Income) from ln(Lagged income)
First decile		−1.074*** (0.135)	−0.494*** (0.184)	−0.433*** (0.094)
Second decile		−0.641*** (0.119)	−0.435** (0.192)	−0.815*** (0.179)
Third decile		−0.526*** (0.115)	−0.510** (0.214)	0.236 (0.271)
Fourth decile		−0.230* (0.122)	0.104 (0.236)	−0.028 (0.345)
Fifth decile		−0.362*** (0.122)	−0.556** (0.246)	−0.151 (0.593)
Sixth decile		−0.414*** (0.119)	−0.231 (0.222)	−0.136 (0.482)
Seventh decile		−0.194* (0.115)	−0.197 (0.170)	−0.691** (0.340)
Eighth decile		−0.284*** (0.097)	−0.211* (0.128)	−0.701*** (0.248)
Ninth decile		−0.068 (0.077)	0.011 (0.080)	−0.547*** (0.171)
Tenth decile		−0.070*** (0.026)	−0.016 (0.023)	−0.356*** (0.072)
Constant	−0.474 (0.619)	7.807*** (1.099)	4.607*** (1.426)	
Region dummies	Yes	Yes	Yes	
Year dummies	Yes	Yes	Yes	
Observations	77,389	77,389	57,142	

Notes: Data from the 1987–96 Family Panel of tax returns. The dependent variable is the three year difference in the log of self-employment income. Robust standard errors, clustered at the taxpayer level, are in parentheses. The change in the net of tax rate is instrumented in all specifications with the change in net of tax rate evaluated at the level of income in the base year (inflated by the CPI for the tax calculation in the later year).
* Significant at 10%.
** Significant at 5%.
*** Significant at 1%.

effects, two changes to the sample are made. First, any observation that has a base year of 1987 or 1988 is dropped.[35] Second, any observation that reported over $10 million in total self-employment income in the base year is dropped.

Comparing Column 5 to the base specification in Column 1, the estimated elasticity increased somewhat to a highly significant 1.149, though due to a relatively large standard error of .435 the estimate is not significantly different from that in Column 1. These results suggest that not controlling for tax rate changes in the corporate sector does not have a large effect on the estimated elasticities.

Consider next income shifting across years. As noted in Goolsbee (2000), taxpayers may be able to shift income or deductions across adjacent years in response to tax wedges between those years.[36] In this case, the equation determining self-employment income (omitting non-tax variables) is

$$\ln\left(I^{SE}_{R,it}\right) = \beta\ln(1-\tau_{it}) + \beta^{f}\left[\ln(1-\tau_{it+1}) - \ln(1-\tau_{it})\right] + \beta^{b}\left[\ln(1-\tau_{it}) - \ln(1-\tau_{it-1})\right] + \varepsilon_{it} \quad (4)$$

where β captures the long-run (or "real") effect of the tax rate on taxable income, β^{f} captures the change in income that results from income being shifted into (out of) the current year because the net-of-tax share is lower (higher) one year forward, and β^{b} captures the change in taxable income that results from income having been shifted into (out of) the current year because the net-of-tax share was lower (higher) one year back. I estimate this equation in difference form as[37]

$$\Delta\ln\left(I^{SE}_{R,it}\right) = \beta\Delta\ln(1-\tau_{it}) + \beta^{f}\Delta\left[\ln(1-\tau_{it+1}) - \ln(1-\tau_{it})\right] + \beta^{b}\Delta\left[\ln(1-\tau_{it}) - \ln(1-\tau_{it-1})\right] + \varepsilon_{it} \quad (5)$$

In this specification, the estimated shifting forward elasticity is correctly signed, though insignificant, but the estimated shifting backward elasticity is wrongly signed and marginally significant. The estimated long-run elasticity is only slightly larger than in the base specification, with a value of 1.048, and is marginally significant. Thus, the results do not provide any conclusive evidence that the base results were appreciably biased due to omission of adjacent years' tax rates.

5.3. Comparison to labor supply literature

A direct comparison of these elasticities to those found in the labor supply literature runs into a couple of difficulties. The labor supply literature generally estimates the elasticity of hours with respect to wages or income at the individual level. That literature has generally found very small elasticities for men, and higher elasticities for women (particularly married women) with a median uncompensated

[35] Data from 1988 is still used to calculate log lagged income and the deviation of log base year income from it.

