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# The Tax Effect on Taxable Income from Privately Held Businesses

Shih-Ying Wu\*

The implications of the tax elasticity of taxable income have been widely discussed in the literature. This study uses the reported rate of return to capture the effects of tax changes on taxable income from privately held businesses. Households' decisions concerning reporting rates of return are embedded in a selection model of business investment decisions. With 1983–1989 Survey of Consumer Finances panel data, the tax elasticity of the reported rates of return on privately held businesses is found to be positive and large. The tax elasticity of taxable income from privately held businesses is thus crucial for policy evaluation. Several reasons for the high tax elasticity and the implications of it are also discussed.

**JEL Classification:** H25, H26, M21

## 1. Introduction

The implications of the tax elasticity of taxable income have been carefully discussed by Feldstein (1997, 1999). As he points out, the conventional approach to evaluating policy focuses on the substitution between labor and leisure, and it usually underestimates the actual deadweight loss because it ignores the effect of the income tax rate on tax avoidance and evasion. Taxpayers can reduce their tax burden through changes in the forms of compensation, through changes in the patterns of consumption, or even through tax evasion. The change in taxable income captures all aspects of an individual's behavioral responses, which include responses of labor supply, forms of compensation, patterns of consumption, and others. Hence, the compensated change in taxable income gives all of the information necessary for evaluating the deadweight loss of changes in the income tax rate.

The total effect of a tax on government revenue is one of the concerns in designing a tax, and so most empirical studies on the tax elasticity of taxable income focus on taxpayers as a whole (see, e.g., Feldstein 1995; Auten and Carroll 1999; Long 1999; Moffitt and Wilhelm 2000). Nevertheless, the distinction between the tax elasticities of taxable income from different sources has implications for policy design. As described by Slemrod (1998), the characterization of an optimal tax system must include not only the tax rates, but also a variety of other instruments because the elasticity of taxable income depends on the design of other instruments such as the definition of a tax base as well as tax rates. Feldstein (1997) also indicates that in order to evaluate the efficiency effect of a tax change on taxable income, more evidence is required regarding the extent to which corporate income tax liabilities and personal income tax liabilities are affected by each other.

One of the reasons for needing all the information above is that whether the existing excess burden of individual tax increases are overstated depends on the magnitude of the shift in income

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between corporate and personal tax bases (Gordon and Slemrod 2000). This study estimates the tax elasticity of taxable income from privately held businesses (hereafter PHBs) and, thus, provides information for understanding the behavioral responses of PHBs to tax changes.<sup>1</sup> Although PHBs have been discussed from various perspectives, the implications of the tax elasticity of taxable income from PHBs have been ignored.<sup>2</sup> Based on data from the motor carrier industry, Enis and Ke (2003) estimate the effect of a tax on the amount of corporate income that shareholders of privately held C corporations shifted to their personal income tax base, providing direct evidence of the magnitude of income shifting. In contrast, this study makes use of a sample of businesses, which are subject only to a personal income tax, and so the estimated tax elasticity of the taxable income is purged from the income shifting between corporate and personal income bases.

The decision to establish or participate in privately held businesses is determined by the expected returns of managerial activity and the expected returns from tax avoidance and evasion.<sup>3</sup> The former depends on market structure, entrepreneurship, innovation, or the competitiveness of products. By contrast, the latter involves legal activities such as income shifting or illegal activities such as underreporting of taxable income. The existence of tax avoidance and evasion alters the tax elasticity of taxable income because the extent of tax avoidance and evasion affects the effective tax rate and the cost of investment. Although this study cannot distinguish real responses of labor supply and investment from avoidance and evasion responses to tax changes, an estimate of the tax elasticity of taxable income from PHBs has its own policy implications as noted above (Feldstein 1999).

The remainder of this study is organized as follows. Section 2 illustrates the effect of a tax on taxable income from PHBs. Aside from considering the effect of real responses to tax on the taxable income from PHBs, this section also illustrates several avenues through which the ownership of PHBs facilitates avoidance and evasion activities. Section 3 develops a simple theoretical model to analyze the effect of a tax on PHB investment and taxable income. In particular, tax avoidance and evasion are incorporated in the model. Section 4 specifies an econometric model and describes the data set and the measurement of the variables used in the estimation. Section 5 presents and discusses the results of regressions. Section 6 concludes.

## 2. Effect of Tax on Taxable Income from PHBs

Tax changes affect PHB income in various ways. In response to a tax change, households can adjust their investment and employment in PHBs. They can also change their effort in managing PHBs, affecting the returns of PHBs. Households can further take up avoidance or evasion activities in order to reduce their tax burdens.

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<sup>1</sup> A private or privately held business, also referred to as a closely held business, is one that does not sell stock to the public. In the United States, privately held businesses are typically not obligated to disclose their financial statements publicly. Incomes from S corporations, partnerships, sole proprietorships, or farms are added to shareholders' or partners' individual incomes and taxed at the individual level. In contrast, corporate income from C corporations is reported separately. Thus, this study focuses on only privately held S corporations, partnerships, and sole proprietorships, and so privately held C corporations are excluded from the analysis.

<sup>2</sup> For example, in an OECD report, aspects such as the contribution of small businesses to new employment and new products have been discussed in detail (OECD 1994). Carroll et al. (2000b) investigate the effect of taxes on labor hired in PHBs. Bruce (2000, 2002) investigates the effect of tax on a worker's decision to be self-employed or take a wage-and-salary job.

<sup>3</sup> Tax avoidance represents legal tax-reducing behaviors such as using accelerating depreciation or deducting charitable giving, while tax evasion represents illegal behaviors such as underreporting taxable incomes. Both tax avoidance and tax evasion are taxpayers' behavioral responses to tax changes and have the same implications for evaluating the deadweight loss of changes in tax rate (Feldstein 1999). They are thus grouped together in discussions and not distinguished from each other in estimations.

As noted above, potential entrepreneurship in PHBs has raised concerns about the effect of a tax on investment in PHBs. Carroll et al. (2000a) analyze the effect of sole proprietors' personal income taxes on their decisions to make capital investments. Based on panel data from individual income tax files for 1985 and 1988, they find that a 5 percentage point increase in marginal tax rates reduces the proportion of sole proprietors' new capital investment by 10.4%. Carroll et al. (2000b) investigate the effect of personal taxes on sole proprietors' hiring decisions and wage bills. Based on the same data, they find that an increase in personal income tax reduces both the probability of hiring and the wage bills paid. Their results imply that raising the sole proprietor's net-of-tax price by 10% raises the mean probability of hiring by about 12%, while the net-of-tax price elasticity of the median wage bill is 0.37. Therefore, the findings of Carroll et al. (2000a, b) indicate that a decrease in the tax rate causes sole proprietors to increase their investment and employment. The results also demonstrate that a tax decrease increases sole proprietors' before-tax income from their businesses.

Bruce (2000, 2002) investigates the tax effect on the decision of an employee to become self-employed and the decision of a self-employed person to close the firm and take a wage-and-salary job. Based on data from the 1970–1991 waves of the Panel Study of Income Dynamics (PSID), Bruce (2000) finds that individuals with higher marginal tax rates when in self-employment are more likely to become self-employed. Bruce (2002) also demonstrates that a higher relative marginal tax rate on self-employment income does not necessarily increase the probability of exiting self-employment to take a wage-and-salary job. As he indicates, this somewhat confusing result is consistent with the concept that higher taxes—accompanied by lump-sum transfers—serve as insurance against the greater risk associated with self-employment. Overall, the findings in Bruce (2000, 2002) imply that individuals are more likely to become self-employed, which means participating in one form of PHBs in response to an increase in personal income tax rates.

Households can also pursue avoidance or evasion activities to reduce their tax burdens. As noted by Andreoni, Erard, and Feinstein (1998), the extent of tax avoidance by participants in PHBs is likely to be relatively large because of the characteristics of PHBs and the lack of information on reporting. Households can engage in tax avoidance activities through legal arrangements. Such legal arrangements include income shifting, the selection of S corporation status, the use of net operating losses, and others. In contrast, illegal evasion can take the form of underreporting taxable income. A tax burden can be reduced by income shifting, which can be accomplished in many ways. Income can be shifted among members of the same household in the form of wage payment to individuals with lower tax rates to take advantage of the differences among their tax rates. Moreover, members of PHBs are able to take advantage of the standard deduction, which was originally intended for people of low income, by ensuring that every member of the family receives a minimum income from PHBs. Through income shifting they can thus reduce the tax burden in their individual income tax returns.

