The Impact of Personal Income Tax Rates on the Employment Decisions of Small Businesses

Katie Sobczyk Player

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Clemson University
ksobczy@clemson.edu
Cell# 208-310-1675

Abstract

Small businesses file taxes in accordance with the personal income tax code because they are considered flow-through entities. Thus, personal income tax reforms directly affect the incentives small business owners face regarding employment and operations. I use the changes in personal income-tax rates during the 1993 and 2001-2003 reforms and micro-level data to estimate the effect of statutory tax-rate changes on small-business employment decisions. I add two contributions to the current literature: first, I allow for intertemporal tax planning and secondly, I allow the firm's decision to employ labor to be correlated with the firm's wage bill decision. Estimation of a Heckman selection model for wage bills shows that the probability that a business will employ labor is 1.18% higher when current tax rates increase by one percentage point and 0.70% lower when future rates are expected to increase by one percentage point. Among firms that already employ labor, the median wage bill elasticity with respect to current tax rates is -0.64. These estimates are larger than those reported in previous research because my model includes future taxes and allows for correlation between the firm's employment and wage bill decisions. Omitting the intertemporal tax responses biases the estimates of previous researchers upwards, whereas assuming the two firm decisions are independent biases estimates towards zero.

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Introduction

Small businesses are considered "flow-through" entities for income tax purposes. The business owner's wage income and business profits are taxed at the same marginal rate. Business owners can use their own labor solely or in conjunction with outside labor, a tax-deductible business expense, in the operations of the firm. Changes in tax rates affect the firm in two distinct ways: by altering the returns of the entire business entity and by inducing relative price changes in the production mix between outside labor and the owner's labor. When tax rates increase, the returns to the business decrease and production and labor demand decline through the scale effect. However, the price of outside labor falls relative to owner labor, so that if the owner's effort can be replaced by employed labor, the substitution effect may lead small firms to employ more outside labor.

Small businesses constitute a large portion of the U.S. economy. Roughly 7.5% of all workers, or 10.3 million people, were self-employed in 2003, and an additional 4.9 million people owned an incorporated business while reporting wages from another job (Hipple 2004). Small businesses account for a vast percentage of new job creation. Birch (1987) estimates that firms with fewer than 20 employees accounted for 82% of new job creation between 1981 and 1985.[1]

The effect of personal marginal income-tax rates on the employment decisions of small businesses is a relatively unexplored topic, yet small businesses account for 94% of all businesses filing with the IRS.[2] I examine changes in the employment and wage bill decisions of

[1] Large estimates for gross job creation by small firms are also reported by Davis et al. (1996), as are high layoffs. Neumark et al. (2008) report small firms create more jobs than larger establishments but not to the extent of the Birch (1987) findings.

[2] C-corporations accounted for 6.6% of all IRS business filers in 2005, while sole proprietors accounted for 72%. The remaining 21% are mainly S-corporations and a few partnerships.

small businesses in response to changes in current and future tax rates when selection on unobservables is assumed to occur among employers.

I seek to identify the two distinct effects of changes in current and future tax rates on the probability of employing labor and total wage bills due to the relative change in the price of owner effort. The probability of employing labor and total wage bills are not independent decision processes; therefore, a Heckman selection model is specified for pooled cross-sections from the NBER Public Use File on individual income-tax returns from 1992-2005 for sole proprietors filing a Schedule C.

The Heckman two-step model allows for the presence of a limited dependent variable (employers) and correlated processes for choosing to employ and then wage bill choice. The first step of the Heckman addresses the decision to employ outside labor. I estimate that a one percentage-point increase in current tax rates increases the probability of employing outside labor by 1.18 percent, while a one percentage-point increase in the marginal tax rate next year decreases the probability of employing labor today by 0.70 percent.

The second step of the model comprises a regression that accounts for selection on unobservables by firms employing labor, and estimates the wage bill elasticity with respect to current and future tax rate changes. The mean and median wage bill elasticities with respect to current tax rates are -0.17 and -0.64, respectively. Increases in future tax rates make production today more attractive relative to production tomorrow, indicating that firms anticipating higher future taxes shift production intertemporally.