[36] For example, an individual could delay making sales until after the beginning of the next year, or could accelerate purchases of supplies into the current year, if he knew that tax rates were going to be lower in the next year.

[37] In this specification, lagged tax rates for year $t-1$ (and year $t+2$, the lagged year for $t+3$) were calculated using the actual income and other variables from these years, while forward tax rates for year $t+1$ (and year $t+4$) were calculated by applying the next year's actual tax law to year t (and year $t+3$) income and other variables inflated to the forward year's price level. Instruments were calculated using the income and other variables from year t.

[38] See, for example, the recent survey by Blundell and MaCurdy (1999), among many others. For conflicting views, see Hausman (1981), whose results imply that men are more responsive to income taxation than others have found, and Blau and Kahn (2007) and Heim (2007), who find that married women's labor supply elasticities have fallen substantially over the past two or three decades.

Table 4
Robustness checks.

	Base specification	One year difference	Population weighted	Different effects by income level	Cutting 87–88 and Income>$10 million	Accounting for shifting across years
	(1)	(2)	(3)	(4)	(5)	(6)
$\Delta\ln(1-\tau)$	0.907*** (0.340)	0.846** (0.373)	0.456 (0.340)		1.149*** (0.435)	1.048* (0.569)
$\Delta\ln(1-\tau)$*(SE Inc>$1 M)				2.477* (1.300)		
$\Delta\ln(1-\tau)$*($500 K<SE Inc<$1 M)				2.443 (2.101)		
$\Delta\ln(1-\tau)$*($100 K<SE Inc<$500 K)				1.220* (0.635)		
$\Delta\ln(1-\tau)$*($50 K<SE Inc<$100 K)				1.351 (0.927)		
$\Delta\ln(1-\tau)$*($0<SE Inc<$50 K)				0.251 (0.393)		
$\Delta[\ln(1-\tau_{t+1})-\ln(1-\tau_t)]$						−0.414 (0.269)
$\Delta[\ln(1-\tau_t)-\ln(1-\tau_{t-1})]$						−0.696* (0.415)
Married	0.043 (0.048)	0.036 (0.025)	0.030 (0.030)	0.039 (0.048)	0.034 (0.055)	0.023 (0.044)
Age/100	0.410 (0.877)	0.543 (0.416)	0.459 (0.585)	0.369 (0.876)	0.203 (1.004)	0.280 (0.873)
Age squared/1000	−0.146* (0.087)	−0.100** (0.040)	−0.152*** (0.056)	−0.138 (0.087)	−0.122 (0.098)	−0.133 (0.087)
Sex of primary filer	0.016 (0.033)	−0.003 (0.014)	0.001 (0.025)	0.019 (0.033)	0.022 (0.039)	−0.002 (0.036)
Itemizer	0.102*** (0.028)	0.097*** (0.016)	0.069*** (0.020)	0.098*** (0.028)	0.109***(0.032)	0.100*** (0.031)
Number of children	0.015 (0.011)	0.005 (0.005)	0.003 (0.010)	0.014 (0.011)	0.017 (0.013)	0.014 (0.012)
Child away from home	−0.021 (0.095)	−0.033 (0.054)	−0.087 (0.086)	−0.021 (0.095)	−0.115 (0.119)	0.023 (0.092)
Constant	4.607*** (1.426)	1.367 (1.018)	3.017*** (0.605)	4.522*** (1.377)	4.258** (1.714)	4.556*** (1.580)
Observations	57,142	89,474	57,142	57,142	47,524	47,476

Notes: Data from the 1987–96 Family Panel of tax returns. Robust standard errors, clustered at the taxpayer level, are in parentheses. The change in the net of tax rate is instrumented in all specifications with the change in net of tax rate evaluated at the level of income in the base year (inflated by the CPI for the tax calculation in the later year). All specifications include ten piece splines in log lagged income and the deviation of log income from log lagged income, region dummies, and year dummies.

* Significant at 10%.
** Significant at 5%.
*** Significant at 1%.

wage elasticity estimate of around .8 (though with a wide range).[38] This study, on the other hand, estimates the elasticity of income with respect to the net-of-tax share at the taxpayer level. To better place these estimates in the context of the labor supply literature, then, two additional sets of specifications were run.