Businesses that frequently or continually incur tax losses, especially those in their starting period, can be organized as sole proprietorships, partnerships, or S corporations so that the owners can deduct the tax losses from their personal tax returns (Ayers, Cloyd, and Robinson 1996). The Tax Reform Act of 1986 (TRA86) reduced the possibility of offsetting losses by prohibiting individual taxpayers from offsetting losses from “passive activities,” in which they did not actively participate, against either “active income” or “portfolio income” from other sources. Nevertheless, the losses from passive activities can still be offset against income from other “passive activities” (West Publishing Company 1986).

PHBs, as well as other forms of businesses, can also take advantage of benefits such as “creative” interpretations of tax codes. For instance, a business owner is entitled to deduct all ordinary and necessary business expenses incurred in a trade or business, including any reasonable

compensation paid to employees. Carefully combining the exclusion and deduction provisions enables employees to be provided with real economic benefits that are never taxed, while providing the employer with an immediate deduction that is equivalent to the costs of the benefits (Sommerfeld and Jones 1991). Such benefits include group-term life insurance, health and accident plans, meals, and lodging. Although some tax-sheltered opportunities are not available to the self-employed proprietor or partner, exceptions such as retirement plan contributions still apply to them.

Taxpayers can even just underreport their incomes to reduce their tax burdens if the probability of auditing or detection is low (see, e.g., Clotfelter 1983; Joulfaian and Rider 1998). In addition to gaining the benefit of tax avoidance, some PHBs can also play an important role in reducing taxes by providing opportunities for underreporting income. As noted, one of the reasons for underreporting the income from farms or sole proprietorships is a lack of reported information from the third party. The 1988 Taxpayer Compliance Measurement Program (TCMP) indicated that taxpayers with income from these sources tend to understate their taxes by markedly larger amounts than other taxpayers (Andreoni, Erard, and Feinstein 1998). Rice (1992) attributes the underreporting of PHB income to the lack of a principal-agent relationship between shareholders and managers in PHBs.<sup>4</sup>

Percentage changes in households' taxable income between 1983 and 1989, summarized in Table B.1 (in Appendix B), indicate that households with PHBs had higher percentage changes in taxable incomes between 1983 and 1989 than those without PHBs. This preliminary evidence suggests that households with PHBs are more likely to exhibit a higher tax elasticity on their taxable income.

### 3. Simple Theoretical Framework

Households make two tiers of decisions concerning a business investment in this model. First, they decide whether to invest in PHBs, and then, if they decide to invest, they must determine how much to invest. Second, after returns on investment are realized, they must decide how much income to report to the taxing authority. Therefore, factors that affect the decision concerning PHB investment include not only the returns on real activities, but also the returns from tax avoidance and evasion. Returns on real activities depend on investment, work effort, and factors such as the skill of management and market structure. In contrast, returns from tax avoidance and evasion depend on the magnitude and the cost of tax avoidance and evasion. The return from tax avoidance and evasion is the benefit of reducing the tax burden through avoidance and evasion activities. Households can reduce their taxable income to lessen their tax burdens, although they bear the cost of avoidance and evasion. The cost could be the expense of manipulating deductibles and exemptions, the penalty if they are audited, or the cost equivalent of such a stigma.

The widely used formula for the user cost of capital is applied herein to determine the optimal business investment, and thereby to investigate their implications (see, e.g., Auerbach and Hassett 1990). When avoiding and evading tax, an individual's problem is to maximize his or her net-of-tax

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<sup>4</sup> Other reasons provided by Rice (1992) to explain the disparity of underreported tax between privately held businesses and publicly traded businesses include the following: (i) information disclosure is required for publicly traded firms whereas PHBs need not do this; (ii) the benefits of tax avoidance by publicly traded firms accrue to shareholders, but the potential punishment falls on managers; (iii) public shareholders have an incentive to report income fully to increase the value of their shares; and (iv) managers report profit more fully because they receive stock options as compensation.

profit by choosing the optimal level of investment and the optimal level of avoidance and evasion. This individual's maximization problem can be written as

$$\begin{aligned} \max_{I_t, a_t} \int_0^\infty e^{-rt} \left\{ P_t F(K_t) - q_t(1-k)I_t - (1-a_t)\tau \left[ P_t F(K_t) - \int_{-\infty}^t q_s I_s D^{t-s} ds \right] \right. \\ \left. - c(a_t) \left[ P_t F(K_t) - \int_{-\infty}^t q_s I_s D^{t-s} ds \right] \right\} dt \\ \text{s.t. } \dot{K}_t = I_t - \delta K_t, \end{aligned} \quad (1)$$

where  $r$  is the after-tax discount rate;  $P$  is the price of output;  $F(K)$  is the output;  $K$  is capital stock;  $q$  is the price of capital;  $I$  is the investment of capital;  $k$  is the rate of investment credit;  $(1-a)$  is the fraction of taxable income reported to the tax authority;  $\tau$  is the proportional tax rate;  $D$  is the depreciation allowance;  $c(a)$  is the unit cost of tax avoidance or evasion that is not deductible from taxable income, and  $\delta$  is the rate of capital depreciation.  $[P_t F(K_t) - \int_{-\infty}^t q_s I_s D^{t-s} ds]$ , which equals total revenue minus total depreciation allowance, is the amount of taxable income before tax avoidance and evasion. Let it be called business income.<sup>5</sup> The fraction  $(1-a)$  must be explained more completely, where  $(1-a)$  is the fraction of business income that is reported. Restated,  $a$  is the fraction of taxable income that is underreported, for reasons that include tax avoidance and tax evasion. Accordingly,  $c(a)$  is the unit cost of underreporting by fraction  $a$  for each dollar of business income and  $c(a) \times [P_t F(K_t) - \int_{-\infty}^t q_s I_s D^{t-s} ds]$  is the total cost of underreporting. Term  $c(a)$  is assumed to be increasing with the fraction  $a$ . More avoidance or evasion requires more expenditure on tax preparation or increases the likelihood of auditing, and so it incurs a higher cost. Therefore, tax avoidance is not distinguished from tax evasion in the following theoretical discussion, and  $a$  is referred to as the fraction of income not reported. Furthermore,  $\partial^2 c / \partial^2 a > 0$  is assumed because reducing the tax burden becomes more difficult as households claim more tax deductions.

The first-order conditions for the optimal fraction of business income to underreport,  $a$ , and the optimal investment,  $I$ , are (derived in Appendix A)

$$\tau = c'(a^*) \quad (2)$$

and

$$F' = g(r + \delta) \left( \frac{1 - k - [(1 - a^*)\tau + c(a^*)]z}{1 - [(1 - a^*)\tau + c(a^*)]} \right). \quad (3)$$

Therefore, households will underreport their returns until the marginal cost of underreporting one dollar of return,  $c'(a)$ , equals the marginal benefit of underreporting one dollar, which is the marginal tax rate  $\tau$ .<sup>6</sup> The tax effect on the optimal fraction of returns to be underreported can be investigated further. According to Equation 2, the optimal fraction  $a^*$  increases with the tax rate  $\tau$  by the assumption  $c'' > 0$ .

According to Equation 3, the effect of underreporting income on a business investment can also be discussed. In Equation 3,  $F'$  is the marginal product of business capital;  $g$  is the ratio of the price of capital to output; and  $z$  is the present value of depreciation allowances, which is  $\int_0^\infty e^{-rt} D' dt$ . Notably, the tax rate in both the denominator and the numerator is replaced by  $(1-a)\tau + c(a)$ , which is the effective tax rate on a business return. The underreporting of income leaves a tax burden of only

<sup>5</sup> If depreciation allowance equals natural depreciation, then  $[P_t F(K_t) - \int_{-\infty}^t q_s I_s D^{t-s} ds]$  is the net business income before tax.