2 Income-tax Background

In 1992, Presidential Candidate Bill Clinton campaigned on a promise to raise taxes on the wealthiest Americans. In the aftermath of the election, the Omnibus Budget Reconciliation Act of 1993 (OBRA-93) was signed into law. OBRA-93 increased personal income-taxes on Americans reporting adjusted gross incomes in excess of $140,000.[3] Married taxpayers filing jointly with AGI greater than $250,000 faced marginal tax rates of 39.6% instead of 31%. Those with AGI greater than $140,000 but less than $250,000 faced a marginal tax rate of 36% instead of the previous 31%.

Table 1: Actual Statutory Tax Rates

1992*		1993-2000		2001		2002		2003	
Marginal Tax Rate	Income Brackets *Over*	Marginal Tax Rate	Income Brackets *Over*	Marginal Tax Rate	Income Brackets *Over*	Marginal Tax Rate	Income Brackets *Over*	Marginal Tax Rate	Income Brackets *Over*
15.0%	$0	15.0%	$0	15.0%	$0	10.0%	$0	10.0%	$0
28.0%	$34,000	28.0%	$36,900	27.5%	$45,200	15.0%	$12,000	15.0%	$14,000
31.0%	$82,150	31.0%	$89,150	30.5%	$109,250	27.0%	$46,700	25.0%	$56,800
		36.0%	$140,000	35.5%	$166,500	30.0%	$112,850	28.0%	$114,650
		39.6%	$250,000	39.1%	$297,350	35.0%	$171,950	33.0%	$174,700
						38.6%	$307,050	35.0%	$311,950

*Income ranges are listed for the first year and are adjusted for inflation in consecutive years.

Most tax reforms, like the 1993 reforms, are announced months or years in advance.[4] With rational expectations or perfect foresight, future taxes are known with certainty and any deviations are random noise. Under the rational expectations theory, deviations from the equilibrium path would be random and only occur when tax-payers are "surprised" by relatively higher or lower tax rates than expected.

Whereas OBRA-93 increased tax rates, the Economic Growth and Tax Relief Reconciliation Act of 2001 (EGTRRA) lowered personal income-tax rates for most taxpayers.

[3] OBRA-93 also repealed the cap on Medicare taxes, increased the taxable portion of social security benefits, limited itemized deductions, increased Federal fuel taxes and expanded the Earned Income-tax Credit (EITC).

[4] The 1993 tax hikes were most likely anticipated in 1992 because the Clinton campaign focused on increasing taxes on the top 1% of taxpayers (defined as AGI greater than $139,999).

Tax-rate decreases were anticipated to phase in gradually through 2006. Rates initially decreased to 39.1% from 39.6% for the top tax-bracket and were scheduled to decline gradually to 35% over five years.[5] In May 2003, in an attempt to stave off recession, Congress passed the Jobs and Growth Tax Relief Reconciliation Act of 2003 (JGTRRA). JGTRRA accelerated the tax decreases previously scheduled for 2006, making them effective immediately.[6]

Calculating the appropriate effective tax rate is not a straight forward process for business owners. The NBER's TAXIM model is useful for analysis on an individual's taxable income but does not adjust for any line-items found on the business schedules (Schedule C, Schedule E, Schedule F). Ideally, I would like the business owner's marginal tax rate without his wage bill and other business expenses which is not possible. The correct tax rate for decision-making depends on the particular issue under consideration: marginal tax rates, average tax rates or statutory tax rates could be the most relevant rate for behavioral changes. A part-time business owner working full-time for another firm may be most sensitive to marginal tax rates. Any additional income earned by the part-time business would be taxed at the marginal rate. Marginal rates are also very difficult to estimate and can suffer from endogeneity[7]. The average tax rate may be more important to full-time owners: they receive wage and profit income from the business; when planning for taxes they examine their total tax liability and potential deductions.