First, in Table 5, the sample was split according to the taxpayer's marital status and gender, so that in these specifications, the unit of observation is an individual. Column 1 repeats the results from the base specification for ease of comparison. Columns 2 and 3 present the results for married and single males, respectively, while Columns 4 and 5 present results for married and single females. It appears from these results that, contrary to what is generally found in the labor supply literature, the self-employment income of married men is quite responsive to changes in tax rates, with an estimated elasticity of .869 (with a standard error of .516), while the elasticity of single males is very small, with the elasticity estimated to be an insignificant .053. Consistent with the labor supply literature, the estimated coefficients for self-employed females are large, with estimates of 1.091 for married females and 1.468 for single females. Both of these estimates are, however, insignificant due to sizable standard errors.

Second, in Table 6, the estimation strategy and observation units used in the base specification were applied to other measures of earned income and other samples. Column 1 again presents results from the base specification for comparison. In Column 2, the dependent variable was changed from self-employment income to wage and salary income, and the sample included all individuals with positive wage and salary income in each year of the three year difference.[39] This specification, then, estimates the extent to which wage and salary income responds to changes in tax rates among those who earn such income. The resulting estimate, at .054 (with a standard error of .026), is much smaller than the estimate found for self-employment income, even after any reporting response is netted out.

There are, however, two possible reasons for this difference. First, it could be that self-employment income is more easily changed in response to taxation, and so the responsiveness of any taxpayer would be higher if they were self-employed than if they were a wage and salary worker. Second, the difference could be reflecting a selection story, in taxpayers who are more responsive to taxation in general are also more likely to be self-employed.

To distinguish between these explanations, in Columns 3 and 4 the sample is cut to include only those observations that are used in the base specifications. The estimation method was then rerun using two different dependent variables. In Column 3, the dependent variable is the sum of self-employment income and wages. If the selection story were true, one would expect that the coefficient on the net-of-tax share would not drop appreciably in this specification. However, the estimated elasticity does decline by a substantial amount to .393, though it is still significant. In Column 4, the dependent variable only includes wages. In this specification, the estimated elasticity is −.115 and insignificant. Taken together, it appears that the self-employed do not have larger elasticities in general, but rather that self-employment income is much more responsive to changes in taxes than is wage and salary income.

6. Conclusion

This paper used data from a panel of tax returns to estimate the responsiveness of self-employment income to tax changes. Results from the base specification suggest that the elasticity of reported self-employment income to the net-of-tax share is approximately .9, implying a real elasticity (net of any reporting response) of around .4. The estimated response tends to be larger for higher income taxpayers, married males, and females. In addition, the elasticity of self-employment income estimated here is considerably larger than that found for wage and salary income using the same methodology.

Some caveats should be kept in mind when interpreting these elasticities and applying them to estimate the possible effect of tax changes. First, these results were estimated using taxpayers who earned self-employment income both before and after the tax change. If, as some papers suggest, there is also responsiveness to changes in tax rates on the extensive margin decision of whether to become self-employed, these results would not give the whole picture of the response of self-employment income to changes in tax rates. For example, if increases in tax rates lead more taxpayers to become self-employed (as some of the earlier literature has suggested), the estimates found here would be overestimates of the effect of the tax rate change on the total amount of reported self-employment income. Obviously, if increases in tax rates lead to decreases in self-

[39] This sample includes self-employed taxpayers who also earned wage and salary income.

Table 5
Three year difference, 1987–96: by marital status and gender.

	Base specification	Married males	Single males	Married females	Single females
	(1)	(2)	(3)	(4)	(5)
$\Delta\ln(1-\tau)$	0.907*** (0.340)	0.869* (0.516)	0.053 (1.176)	1.091 (0.806)	1.468 (2.482)
Married	0.043 (0.048)				
Age/100	0.410 (0.877)	0.107 (1.053)	−1.765 (2.733)	1.808 (1.782)	−1.926 (2.920)
Age squared/1000	−0.146* (0.087)	−0.153 (0.103)	0.091 (0.267)	−0.253 (0.172)	0.149 (0.264)
Sex of primary filer	0.016 (0.033)				
Itemizer	0.102*** (0.028)	0.095** (0.037)	0.206** (0.102)	0.096 (0.070)	−0.059 (0.146)
Number of children	0.015 (0.011)	0.006 (0.014)	0.192** (0.081)	−0.038 (0.032)	0.293* (0.149)
Child away from home	−0.021 (0.095)	0.021 (0.137)	−0.320 (0.255)	−0.019 (0.280)	0.504** (0.215)
Constant	4.607*** (1.426)	2.471 (2.652)	0.803 (6.222)	−0.409 (2.540)	−4.588 (5.683)
Observations	57,142	31,255	2,864	10,353	1,515