<sup>6</sup> Because this study excludes C corporations, the tax rate,  $\tau$ , in the above Equation 2 is the marginal tax rate faced by households. Income from PHBs such as sole proprietorships, partnerships, and S corporations is subject only to a tax at the individual level. Income from the PHBs is thus added to income from other sources to calculate the total tax.

$(1 - a)\tau$ . However, the cost of underreporting per dollar of return,  $c$ , needs to be added to yield the effective tax rate. Equation 3 can be rearranged as

$$F' = g(r + \delta) \left( \frac{1 - k - \tau_e z}{1 - \tau_e} \right), \quad (4)$$

where the effective tax rate,  $\tau_e = (1 - a)\tau + c$ , is less than  $\tau$ .<sup>7</sup> Therefore, the underreporting of income reduces the effective tax rate on business income.

The effect of a tax on the user cost of capital can be obtained by differentiating the user cost with respect to the tax rate. With all other things held constant, the effect of tax on the user cost is found to be positive if  $(1 - k - z) > 0$ . The marginal effect of a tax increase on the user cost is smaller than it would be in the absence of income underreporting.<sup>8</sup> If the sum of the rate of the investment credit and the present value of the depreciation allowance is less than one, then an increase in the tax rate increases the user cost of capital and then reduces total assets of a PHB. Thus, the total assets in PHBs decline as the tax rate increases.

The actual rate of return on PHBs is defined as the ratio of taxable income to the total assets in PHBs. Therefore, the actual rate of return is  $R_t \equiv (P_t F[K_t] - \int_{-\infty}^t q_s I_s D^{t-s} ds) / (q_t K_t)$  and the reported rate of return is

$$\bar{R} \equiv R(1 - a[\tau]). \quad (5)$$

Notably, the reported rate of return of PHBs is lower than the actual rate of return, by the underreported fraction of return  $a(\tau)$ . Only the reported rate  $\bar{R}$  is observable, and so the effect of a tax on  $R$  cannot be distinguished from the effect of a tax on  $a(\tau)$ . Carroll et al. (2000a) find that an increase in the net-of-tax price induces more investment in PHBs, reducing the pretax return at the margin if the return on investment decreases with investment. However, an increase in the net-of-tax price could induce more work effort and thus raise the pretax return. The reported rate of return also depends on  $a(\tau)$ . A higher  $\partial a(\tau) / \partial \tau$ , which implies more flexible avoidance or evasion associated with PHBs, leads to a higher elasticity of the reported rate.

#### 4. Estimations of Elasticities

##### *Empirical Model*

A reduced-form econometric model is specified to estimate the effects of tax changes on decisions regarding PHB investment and the reported rate of return on PHBs, on the basis of the theoretical discussion in the previous section.<sup>9</sup> As Triest (1998) points out, changes in tax law provide an exogenous source of variation in tax rates, which can be used to improve the identification of tax effects. Therefore, this study uses the Survey of Consumer Finances (SCF) panel data and the first-differenced approach to estimate the model.

<sup>7</sup>  $c'(a)$  is an increasing function of  $a$ .

<sup>8</sup>  $\partial f' / \partial \tau = g(r + \delta)[-z(1 - \tau_e) + (1 - k - \tau_e z)](\partial \tau_e / \partial \tau) = g(r + \delta)(1 - k - z)(1 - a)$  because  $\partial \tau_e / \partial \tau = 1 - a$ . In contrast,  $\partial f' / \partial \tau = g(r + \delta)[-z(1 - \tau) + (1 - k - \tau z)] = g(r + \delta)(1 - k - z)$  when income underreporting is not feasible. Hence, the sign of the effect of tax on the user cost is positive if  $(1 - k - z) > 0$ . The marginal effect of the tax change on the user cost with income underreporting is also smaller than that without income underreporting.

<sup>9</sup> Although a structural-form econometric model can be adopted to estimate the tax elasticity of taxable income, it requires information of various behavioral responses to tax changes, including changes in work hours, income shifting, tax avoidance, and tax evasion, which are not available in the data set. For the purpose of estimating the tax elasticity of taxable income, a reduced-form model is appropriate.

**Table 1.** Households' PHB Assets in 1983 and 1989

	1983	1989
With PHB assets		
Investment in 2 years	175	175
Investment in 1 year	183	66
No PHB assets	1019	1136
Total	1377	1377

Source: The Survey of Consumer Finances, 1983–1989 Panel.

As shown in Table 1, most households do not have any assets in PHBs. Households consider not only how much to invest in businesses, but also whether or not to invest, and so a criterion equation, as well as a level equation, is associated with investment. One concern in modeling the impact of investment in PHBs on the reported rate of return is the nonrandom allocation of taxpayers to the group with PHBs. If the unobserved factors that influence the decision to invest are correlated with unobserved factors that influence the reported rate of return, then the role of self-selection in estimating the reported rate of return must be controlled for. When observations are selected nonrandomly, either the least squares estimates based on all of the observations or the least squares estimates based on only the observations with a positive business investment will be biased (Amemiya 1985). A binary probit model of PHB investment could be embedded within an endogenous switching model of return reporting.

The change in the reported rate of return,  $\Delta\bar{R}$ , is specified as a function of the change in the net-of-tax rate, the change in the ratio of active PHBs, and other control variables including business characteristics such as business type and individual characteristics such as marital status, education, age, and attitude to risk.<sup>10</sup> Moreover, a disturbance term is included to capture the stochastic feature of uncertain returns. The tax rate is endogenous in the sense that a higher rate of return will increase taxable income and hence cause households to bear higher tax rates. This paper adopts the instrumental variables approach described by Carroll et al. (1998, 2000a) to avoid the problem of endogeneity. The calculation of the instrumental variables for tax rates will be explained in detail below. Conditioned on the PHB's holding assets in 1983, the decision whether or not to hold PHB assets in 1989 is assumed to be a probit function of variables such as the change in the net-of-tax rate, the change in wealth, the change in bankruptcy exemptions, and the control variables of other demographic characteristics.<sup>11</sup> PHB assets may be affected by wealth if investment is affected by liquidity constraints. Therefore, wealth is also included in the function for the decision of PHB assets, yielding a reduced-form model with the following equations for the reported rate of return and the decision to invest in a PHB investment.

The following model incorporates the joint effect of unobserved factors on the decisions to invest in a PHB and the reported rate of return by allowing correlations between the errors of the equation that explain the reported rate of return and the errors of the equation that explain the decision regarding investing in a PHB. The model is specified as follows to incorporate reported rate of returns and the selection rule:

<sup>10</sup> In investigating income shifting, Enis and Ke (2003) also specify the reported rate of return as a function of the tax rate and other factors.

<sup>11</sup> Carroll et al. (2000a) note that a model that specifies business investment as a function of the user cost of capital is preferred when a marginal tax rate is not the only component of the user cost. Nevertheless, they also point out that their data reveal that the change in the user cost of capital and the change in the marginal tax rate are highly correlated.



$$\Delta \bar{R}_i = \beta_0 + \beta_1 \Delta(1 - \tau_i) + X_i \tilde{\beta} + \varepsilon_i. \quad (6)$$

The decision to have PHB assets in 1989, conditioned on having PHB assets in 1983, is specified as a binary probit model:

$$b_i^{89} = 1 \quad \text{if } K_i^{89} = \gamma_0 + \gamma_1 \Delta(1 - \tau_i) + \gamma_2 \Delta W_i + Z_i \tilde{\gamma} + \eta_i > 0 \quad (7)$$

$$b_i^{89} = 0 \quad \text{if } K_i^{89} = \gamma_0 + \gamma_1 \Delta(1 - \tau_i) + \gamma_2 \Delta W_i + Z_i \tilde{\gamma} + \eta_i \leq 0. \quad (8)$$

The term  $\Delta \bar{R}_i$  is observable only when  $K^{89}$  is greater than zero; that is, when an investment is made in a PHB in 1989. The reported rate of return in Equation 6 is defined as the ratio of taxable income to assets. The error term  $\varepsilon_i$  is assumed to be independently and identically distributed over individuals, independent of right-hand side variables  $\Delta(1 - \tau_i)$ , and  $X_i(\forall i)$ . In asset Equations 7 and 8, some of the variables in vector  $Z_i(\forall i)$  may influence the investment, but not the reported rate of return. Such variables include, for example, bankruptcy exemptions. Thus,  $Z_i$  is not necessarily identical to  $X_i$ .<sup>12</sup> The error term  $\eta_i$  is assumed to be independently and identically distributed over individuals and independent of right-hand side variables  $\Delta(1 - \tau_i)$ ,  $\Delta W_i$ , and  $Z_i(\forall i)$ . Moreover, in estimating the selection model,  $\varepsilon \sim N(0, \sigma)$ ,  $\eta \sim N(0, 1)$  and  $\text{corr}(\varepsilon, \eta) = \rho$  are assumed.