The statutory tax rate may be appropriate when deciding how many businesses to operate or expanding existing operations[8]. The statutory tax rate is not likely to be endogenous because

[5] See Figures 1 and 2 for comparison of anticipated and actual tax rates.
[6] See Table 1 for all relevant marginal tax rate changes. With knowledge of future tax changes, taxpayer and employers can plan in advance to take advantage or avoid any tax changes.
[7] Marginal tax rate calculations are estimates that try to account for statutory and implicit tax rates as well as personal and itemized deductions and credits that arise from special features of the tax code.
[8] Statutory tax rates are the tax rates listed for each income-bracket in a given year by the Internal Revenue Service. For example, a taxpayer with the median taxable income of $90,443 in 2005 would be taxed at three different rates:

the majority of people do not bunch at tax bracket kink points.[9] Statutory rates offer transparency in most cases; it is relevant for either of the two prior scenarios because it determines the tax liability independent of behavioral adaptations.[10]

Using similar methodologies but studying different tax reforms, Carroll et al. (2000a) and LaLumia (2008) find conflicting coefficients for the contemporaneous employment and gross receipts responses of business owners to current tax-rate changes. My novel theoretical framework reconciles the conflicting estimates obtained by previous researchers. The theoretical models in the previous research predict negative labor-demand and wage bill coefficients for tax-rate increases. My model shows this is only the case for larger firms; small firms may actually employ more labor when tax rates increase.

Carroll et al. (2000a) and LaLumia (2008) implicitly assume the decisions to employ labor and the amount of labor are independent. LaLumia (2008) does not find evidence of increased employment probabilities or higher gross receipts, whereas Carroll et al. (2000a) do find such evidence.

LaLumia (2008) investigates changes in gross business receipts and in the probability of hiring labor before and after the Economic Growth and Tax Relief Reconciliation Act of 2001. She constructs a five-year panel beginning in 1999 and instruments for the tax decrease by applying post-reform tax rates to pre-reform reported income. While most tax reforms take place immediately, the 2001 tax reforms were intended to phase in through 2006 with small yearly decreases. When explaining the difference in her results and those by Carroll et al., LaLumia

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the first $14,000 would be taxed at 10%, the next $42,800 would be taxed at 15% and anything in excess of $56,800 would be taxed at 25%.

[9] Bunching at kink points would indicate strong behavioral responses to bracket ranges; however, such behavior is not observed. See Saez (2009) for detailed analysis.

[10] Statutory rates may be the first indicator to businesses that marginal adjustments are necessary going forward.

(2008) notes "the 2001 cuts were…more equally distributed across the income distribution (than the 1986 cuts)".[11]

Carroll et al. (2000a) use a two-year balanced panel of Schedule C filers appearing in both 1985 and 1988 to estimate the effects of the 1986 tax reforms on small business employment and wage bills. They model the contemporaneous behavior of individuals reacting to the tax rates of the current period and find that owners are 12% more likely to hire workers and increase salaries after a 10% decrease in the individual marginal income-tax rate.

LaLumia (2008) and Carroll et al. (2000a) estimate probit and least-squares models. The present study exploits the flexibility of the Heckman model to allow for selection on unobservables in the data to learn more about firms employing labor. The two data-generating processes for choosing to employ labor and then choosing a wage bill may not be perfectly correlated, as is assumed in the alternative tobit specification. Carroll et al. (2000a) simply estimate least-squares regressions on observations with positive wage bills. My estimates will show the former least-squares estimates are biased with incorrect signs when the decision to employ labor and the wage bill level are not independent decisions.[13]

After replicating the Carroll et al. (2000a) findings, I then extend the literature to allow for anticipatory tax planning by firms and for correlation among the error terms in the two empirical decisions. I attempt to account for tax planning when tax rates are expected to change in the following period. My dataset consists of repeated cross-sections which allows for potential

[11] Taxes decreased to 38.5% from 50% for the top income-bracket in 1986. In 2001, the top rate was immediately reduced to 39.1% from 39.6%, with phased-in reductions to 35% through 2006.

[13] Carroll et al. (2000a) employ a tobit model as a specification test, but they do not find meaningfully different results. OLS estimates on a truncated sample may provide reasonable crude estimates for marginal effects since the truncated mean is still fairly linear in **x** if the two decisions are independent; however, the estimates are inconsistent. If the decisions are not independent, OLS on a truncated sample is biased and inconsistent (Cameron and Trivedi, pg. 540-2).

changes in the true population due to the legal reforms governing S-corporations[14]. A two-year panel focuses only on observations appearing in both years; Carroll et al. (2000a) report that their results do not statistically change when including employers present in only one of the years, so cross-sectional data may be a good approximation to the underlying data-generating process. The minute differences Carroll et al. (2000a) found indicate their panel results may include a small survivor bias and would be upwardly biased for tax rate decreases.