Notes: Data from the 1987–96 Family Panel of tax returns. Robust standard errors, clustered at the individual level (taxpayer level for Column 1), are in parentheses. The change in the net of tax rate is instrumented in all specifications with the change in net of tax rate evaluated at the level of income in the base year (inflated by the CPI for the tax calculation in the later year). All specifications include ten piece splines in log lagged income and the deviation of log income from log lagged income, region dummies, and year dummies.
* Significant at 10%.
** Significant at 5%.
*** Significant at 1%.

Table 6
Three year difference, 1987–96: by type of income.

	Base specification	Wages only — full sample	Self-employment income and wages — SE sample	Wages only — SE sample
	(1)	(2)	(3)	(4)
$\Delta\ln(1-\tau)$	0.907*** (0.340)	0.054** (0.026)	0.393** (0.158)	−0.115 (0.237)
Married	0.043 (0.048)	0.068*** (0.010)	0.119*** (0.036)	−0.071 (0.077)
Age/100	0.410 (0.877)	4.320*** (0.287)	1.539** (0.669)	3.729*** (0.916)
Age squared/1000	−0.146* (0.087)	−0.638*** (0.032)	−0.308*** (0.070)	−0.508*** (0.096)
Sex of primary filer	0.016 (0.033)	−0.007 (0.008)	−0.001 (0.017)	−0.032 (0.031)
Itemizer	0.102*** (0.028)	0.079*** (0.007)	0.145*** (0.024)	0.097*** (0.029)
Number of children	0.015 (0.011)	0.026*** (0.003)	0.018*** (0.007)	0.016 (0.010)
Child away from home	−0.021 (0.095)	0.015 (0.017)	−0.106 (0.098)	0.028 (0.096)
Constant	4.607*** (1.426)	4.295*** (0.370)	4.541*** (1.022)	0.117 (1.211)
Observations	57,142	228,229	57,142	25,838

Notes: Data from the 1987–96 Family Panel of tax returns. Robust standard errors, clustered at the taxpayer level, are in parentheses. The change in the net of tax rate is instrumented in all specifications with the change in net of tax rate evaluated at the level of income in the base year (inflated by the CPI for the tax calculation in the later year). All specifications include ten piece splines in log lagged income and the deviation of log income from log lagged income, region dummies, and year dummies.
* Significant at 10%.
** Significant at 5%.
*** Significant at 1%.

employment (as some more recent papers suggest), the estimates here would be underestimates of the total effect of the tax change on self-employment income. However, since Moore (2003) finds that two of the tax changes used in this analysis, OBRA90 and OBRA93, did not have a consistent significant effect on the decision to be self-employed, the magnitude of this bias is probably small.

Second, since the responsiveness of self-employment income appears to be larger for higher income taxpayers, any estimate of a possible tax change's effect on the amount of self-employment income reported and the amount of revenue collected would depend crucially on the structure of the tax change and the resulting distribution of tax rate changes across income groups. In particular, the results suggest that tax changes focused on lower income taxpayers will result in less of a behavioral response than tax changes focused on higher income taxpayers.

Overall, the results in this paper suggest that changes in tax rates do have a substantial impact on the income of the self-employed. In addition, these results provide a self-employed worker counterpart to the often estimated elasticities of labor supply for wage and salary workers. Finally, the results here help to deepen our understanding of why and how much taxable income responds to tax rates.

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Appendix A. Model appendix

To derive the relationship between the amount of reported self-employment income and marginal tax rates, start with a standard model of consumer choice, where the taxpayer can earn income from self-employment, wage and salary work, and investment activities. Let C denote ordinary consumption, D denote deductible or excludable consumption, I^{WS} denote income earned from wage and salary employment,[40] I^{SE} denote income earned from self-employment, I^{I} denote investment income (which is assumed to be exogenous), and M denote the exemption to which the taxpayer is entitled.

As noted in the text, taxpayers are responsible for reporting their own income from self-employment, and so they might misreport.

[40] An alternative specification would be to specify utility as a function of hours as a wage and salary worker, with the individual's wage entering into the budget constraint. Since tax data does not contain information on hourly wages, it is more natural to use an income-based model.