According to the theoretical model in the previous section, the coefficient of the net-of-tax rate in asset Equations 7 and 8 is theoretically positive. However, as indicated above, the effect of the net-of-tax rate on the reported rate of return in Equation 6 is ambiguous because it negatively affects the actual rate of return and positively affects the fraction of return reported. However, if the work effort is not affected by the tax changes, then a positive coefficient of the net-of-tax rate in Equation 7 implies that tax avoidance or evasion increases with the net-of-tax rate.

## Data

TRA86 dramatically changed tax rates, and so TRA86 provides a natural experiment concerning how the changes in the tax rate influence the reported return on PHBs (see, e.g., Feldstein 1995). Therefore, the 1983 and 1989 panel data of the Survey of Consumer Finances (SCF), which span the introduction of TRA86, are used to estimate the above model.<sup>13</sup> The main purpose of the SCF is to acquire information about households' financing behavior, so the SCF includes no direct measure of tax compliance as in the TCMP.<sup>14</sup> However, as discussed above, another measure used to evaluate tax policy is the tax elasticity of taxable income; thus, the effects of a tax on the taxable income from PHBs can be investigated by examining the reported rates of return of PHBs because the reported rate of return is the ratio of taxable income to assets of a PHB. Furthermore, the SCF oversamples high-income households. Thus, the SCF is especially valuable for estimating the behaviors of households with PHBs, since households with PHBs are more likely to be in the high-income group.

In contrast to the TCMP, another aspect of the SCF is its detailed information on households' assets in PHBs, other assets, and incomes from these assets. This information provides an advantage in estimating a joint model of decisions concerning PHB investment and income reporting. Statistics are provided to check the reliability of the SCF survey. Based on a total of 334 households with PHBs in 1982, it is shown that the mean of 1982 adjusted gross income (AGI) calculated from various

<sup>12</sup> As described below,  $X_i$  includes the ratio of active PHB and the number of family members working in PHB, while  $Z_i$  includes wealth and bankruptcy exemptions beside their common variables.

<sup>13</sup> Although the SCF gathers data for the year preceding the survey, variables are still referred herein to being related to 1983 or 1989.

<sup>14</sup> The TCMP has been used in most previous studies of tax evasion (see, e.g., Clotfelter 1983; Joulfaian and Rider 1998).

taxable incomes is \$229,808, which is 6% higher than the measure suggested by Moffitt and Wilhelm (2000).<sup>15</sup> Nevertheless, the mean of 1988 AGI calculated from various taxable incomes is \$417,322, only 0.2% higher than the above measure suggested by Moffitt and Wilhelm. If we take into account the usual variation in variable definitions in surveys, the modest difference between AGI calculated from various sources and that directly provided in the survey could provide indirect evidence for the consistency of SCF data regarding the information of taxable income.

The 1983–1989 SCF panel comprises 1479 households. The estimations are based on households that had PHB assets in 1983 in order to take advantage of the first-differenced method. Households without PHB assets in 1983 are thus excluded from the estimations. Income earned by a C corporation is first subject to the corporate income tax and then to individual income tax as earnings are distributed. Thus, the tax rate applicable to income from a C corporation typically differs from that applicable to the income from unincorporated businesses. Households with investments in C corporations in 1989 are excluded, leaving 358 households, so as to avoid any possible miscalculation of the applicable tax rate.<sup>16</sup> Moreover, the outlier households with rates of return that exceed 2 or are less than  $-1$  (24 in all) are excluded from the estimations. Therefore, the final subsample used in the estimations comprises 334 households. All monetary values in 1983 are inflated by 23% to be in real 1989 dollar terms in the regressions.

More specifically, each variable is measured as follows.

### *Income from PHBs*

The SCF records households' income from professional practices, businesses, or farms. This amount is used to represent the reported income from PHBs. The income from PHBs is defined to reflect the returns on PHBs and should exclude wages or salaries from PHBs. As explained in the SCF survey document, the 1983 survey may have included wage incomes for some self-employed persons. Therefore, the return on PHBs in 1983 in the SCF might contain parts of the returns on labor and be higher than the actual returns on capital in PHBs in 1983.<sup>17</sup>

### *Assets in PHBs*

The values of assets are available for two main privately held businesses with active management in 1983 and for up to three main privately held businesses with active management in 1989.<sup>18</sup> The

<sup>15</sup> Moffitt and Wilhelm (2000, p. 205) provide an evaluation of the reliability of the SCF data. As described, the SCF obtained AGI information using different methods in 1983 and 1989. In 1989, respondents were queried directly about 1988 AGI in a section of the survey dealing with their federal income taxes. Aggregated AGI estimated from this measure exceeds published Internal Revenue Service (IRS) totals by about 13%. In 1983, there was no direct query of AGI, but rather the SCF constructed AGI from responses of various incomes. The measure, which is adjusted to current 1982 law by subtracting 60% of capital gains and the dividend exclusion, is suggested by Moffitt and Wilhelm because it differs from the IRS totals by only \$1 billion.

<sup>16</sup> C corporations are not distinguished from S corporations in 1983, and so some households in the regressions may have had C corporations in 1983. The impact of this possibility on the estimates will be discussed below.

<sup>17</sup> The tax rates in 1983 generally exceeded those in 1989, meaning this possible error in measuring the returns from PHBs could downwardly bias the net-of-tax effect on the rate of return.

<sup>18</sup> In practice, the sum of assets in actively managed PHBs, that is, the values of households' shares in the business with a management role (including variables b3509 and b3522 from the SCF), and assets in passively managed PHBs, that is, the net values of households' shares in businesses with no management role (variable b3501 from the SCF), are used to represent assets in PHBs in 1983. In 1989, the sum of the values of assets in actively managed PHBs that households could sell for (including variables x3129 and x3229 from the SCF) and the values of assets in passively managed PHBs that households could sell for (including variables x3408, 3412, x3416, x3420, x3424, and x3428 from the SCF) are used to represent assets in PHBs.

values of assets are subjective evaluations of respondents regarding the market values of assets that they had invested in PHBs at the time they responded to the survey. To make the PHB assets in 1983 comparable with those in 1989, only the sum of assets in the two main actively managed PHBs is added to the assets in the not actively managed PHBs to determine households' total assets in PHBs. There are no households that responded to having PHBs but that reported negative values of PHB assets in the SCF survey. As summarized in Table B.2 (in Appendix B), the sum of assets in the two main actively managed PHBs should comprise mostly of households' assets in actively managed PHBs.<sup>19</sup>

### *Reported Rate of Return*

Reported rate of return of PHBs is defined as the ratio of the income from PHBs to assets of PHBs.

### *Tax Rate*

Although the SCF asked a direct question concerning the marginal tax rate in its 1983 survey, a substantial number of households answered "don't know" or "not applicable." Therefore, taxable income is calculated from AGI, and the marginal tax rate is obtained according to the tax table from the Internal Revenue Service (IRS) of each year (U.S. Internal Revenue Service 1984, 1991). As described in Moffitt and Wilhelm (2000), respondents were queried directly about 1988 AGI in a section of the 1989 survey dealing with their federal income taxes. In 1983, there was no direct query of AGI, but rather the SCF constructed AGI from responses of various incomes. The measure, which is adjusted to current 1982 law by subtracting 60% of capital gains and the dividend exclusion, is suggested by Moffitt and Wilhelm.<sup>20</sup>

### *Instrumental Variable for the Tax Rate*

The tax rate is determined by taxable income, which is a function of the return of PHBs; thus, the tax rate is endogenous to taxable income. One approach to solving the endogeneity problem is to find an instrumental variable (IV) for the tax rate. The approach of Carroll et al. (1998, 2000a) is adopted herein to obtain the IVs for the change in tax rates. The key feature of their approach is to consider the exogenous decline in the statutory tax rate due to TRA86 itself. In this study, each household's marginal tax rate is computed using the data for 1983 (inflated to 1989 levels) but employing the tax law for 1989. As noted by Carroll et al., the change between the 1983 tax rate and the "synthetic" 1989 tax rate is due entirely to changes in the tax codes and so is an appropriate IV for the change between the 1983 tax rate and the actual 1989 tax rate. The change between the 1983 tax rate and the synthetic 1989 tax rate is the instrument for the actual tax change in the estimations.<sup>21</sup>

<sup>19</sup> Table B.2 in Appendix B presents the proportion of households with the second and the third PHBs and their mean values.