My analysis focuses on the tax reforms of 1993 and 2001-2003 to avoid complications arising from the changes to the definition of taxable income that occurred in 1986. The 1986 reform, studied by Carroll et al. (2000a), changed the definition of the taxable base as well as marginal tax rates, making it impossible to separate and identify the two independent effects.[15] This is a major criticism of all tax literature using only the 1986 reform for variation.[16] The 1993 and 2001-2003 reforms isolate the behavioral response of Schedule C filers with respect to marginal tax rate changes.[17] The results presented in Appendix A recreate the Carroll et al. (2000a) study using 1993 and 2001-2003 variation. The estimates provide a bias range for the impact of the definitional changes to the taxable-base in 1986.

Taxation affects the production mix of small businesses in many ways. Rather than simply reacting to current tax rates, business owners are presumably forward-looking. Many

[14] The 1986 reforms made S-corporations more attractive by increasing the allowed number of shareholders. The number of S-corporations as a percentage of all businesses filed with the IRS has gradually climbed to 12.5% in 2007 from 6.6% in 1988.

[15] The 1986 Tax Reforms changed the definition of taxable income, or the tax base, in many ways, including: taxing capital gains as ordinary income, disallowing the deduction of consumer loan interest, eliminating income averaging, increasing the standard deduction, increasing the personal exemption amount, further restricting tax-deductable IRA contributions, increasing the depreciation lives of equipment purchases, limiting the deductions on passive investment losses, and requiring a social security number for all dependents claimed. It also made S-corporations more attractive by increasing the allowed number of shareholders.

[16] See Saez, Slemrod and Giertz (2009).

[17] Furthermore, the substantial rate cuts and changes in the definition of the taxable base in 1986 could induce changes in the Schedule C taxpayer distribution that would not be reflected in only two years of panel data.

revenues and expenses can be shifted across consecutive tax years when upcoming tax changes are anticipated.[19] Owners can deduct higher levels of expenses by shifting purchases of durable goods to years of relatively high marginal tax rates.[20] Higher marginal rates also increase the incentive to deduct personal expenses on the Schedule C.[21] When lower future tax rates are expected, business owners have the incentive to time and shift revenue to book in the low-tax year.

3 The Relative Price of Owner Effort

To allow for the full range of small business owners' potential responses to tax changes, a theoretical model must account for owner effort and the possibility of employing outside labor. The basic assumption is that firm owners maximize utility. Utility is increasing in consumption, generated from the firm's production and decreasing in owner effort (e):

$$U = U(C, e) \qquad (1)$$

All income earned from the business venture is taxed at the personal income-tax rate because the small business is a flow-through tax entity, meaning firm profits and income flow through to the owner and are taxed at personal tax rates rather than as a separate entity under corporate tax law.

Consumption is assumed to be the after-tax net income from the business:

$$C = (1-t)M\,, \qquad (2)$$

where firm net income is denoted by:

[19] This analysis focuses on the net result of timing income since the data is ex-post and only speak to covariates that were actually shifted: Benefit of shifting income less the cost of shifting income.
[20] Higher rates can also promote "luxury office" spending that would not take place under relatively lower tax rates. Ceteris paribus, Persian rugs, leather and mahogany furniture, and Tiffany lamp purchases are more likely to reflect high tax periods than low.
[21] With proper documentation, meals, entertainment, travel and office supply expenses are appealing categories to increase.