Misreporting income, however, may lead to a penalty if such evasion is discovered by the IRS. So, let I_{NR}^{SE} denote the amount of self-employment income not reported to the IRS, and let $f(I_{NR}^{SE}, \theta, \eta)$ denote the expected penalty from this evasion, where θ denotes the parameters of the detection and penalty systems of the IRS[41] and η denotes the individual's taste for misreporting.

Suppose that an individual is maximizing utility over these types of consumption, subject to the constraint that the total spent on consumption is equal to their after tax income. Similar to Gruber and Saez (2002), for simplicity assume that income generating activities exhibit disutilites because they require effort, so that in the reduced form utility is a function of income earned. Assuming a one-period static choice model, and ignoring progressive taxation and the choice of itemization status, the consumer's problem is

$$\max_{C,D,I^{WS},I_R^{SE},I_{NR}^{SE}} U\left(C, D, I^{WS}, I_R^{SE}, I_{NR}^{SE} Z\right) \tag{6}$$
$$s.t.\ C + \left(1-\tau^U\right)D = \left(1-\tau^E\right)\left[I^{WS} + I_R^{SE}\right] + \left(1-\tau^U\right)\left[I^I - M\right] + I_{NR}^{SE} - f\left(I_{NR}^{SE}, \theta, \eta\right)$$

where τ^U denotes the marginal income tax rate on unearned income, τ^E denotes the tax rate on earned income (including payroll and income taxes),[42] and Z denotes demographic characteristics of the individual. This equation reflects the fact that self-employment and wage and salary income are subject to both income and payroll taxes, but that investment income is only subject to income taxes. In addition, it reflects the fact the individual saves both income and payroll taxes for each dollar of self-employment income that they do not report.

Solving for the first order conditions yields a number of straightforward and intuitive implications. First, if the individual works in a particular sector in which they pay taxes, they will work until the disutility of work equals the negative after-tax marginal utility of wealth (or in the case of non-reported self-employment, the net of marginal expected penalty marginal utility of wealth). Second, an individual could be a wage and salary worker, self-employed, or both, with the choice among these (as well as the decision of how much self-employment to report or not) being a function of the marginal tax rate and the marginal penalty from not reporting income, as well as taste parameters.[43] Third, if the individual works in multiple sectors, they will work until the ratio of the marginal disutilities of work in each sector equals the ratio of the after-tax (or after marginal expected penalty) shares of income in the two sectors.

Finally, and most importantly for the present the amount of self-employment income reported on tax returns of the form can be written as a function of the marginal tax rate on earned income, demographic characteristics and taste parameters, and detection and penalty parameters,

$$I_R^{SE} = I_R^{SE}\left(\left(1-\tau^E\right), Z, \eta, \theta\right) \tag{7}$$

Assuming a linear logarithmic form, this becomes

$$\ln\left(I_R^{SE}\right) = \alpha + \beta(1-\tau) + \gamma Z + \delta\theta + \eta + \varepsilon \tag{8}$$

which forms the basis for the estimating equation.

[41] This function reflects both the probability of getting caught misreporting income and the penalty if caught.

[42] The net-of-tax shares on wage and salary and self-employment income in the United States are almost, but not exactly, the same. The exact net-of-tax share on before payroll tax wage and salary income is $(1-\tau^P-\tau^I)/(1+\tau^P)$, where τ^P is the marginal payroll tax rate and τ^I is the marginal income tax rate, while the exact net-of-tax share on pre-tax self-employment income is $(1-2\tau^P+2(\tau^P)^2-\tau^I+\tau^P\tau^I-(\tau^P)^2\tau^I)$, which equals $(1-\tau^P-\tau^I-2(\tau^P)^3-(\tau^P)^3\tau^I)/(1+\tau^P)$.

[43] The large literature mentioned in the text on the effect of marginal tax rates on the decision to be self-employed follows from this observation.

Appendix B

Sample sizes after sample cuts.

Sample cut	Sample size
Initial sample	1,267,929
Note: Observations with self-employment income in year t and year $t+3$	100,824
Cut dependent filers	900,367
Cut observations with change in filing status	677,417
Cut primary filers under age 25	615,552
Keep observations with self-employment income in year t and year $t+3$	77,389
Cut observations with no self-employment income in year $t-1$	57,142

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