<sup>20</sup> An approach similar to that of Moffitt and Wilhelm (2000) is adopted here to calculate the amount of deductions. The "Individual Income Tax Return," published by the IRS, makes available the percentage of tax returns with itemized deductions and the total amount of these deductions by AGI category. Deductions are determined by weighting mean itemized deductions and standard deductions in each AGI category. Deductions and exemptions are then subtracted from AGI to find taxable income. A direct question regarding the filing status is asked in the 1989 survey of the SCF. However, in 1983 all married couples are treated as filing jointly and all single persons are treated as filing single because no direct question regarding the filing status was asked in 1983.

<sup>21</sup> Based on Moffitt and Wilhelm (2000), an alternative estimation, using the value of house and life insurance in 1983 as IVs, was tested. However, the estimate has a large standard error because the IVs are weakly correlated with the actual tax rate (Bound, Jaeger, and Baker 1995). Although demographic variables are exogenous and could serve as IVs, they are also explanatory variables in Equations 6 through 8 and are not appropriate IVs.

### *Wealth*

Comprehensive information on wealth is present in the data set. Total wealth equals the sum of the net values of all assets, including real estate, vehicles, PHB, checking accounts, individual retirement account (IRA) or Keogh accounts, money market accounts, certificates of deposit (CDs), savings accounts, mutual funds, bonds, stocks, life insurance, cash, money owed by friends or relatives, and other assets such as collectibles. The net values of these assets were determined by subtracting debts from the market values of these assets. The debt on credit cards, consumer loans, and other loans was deducted from total wealth.

### *Risk Attitude*

Business investments are riskier than other investments such as bank deposits, and hence individuals' attitudes toward risk affect their investments in PHBs. Each individual was asked by the SCF to place his or her attitude toward financial risk in one of four categories. A dummy variable for risk attitude is set to 1 if a respondent indicates that he or she is willing to take substantial or above average financial risk when making investments. This dummy variable is included in the estimations to control for each individual's attitude toward business investment, tax avoidance, and evasion.

### *Business Type*

PHBs in 1989 are categorized as sole proprietorships, partnerships, S corporations, C corporations, and others. However, in 1983, S corporations were not distinguished from C corporations (see Table B.3 in Appendix B).<sup>22</sup> Some C corporations in 1983 might have been converted to S corporations following TRA86, since TRA86 shifted the tax burden from individuals to corporations (Plesko 1995). Although households with C corporations in 1989 are excluded from the estimations, households that had no investment in a C corporation in 1989 but did have an investment in a C corporation in 1983 may be included.

### *Ratio for PHB with Active Roles*

The ratio of assets in actively managed PHBs to total assets in PHBs is calculated to reflect possible differences regarding returns, tax avoidance, and evasion between actively managed PHBs and not actively managed PHBs.

### *Bankruptcy Exemption*

Bankruptcy exemptions affect a household's liability in case of bankruptcy and thus their investments in businesses (Gropp, Scholz, and White 1997). A generous bankruptcy exemption level reduces a household's risk and tends to encourage them to invest more, but it also increases the creditors' risk when debtors claim bankruptcy, making the creditors less willing to make loans to potential investors. The total amount of bankruptcy exemptions for each household is categorized into one of four quartiles, using the homestead and nonhomestead exemptions in each state and the respondent's marital status. No information was available on the states of residence of the high-income group, which represents about 30% of the sample. All of the members of this group are thus assumed to have the first quartile of bankruptcy exemption. Dummies for different bankruptcy exemptions are included in the regression to estimate the effect of bankruptcy exemption on business assets.

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<sup>22</sup> Table B.3 summarizes the proportions of the business types, which are thus not reported in Table 2.

**Table 2.** Sample Statistics

Variables <sup>a</sup>	N <sup>b</sup>	Unweighted		Weighted <sup>c</sup>		Median	Min.	Max.
		Mean	SD	Mean	SD			
Δ(PHB assets)(US \$1000)	162	320	7900	280	2200	2.8	−81,000	33,000
Δ(Reported rate of return)	162	−0.084	0.52	−0.099	0.53	−0.025	−1.92	2
Δ(Net-of-tax rate)	334	0.121	0.12	0.052	0.14	0.050	−0.33	0.50
Δ(Net-of-tax rate) (IV)	334	0.129	0.06	0.082	0.06	0.070	−0.09	0.23
Δ(Net-of-tax rate)	162	0.126	0.12	0.058	0.15	0.170	−0.33	0.50
Δ(Net-of-tax rate) (IV)	162	0.136	0.06	0.095	0.06	0.170	−0.09	0.23
Δ(Ratio of active PHB)	162	−0.075	0.44	0.092	0.39	0	−1	1
Δ(Wealth) (US \$1000)	334	530	6500	120	1600	−2.9	−65,000	26,000
Δ(Bankruptcy exemption)	334	0.003	0.49	−0.019	0.69	0	−1	1
Married	334	0.844		0.768			0	1
College graduate	334	0.725		0.472			0	1
No. of dependents	334	2.677	1.18	2.952	1.31	3	0	7
Family members in PHB	334	1.055	0.36	1.124	0.47	1	0	3
Age ≥65	334	0.374		0.236			0	1
Risk attitude	334	0.215		0.148			0	1
<b>Industry</b>								
Farming and agriculture	334	0.102		0.177			0	1
Restaurant	334	0.018		0.031			0	1
Repair service	334	0.027		0.042			0	1
Direct sales	334	0.021		0.047			0	1
Construction service	334	0.060		0.121			0	1
Professional practice	334	0.234		0.137			0	1
Personal service	334	0.012		0.025			0	1
Manufacturing	334	0.081		0.035			0	1
Retail	334	0.093		0.125			0	1
Moving and storage	334	0.015		0.023			0	1

<sup>a</sup> Δ denotes the change in variables between 1983 and 1989. All monetary amounts are in 1989 constant dollars, while PHB assets and wealth are in thousands of 1989 constant dollars. The inflation rate from 1983 to 1989 was 23%. The demographic variable and business type are based on the 1989 survey while industry categories are based on the 1983 survey. SD denotes standard deviation.

<sup>b</sup> Only 334 households with PHB assets in 1983 are left after the outliers where rates of return greater than 2 or less than −1 are excluded. The statistics in this table are based on the subsample of 334 households, of which only 162 households also have PHB assets in 1989. Some of the descriptive statistics are based on these 162 households.

<sup>c</sup> According to the SCF document, the weights of observations were constructed to compensate stratified selection criteria for sampling, implying a low weight for oversampling observations.

The number of family members who work in a PHB is also included to account for possible tax avoidance avenues by shifting business income to family members. Furthermore, various demographic characteristics, such as marital status, highest level of education, number of dependents, and whether age exceeds 65, are included in the estimations.

Business industry dummies are included to control for the impact of industry, such as those related to the business cycle. The industry dummies include farming, forest management and agricultural services, restaurants, repair services, direct sales, construction services such as painting and plumbing, professional practices such as law consulting and accounting, personal services such as beauty shops and dry cleaners, manufacturing, retailing such as gas stations and food stores, moving and storage, and the baseline industry, which includes business management services such as consulting and advertising.