$$M = X - wL - rK \qquad (3)$$

where X is the production or output of the firm. Output is a function of three possible inputs: owner effort, hired labor, and capital. The total labor input is specified as the sum of the owner's direct labor and outside labor, so that hired labor is perfectly substitutable for the owner's labor. Owner effort (e) can take two forms: owner labor effort (e_L) where the owner performs tasks related to direct production (book keeping, sales, etc.) and owner managing effort (e_M) where the owner monitors the direct production of the outside labor he employs[22]. The firm's concave production function is therefore:

$$X = f(e_m, L + e_L, K) \qquad (4)$$

The owner chooses e_M, e_L, L, and K to maximize utility (*equation 1*) subject to equations (2), (3), and (4), and the nonnegativity constraints $e_L \geq 0$ and $L \geq 0$. The owner's optimization problem is therefore:

$$\underset{e_m,\, e_L,\, L}{\mathcal{L}} = U(C, e) + \lambda_0\{(1\text{-t})[f^*(e_m, L + e_L, K) - wL - rK] - C\} + \lambda_1(e_L) + \lambda_2(L) \qquad (5)$$

The Kuhn-Tucker conditions are:

$$U_c = \lambda_0 \qquad (6a)$$

$$-U_e = f_{e_m}\,(1\text{-t})\,\lambda_0 \qquad (6b)$$

$$\lambda_0\,(1\text{-t})f_{e_L} = -(U_e + \lambda_1) \qquad \text{if } L = 0,\ (\acute{L} = L + e_L) \qquad (6c)$$

$$f_{\acute{L}} = w \text{ if } e_L = 0 \qquad (6d)$$

$$f_k = r \qquad (6e)$$

[22] For simplicity, I assume the supply curve of total owner effort is upward sloping because the vast majority of business owners in my sample are married males with adjusted gross incomes below $250,000. This reasonable assumption is not necessarily true and leaves the possibility of a backwards bending effort supply curve to future work.

Condition 1 The complementary slackness condition requires $\lambda_1 \geq 0$ (or $\lambda_1 = 0$ if $e_L > 0$) and requires (e_L, e_m, L) to satisfy $e_L \geq 0$. If $\lambda_1 > 0$, it must be the case that $e_L = 0$.

Condition 2 The complementary slackness condition requires $\lambda_2 \geq 0$ (or $\lambda_2 = 0$ if $L > 0$) and requires (e_L, e_m, L) to satisfy $L \geq 0$. If $\lambda_2 > 0$, it must be the case that $L = 0$.

The Kuhn-Tucker conditions provide two sets of input demand functions: one set when L = 0, for non-employers, and the other when L > 0, for employers. The Kuhn-Tucker conditions *(6a)* and *(6c)* therefore imply:

$$f_{e_L} = \frac{-U_e}{(1-t)U_c} \quad \textit{if } L = 0,$$

While *(6d)* implies: $f_{\acute{L}} = w \quad \textit{if } L > 0.$

It is important to notice that when outside labor is employed, taxes only enter the optimization problem through the business owner's effort.

The marginal cost of output is:

$$Min\left[\frac{w}{f_L}, \frac{-(U_e/U_c)}{(1-t)f_{e_L}}\right] = \frac{r}{f_k},$$

So when $L > 0$, *as* $\frac{r}{f_k} \leq \frac{-(U_e/U_c)}{(1-t)f_{e_L}}$ or, as $(1-t)\frac{f_{e_L}}{f_L} \leq or \geq \frac{-(U_e/U_c)}{w}$.

Or, as $(1-t) \leq \frac{f_L}{w} \cdot \frac{-(U_e/U_c)}{f_{e_L}} = \frac{MC_L}{MC_{e_L}}$.

Thus, there is a firm-specific critical value of *t* such that $L = 0$ if $t < t_c$ *and* $L > 0$ *if* $t > t_c$. Over some range it is possible that $e_L, L > 0$. This will occur when the sum of the marginal costs of all owner managing effort and owner labor effort is less than the wage that would be paid to outside labor:

$$f_{e_m} + f_{e_L} < w^* \qquad (7)$$

The wages paid to outside labor are assumed to be determined in a perfectly competitive labor market.

To distinguish how business owners respond to tax changes, I differentiate Equation (7) with respect to *t*. Recalling that when *L = 0*, owners equate the marginal products of their efforts: $f_{e_m} = f_{e_L}$, I find that:

$$dt = \frac{2U_{e_m}}{(1-t)^2} = 0 \text{ , which is clearly positive.} \qquad (8)$$

Because *dt* is positive, there exists a value of *t* where it is optimal for a business owner to switch from a regime without employed outside labor to a regime employing labor, *L > 0*.