Table 2 presents both unweighted and weighted means of the relevant variables, which include the change in PHB assets, the change in reported rate of return, the change in the tax rate, the change in

wealth, the change in bankruptcy exemptions, and other control variables. The weighted means of changes in PHB assets and wealth are lower than the unweighted means because high-income households are oversampled. The result is generally consistent with the expectation that PHB assets increase with the net-of-tax rate. Nevertheless, the average reported rate of return declined from 1983 to 1989.

Correlations of the variable used in the estimations of the investment decision in 1989 and the reported rate of return are provided in Tables 3 and 4, respectively. Table 3 reveals that the decision to invest in 1989 was significantly correlated with many explanatory variables, including IV of the net-of-tax rate, wealth, college, and business types. Several explanatory variables are also correlated. Notably, the college dummy is correlated with most of the other explanatory variables, possibly due to an important influence of college education on income, risk, and the choice of business types. The explanatory variable of main interest, the net-of-tax rate, is also correlated with college, number of dependents, age, and proprietorship, and especially correlated with IV of the net-of-tax rate, suggesting that IV is appropriate. Table 4 reveals that the reported rate of return is significantly correlated with IV of the net-of-tax rate and the ratio of active PHBs, implying that the net-of-tax rate and ratio of active PHBs affect the reported rate of returns. The correlation between IV of the net-of-tax rate and the actual net-of-tax rate suggests that IV is appropriate. Correlations are also found between explanatory variables, especially between college and other explanatory variables. It is not surprising to find a correlation between the number of dependents and the number of family members working in PHBs.

## 5. Results and Discussion

Table 5 presents the estimate of the selection model of the reported rate of return of PHBs (Eqns. 6–8). Column 1 presents the estimates from the selection equation, for both households that had a PHB in 1989 and those that did not, while column 2 presents the results of the reported rate of return equation.

The results show that most variables had a statistically significant impact on the decision to invest in PHBs in 1989. The net-of-tax rate significantly affects the decision to hold PHB assets, with a coefficient of 2.86. A positive estimate implies that the increase in the net-of-tax rate between 1983 and 1989 made households with PHBs in 1983 more likely to have PHB assets in 1989. Carroll et al. (2000a) also find a similar result—that corporations increase investment in response to a fall in the user cost of capital.

TRA86 was characterized by generally lower tax rates applied to a broader base of both corporate and individual incomes. The present study uses a reduced-form approach in the estimation, and so other changes in the tax law may have affected the estimate of the net-of-tax effect. For example, a calculation by Carroll et al. (2000a) shows that both the investment tax credit and the present value of the depreciation allowance for investment in sole proprietorships declined following TRA86. If all PHBs experienced declines in investment tax credit and depreciation allowance, then all other things being equal, the user cost of capital in PHB increases. Most households face lower personal income tax rates after TRA86, and hence the estimate of the effect of a tax change should have been affected by the change in investment tax credit and depreciation allowance, downwardly biasing the absolute values.

The investment in C corporations in 1983 was not distinguished from that in S corporations, so the estimation includes some of the investment in C corporations in 1983. Hence, the above estimate reveals the effect of a tax on assets in all private businesses, including C corporations, S corporations, partnerships, and sole proprietorships. Income from a C corporation is taxed at the corporate level and again at the individual level if income is distributed. Therefore, as explained above, the reason to exclude C corporations from the estimations is to avoid miscalculation of applicable tax rates. Some private businesses in the sample in 1983 may have been C corporations then, and therefore one

Table 3. Correlation of Determinants of PHB Investment Decision<sup>a</sup> (N = 334)

Variables	Investment in 1989	$\Delta(\text{Net-of-Tax}$ Rate)	$\Delta(\text{Net-of-Tax}$ Rate) (IV)	$\Delta(\text{Wealth})$	$\Delta(\text{Bankruptcy}$ Exemption)	Marital status	College	Dependent	Age $\geq 65$	Risk Attitude	Proprietorship
$\Delta(\text{Net-of-tax rate})$	0.040										
$\Delta(\text{Net-of-tax rate})$ (IV)	0.110**	0.616*									
$\Delta(\text{Wealth})$	0.094***	-0.007	0.028								
$\Delta(\text{Bankruptcy}$ exemption)	0.043	0.058	-0.009	-0.001							
Marital status	0.037	0.054	0.102***	-0.050	0.122**						
College	0.116*	0.342*	0.525*	0.069	-0.065	0.160*					
Dependent	0.017	-0.117**	-0.142*	0.002	0.012	0.309*	-0.004				
Age $\geq 65$	-0.082	0.133**	0.070	-0.042	-0.018	0.076	0.020	-0.381*			
Risk attitude	0.059	0.056	0.145*	0.085	0.027	-0.036	0.225*	0.045	-0.090		
Proprietorship	0.283*	-0.158*	-0.180*	-0.122**	0.062	-0.021	-0.124**	-0.008	-0.077	-0.029	
S corporation	0.307*	0.034	0.116**	0.085	-0.063	0.035	0.097**	0.042	-0.076	0.113**	-0.076

<sup>a</sup> The statistics in this table are based on the 334 households that had PHB assets in 1983.

\* Significance at the 0.01 level.

\*\* Significance at the 0.05 level.

\*\*\* Significance at the 0.1 level.

**Table 4.** Correlation of Determinants of Reported Rate of Return<sup>a</sup> ( $N = 162$ )

Variables	Return Rate	$\Delta(\text{Net-of-Tax Rate})$	$\Delta(\text{Net-of-Tax Rate})$ (IV)	$\Delta(\text{Ratio of Active PHB})$	Marital Status	College	Dependent	Family Members	Age $\geq 65$	Risk Attitude	Proprietorship
$\Delta(\text{Net-of-tax rate})$	-0.060										
$\Delta(\text{Net-of-tax rate})$ (IV)	0.126***	0.537*									
$\Delta(\text{Ratio of active PHB})$	0.240*	-0.045	-0.133***								
Marital status	-0.068	0.004	0.061	-0.086							
College	0.120	0.289*	0.499*	-0.073	0.165**						
Dependent	0.028	-0.036	-0.029	-0.041	0.442*	0.109					
Family members	-0.014	-0.035	-0.068	0.013	0.064	-0.125	0.220*				
Age $\geq 65$	0.083	0.103	0.072	-0.040	-0.013	0.095	-0.334*	-0.147***			
Risk attitude	0.010	0.027	0.117	0.088	-0.102	0.197**	0.114	-0.088	-0.031		
Proprietorship	-0.011	-0.276*	-0.372*	-0.282*	-0.018	-0.256**	-0.067	0.210*	-0.010	-0.034	
S corporation	0.051	0.075	0.178**	0.035	0.024	0.116	0.058	0.053	-0.088	0.120	-0.209*

<sup>a</sup> The statistics in this table are based on the 162 households that had PHB assets in both 1983 and 1989.

\* Significance at the 0.01 level.

\*\* Significance at the 0.05 level.

\*\*\* Significance at the 0.1 level.



**Table 5.** PHB Investment Decision and Reported PHB Return<sup>a</sup>

Variables <sup>b</sup>	Investment Decision (1)		Reported Rate of Return (2)	
	Coefficient	<i>t</i> -Value	Coefficient	<i>t</i> -Value
Intercept	-0.62***	(1.71)	0.06	(0.27)
Δ(Net-of-tax rate)	2.86***	(1.88)	2.00*	(2.91)
Δ(Ratio of active PHB)			0.35*	(3.05)
Δ(Wealth)	9.6e-8**	(2.10)		
Δ(Bankruptcy exemption)	0.19	(1.38)		
Married	0.49***	(1.89)	-0.21	(1.42)
College graduate	0.20	(0.95)	0.05	(0.48)
Number of dependents	-0.28*	(3.11)	0.06	(1.12)
Family members			-0.05	(0.44)
Age ≥ 65	-0.68*	(2.86)	0.07	(0.58)
Risk attitude	0.44***	(1.70)	-0.17	(1.46)
Proprietorship	1.80*	(8.07)	-0.08	(0.69)
S. corporation	2.45*	(4.52)	-0.08	(0.49)
Industry				
Farming and agriculture	0.57***	(1.86)	0.27***	(1.81)
Restaurant	-1.48**	(2.01)	-0.14	(0.39)
Repair services	-0.23	(0.47)	-0.38***	(1.78)
Direct sales	-0.38	(0.67)	0.26	(1.00)
Construction service	-0.13	(0.37)	-0.00	(0.00)
Professional practices	-0.24	(0.79)	-0.21	(1.27)
Personal services	-1.22***	(1.72)	-1.27*	(3.54)
Manufacturing	-0.33	(0.65)	-0.01	(0.05)
Retail	0.18	(0.56)	-0.30***	(1.94)
Moving and storage	-1.01	(1.16)	-1.44*	(3.80)
No. of households	334		162	

Log-likelihood = -198. Prob( $\chi^2(1) > 3.44$ ) = 0.064. The probability that the chi-square value is greater than 3.44 equals 0.064, implying that the null hypothesis that the reported rate of return is independent of investment decisions is rejected at a 0.10 level of significance.

<sup>a</sup> Outliers with a rate of return greater than 2 (23 observations) or less than -1 (1 observation) are excluded from the estimations. The *t* value is given in parentheses.

<sup>b</sup> Δ denotes the change between 1983 and 1989. The demographic variables and the types of business types are taken from the 1989 survey, while the industry categories are taken from the 1983 survey. The baseline industry includes entertainment services, business management, advertising, brokerage, etc.

\* Significance at the 0.01 level.

\*\* Significance at the 0.05 level.

\*\*\* Significance at the 0.1 level.

limitation on the above estimate is the possibility of a miscalculation of the applicable tax rates on C corporations.

The change in total wealth also significantly affects the decision to hold PHB assets in 1989. The influence may be related to the tendency of the liquidity constraint to decline as wealth increases. A significantly positive estimate of the effect of the change in wealth on a household's decision to stay in PHBs may explain why some households with PHBs in 1983 decided to terminate their investments in PHBs. It implies that owners of profitable PHBs will realize an increase in wealth and thus has enabled these enterprises to survive from 1983 until 1989. This is the main reason why this study adopts a selection model to avoid potential biases associated with estimations based on the subsample of households surviving to own PHBs in 1989 because households with PHBs in 1989 are more likely to be those with profitable PHBs.

The exemption levels of bankruptcy do not have a statistically significant impact on PHB investment. The insignificance of these effects might follow from the conflict between the effects discussed above. A generous bankruptcy exemption reduces a household's risk and encourages households to invest more, but it also increases the risk to creditors in case of a bankruptcy, making them less willing to make loans to potential investors. Married households also tend to be more likely than single persons to continue to invest in PHB assets in 1989. The number of dependents in the family significantly affects PHB assets. Households with more dependents are less likely to have an investment in PHB in 1989. Individuals 65 years or over are found to invest less than younger individuals in PHBs. Since they are more likely to retire, more of their wealth may be in the form of assets with a stable return or greater liquidity. They may also perhaps draw down their PHB assets after their retirement.

As expected, individuals who are willing to take a greater financial risk own more assets in PHBs. Households with different types of PHBs show different tendencies to invest in PHBs in 1989. Households with PHBs of sole proprietorships or S corporations are more likely than households with PHBs of partnerships to invest in PHBs in 1989. Households with PHBs in farming, forest management, or agricultural services in 1983 are more likely than those with other PHBs to have PHBs in 1989.

Column 2 of Table 5 lists the estimates of the reported rates of return on PHB assets. The chi-square probability 0.064 implies that the null hypothesis of independence between the investment decisions and reported rate of return should be rejected at a 0.10 level of significance. This result supports the conjecture of possible biases if OLS estimations instead of a selection model are adopted.

The effect of the net-of-tax rate on the reported rate of return is significantly positive. Converting the coefficient, two, to an elasticity using the weighted means of the data demonstrates that the net-of-tax elasticity of the reported rate of returns is five.<sup>23</sup> An estimate of five implies that taxpayers will respond by increasing their reported rate of returns by 5%; for example, from 20% to 21% if their net-of-tax rate increases by 1%, from 75% to 75.75%. As described above, the 1983 survey included wage incomes for some self-employed persons, and so the return on PHBs in 1983 might be overestimated. TRA86 generally increased the net-of-tax return, meaning this estimate could be underestimated. Moreover, income shifting between 1987 and 1988 might cause the estimate to be upward biased (taxable income 1988 was reported in the 1989 SCF survey). Because the tax rate reductions in TRA86 were phased in and 1987 was a transition year that blended the old higher rates with the new lower rates in 1988, taxpayers were motivated to shift income from 1987 to 1988. Most PHBs use the cash basis of accounting, which makes it easy to shift income from one year to the next. This shifting can be accompanied by delaying the constructive receipt of cash for December. In other words, the greater reporting of taxable income in 1988 is partly attributable to showing a certain amount of income in 1988 that under normal circumstances would have been shown in 1987. This specific shifting accounts for a higher than expected net-of-tax elasticity.<sup>24</sup>

This estimate implies that the net-of-tax elasticity of taxable income is five if PHB assets are held constant. Feldstein (1995) finds that the estimate of the elasticity of taxable income with respect to the net-of-tax rate can be as large as 3.05. Lindsey (1987) also suggests that higher income taxpayers appear to have higher elasticities. A large estimate of the elasticity may be partly attributed to the fact that most households with PHBs are also high-income taxpayers. It also suggests that financial arrangements respond more promptly to a tax change than real behaviors such as the labor supply

<sup>23</sup> The weighted means of reported rates of returns are 0.336 in 1983 and 0.237 in 1989, while the weighted means of the net-of-tax rate are 0.747 in 1983 and 0.806 in 1989. Therefore, the net-of-tax elasticity,  $[\partial R/\partial(1-\tau)] \times [(1-\tau)/R]$ , equals 5 ( $\cong 2 \times [0.747+0.806]/[0.336+0.237]$ ) if calculated at the means of net-of-tax rate and reported rate of return.

<sup>24</sup> The author thanks the referee for pointing out this possible income shifting between 1987 and 1988.

(see, e.g., Slemrod 1998). Using the same SCF 1983–1989 panel, Moffitt and Wilhelm (2000) find that the hours of work of high-income men did not significantly respond to the tax reduction.

Factors such as the change in the work effort of PHB owners can also affect the net-of-tax elasticity of the reported rate of return. Compared to employees, owners of PHBs obtain most of the yields from more work effort or improved productivity. Taxpayers with PHBs may thus work harder or try to improve productivity in response to a tax change. Therefore, this finding does not represent direct evidence of the extent of tax avoidance and evasion. Nevertheless, the net-of-tax elasticity of taxable income estimated herein exceeds that of Feldstein (1995) and Auten and Carroll (1999), supporting the conjecture that PHB owners have more opportunities to respond to tax law changes. Enis and Ke (2003) provide evidence concerning the effect of TRA86 on the shifting of income between deductible expenses and taxable returns of C corporations. In contrast, this study provides evidence concerning PHB owners' behavioral responses to TRA86, which are not associated with income shifting between deductible expense and taxable returns because C corporations are excluded from the estimation.

One limitation of the above estimate of net-of-tax elasticity is that some of the S corporations in 1989 were converted from corporations that were of the C type, so treating these C corporations as S corporations may lead to a miscalculation of applicable tax rates of the income from these corporations. Income from C corporations is taxed at the corporate level and then at the individual level when income is distributed, meaning that the actual net-of-tax rate for income from C corporations could be lower than the calculation. TRA86 increased the net-of-tax rate, so the elasticity is overestimated if the reported rates of return of C corporations are on average similar to that of S corporations.<sup>25</sup> Although predicting the extent to which the estimate is influenced by the possible inclusion of C corporations is difficult without further information, the influence could be negligible inasmuch as the sample included far fewer C corporations than other types of businesses. Moreover, as noted above, the 1983 survey may have included wage income for some self-employed persons. This inclusion may overstate the returns on PHB investment in 1983 and thus bias the estimate downward since TRA86 generally reduced individual tax rates.

Households with more active participation in PHBs reported higher rates of return on PHBs, perhaps because of the returns to active management or the possibility that individuals holding active PHBs have more opportunities to avoid tax. However, neither of the demographic factors significantly affects the reported rate of return. Surprisingly, neither the number of dependents nor the number of family members who work in a PHB significantly affects the reported rate of return, mostly because the tax-avoidance advantage of PHBs is the opportunity to shift income to family members. Households that are willing to take higher financial risks have reported rates that do not differ significantly from the rates reported by others. Households more tolerant of risk are on average expected to realize a higher actual rate of return. However, they may be also more aggressively involved in tax avoidance and evasion. These two effects may counteract each other, causing an insignificant net effect.

The rates of return of households with sole proprietorships or S corporations do not differ significantly from those with partnerships. Households with PHBs in farming, forest management, or agricultural services have higher rates of returns, while households with PHBs in repair services, personal services, retail, and moving and storage have lower rates of return than those with PHBs in other industries. Rice (1992) investigates the determinants of tax noncompliance by small corporations using the TCMP sample from 1980 tax returns. He finds that firms in highly regulated industries such as banking, real estate, and securities brokerage had less tax noncompliance compared with the industries of manufacturing and construction. Because the baseline industry in Table 5 includes firms of advertising,

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<sup>25</sup> However, if PHB owners who chose C corporations in 1983 effectively mitigated the tax burden and so reported a lower rate of return, then the influence of the inclusion of C corporations in the 1983 data on the estimate would be ambiguous.

banks, and brokerages, it is thus more regulated compared with other industries. Therefore, negative estimates of the coefficients of repair services, personal services, and retail are generally consistent with Rice's finding, although the industry categorization in this study is not identical to his. A large estimate of the coefficient of personal services also supports the practitioners' literature on tax evasion, whereby firms in services tend to have more tax noncompliance because of the difficulty in measuring the costs of production and the value of output (Rice 1992). The motor carrier industry was deregulated in the 1980s, which possibly caused the lower rate of return in the industry of moving and storage.

## 6. Conclusions

The tax elasticity of taxable income has important implications for a taxation policy because it incorporates a taxpayer's responses in terms of compliance and labor supply. As discussed herein, investment in PHBs rests on two considerations—returns to management and returns to avoidance or evasion activities.

The study develops a selection model for joint decisions concerning both business investment and tax avoidance and evasion. SCF panel data for 1983 and 1989 are used to estimate the tax elasticity of PHB assets and the net-of-tax elasticity of the reported rate of return on PHBs. The net-of-tax elasticity of the reported rate of return was found to be positive and large. The share of taxable income from PHBs is thus crucial for estimating the revenue and evaluating a budget policy because the taxable income from PHBs is highly responsive to tax changes.

Although this study finds that the tax elasticity of taxable income from PHBs is significant, understandings about the behavior of households with PHBs in response to taxation are limited. The major limitation is associated with the effectiveness of data in yielding information about other aspects of the behaviors of households with PHBs. For example, an appropriate measure of work effort is lacking. Therefore, better measures of these behaviors of PHB owners are required to distinguish quantitatively the effects of avoidance responses on taxable income from the effect of real responses.

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## Appendix A: Derivation of Equations 2 and 3

### Individuals

$$\max_{I_t, a_t} \int_0^\infty e^{-rt} \left\{ P_t F(K_t) - q_t(1-k)I_t - (1-a_t)\tau \left[ P_t F(K_t) - \int_{-\infty}^t q_s I_s D^{t-s} ds \right] - c(a_t) \left[ P_t F(K_t) - \int_{-\infty}^t q_s I_s D^{t-s} ds \right] \right\} dt \quad (\text{A1})$$

s.t.  $\dot{K}_t = I_t - \delta K_t$ .

That is,

$$\max_{I_t, a_t} \int_0^\infty e^{-rt} \left\{ (1 - [1 - a_t]\tau - c[a_t])P_t F(K_t) - q_t(1-k)I_t + ([1 - a_t]\tau + c[a_t]) \int_{-\infty}^t q_s I_s D^{t-s} ds \right\} dt \quad (\text{A2})$$

s.t.  $\dot{K}_t = I_t - \delta K_t$ .

Therefore,

$$\max_{I_t, a_t} \int_0^\infty e^{-rt} \left\{ (1 - [1 - a_t]\tau - c[a_t])P_t F(K_t) - q_t(1-k - \tau z)I_t \right\} dt + \tau \int_{-\infty}^0 q_s I_s \left\{ \int_0^\infty D^{-s+t} dt \right\} ds \quad (\text{A3})$$

s.t.  $\dot{K}_t = I_t - \delta K_t$ ,

where  $z = \int_0^\infty e^{-rt} D^t dt$ .

To solve the problem, we define the Hamiltonian equation:

$$H = e^{-rt}[(1 - [1 - a_t]\tau - c[a_t])F(K_t) - q_t I_t(1 - k - \tau z)] + \lambda_t(I_t - \delta K_t). \tag{A4}$$

If we rewrite the Hamiltonian equation with  $v_t \equiv e^{rt}\lambda_t$ , then we get the current-valued Hamiltonian equation:

$$H = e^{-rt}[(1 - [1 - a_t]\tau - c[a_t])F(K_t) - q_t I_t(1 - k - \tau z) + v_t(I_t - \delta K_t)]. \tag{A5}$$

In this model,  $I_t$  and  $a_t$  are the choice variables and  $K_t$  is the only state variable. The necessary conditions are

$$(i) \quad \frac{\partial H}{\partial a} = 0, \tag{A6}$$

$$(ii) \quad \frac{\partial H}{\partial I} = 0, \tag{A7}$$

$$(iii) \quad \frac{\partial H}{\partial K} = -\frac{d}{dt}\lambda_t, \tag{A8}$$

$$(iv) \quad \text{A transversality condition.} \tag{A9}$$

By these necessary conditions, we can then derive Equations 2 and 3 for optimal  $a$  and  $I$ .

## Appendix B

**Table B.1.** Means of AGI, Taxable Income, and Business Income between 1983 and 1989 (US\$)

	1983	1989	$\Delta\%$
AGI <sup>a</sup> ( $N = 1377$ )	29,247	33,909	16%
Taxable income ( $N = 1377$ )	18,013	22,502	25%
Households with PHB <sup>b</sup> ( $N = 175$ )	42,297	90,164	113%
Households without PHB ( $N = 1202$ )	16,793	19,138	14%
Business income ( $N = 1377$ )	4011	4424	10%
Households with PHB ( $N = 175$ )	33,389	46,920	41%
Net-of-tax rate ( $N = 175$ )	0.740	0.804	8.6%

<sup>a</sup> By Moffitt and Wilhelm (2000), taxable income here is equal to AGI minus the sum of exemptions and weighted standard and itemized deductions. To make the comparison consistent, a 60% exemption of capital gains is added back to AGI and taxable income in 1983. All monetary values are in 1989 constant dollars and are weighted.

<sup>b</sup> Households with PHB are households with a privately held business in both 1983 and 1989.

**Table B.2.** Household's Investment in PHB in 1983 and 1989

Business <sup>a</sup>	Unweighted				Weighted			
	1983		1989		1983		1989	
	%	Means <sup>b</sup>	%	Means	%	Means	%	Means
First	100.0	1066	100.0	1124	100.0	167	100.0	241
Second	28.6	481	19.9	1463	13.1	158	11.9	303
Third	—	—	7.4	1498	—	—	1.2	714

<sup>a</sup> The calculations of percentages are based on households with the second and third PHB as ratios of those with at least one PHB.

<sup>b</sup> All means are in thousands of 1989 constant dollars, representing the mean values of PHB assets.

**Table B.3.** Types of Privately Held Businesses in 1983 and 1989<sup>a</sup>

Business types	Unweighted Percentage <sup>b</sup>		Weighted Percentage	
	1983	1989	1983	1989
Sole proprietorship	27.3	29.9	47.0	47.0
Partnership	27.7	23.7	21.2	24.2
Corporation	45.0	44.2	31.8	26.2
S corporation	—	15.2	—	9.6
C corporation	—	29.0	—	16.6
Others	—	2.2	—	2.5

<sup>a</sup> The unweighted percentages of households with PHB in the sample are 24.3% in 1983 and 22.9% in 1989, while the weighted percentages of households with PHB are 12.4% in 1983 and 13.3% in 1989.

<sup>b</sup> The percentages are based on the two main businesses with an active management role, for which the legal types of businesses are available.