The Kuhn-Tucker conditions *(6a)* and *(6b)* imply: $f_{e_m} = \frac{-U_e}{(1-t)U_c}$, together with *(6c)* this implies that $f_{e_m} = f_{e_L}$, if *L=0*. It follows that the relevant comparative statics are:

$$(1-t)f_{e_m} = \frac{-U_e}{U_c} \quad \equiv \quad MRS_{e,c}$$

$$\text{So,} \quad (1\text{-}t) = \frac{MRS_{e,c}}{f_{e_m}}$$

$$d(1\text{-}t) = -dt = d\left(\frac{MRS_{e,c}}{f_{e_m}}\right)$$

$$dt = d\left[\frac{U_e/U_c)}{f_{e_m}}\right] = d\left[\frac{U_e}{U_c f_{e_m}}\right] = U_c f_{e_m}\left[\frac{\partial U_e}{\partial e}de + \frac{\partial U_e}{\partial c}dc\right]$$

$$dt = \frac{U_c f_{e_m}[U_{ee}de + U_{ec}dc] - U_e[U_c dc + f_m U_{cc}dc + U_{ec}de]}{U_c^2 f_{e_m}^2}$$

An increase in the marginal tax rate is a relative decrease in the price of labor because taxes are applied to business profits and not revenues; however, the after-tax price of capital and all other inputs have decreased at identical rates. Hence, the relative price of labor is unchanged as a production input but it has changed relative to the price of owner-effort.

Employers: Firms employing outside labor face the Kuhn-Tucker condition that $\lambda_2 = 0$ because L > 0. The firm owner equates his marginal product of managing effort with the marginal product of outside labor: $(f_{e_m} + f_{e_L}) = f_L$ When $e_L=0$, $f_{e_m} = f_L$ and all changes in the demand for labor and capital are determined by scale effects. So,

$$\frac{dL}{dt} = \frac{dL}{dx} \cdot \frac{dx}{de_m} \cdot \frac{de_m}{dt} .$$

I would like to find: $\frac{dx}{de_m} \cdot \frac{de_m}{dt}$, because I know $\frac{dL}{dx}$ (or, at least, $\frac{dL}{dx} \cdot \frac{x}{c} = \theta_{Lx}$).

The business owner's first order condition with respect to managing effort is:

$$U_e + (1-t)U_c f_e = 0, \qquad (9)$$

The total derivative of equation *(9)* is then:

$$U_{ee}de + U_{ec}dc + (1-t)U_c f_{ee}de + (1-t)f_e U_{ce}de + (1-t)f_e U_{cc}dc - U_c f_e dt = 0, \qquad (10)$$

Recalling that, $dc = (1-t)dx$, the total derivative becomes:

$$U_{ee}de + U_{ec}(1-t)dx + (1-t)U_c f_{ee}de + (1-t)f_e U_{ce}de + (1-t)f_e U_{cc}(1-t)dx - U_c f_e dt = 0, \qquad (11)$$

Now, $dx = f_e de$, so equation *(11)* becomes:

$$U_{ee}de + U_{ec}(1-t)f_e de + (1-t)U_c f_{ee}de + (1-t)f_e U_{ce}de + (1-t)^2 f_e^2 U_{cc}de = U_c f_e dt , \qquad (12)$$

From the Kuhn-Tucker conditions *(6a)* and *(6b)*, I have the following:

$$(1-t)U_c f_e + U_e = 0 ,$$

Neither outside labor nor capital vary directly with taxes (*t*).

$$(1-t)U_c f_{ee}de + (1-t)f_e U_{ce}de + (1-t)f_e U_{cc}dc - U_c f_e dt + U_{ee}de + U_{ec}dc = 0 , \qquad (13)$$

It follows that because *L* and *K* do not vary directly with *t*,

dc = (1-t)dx = (1-t)$f_e$de , so by substitution equation *(13)* becomes:

$$\{(1-t)[U_c f_{ee} + f_e U_{ce} + f_e U_{cc}(1-t)f_e] + U_{ee} + U_{ce}(1-t)f_e\}de = U_c f_e dt \,, \qquad (14)$$

And therefore,

$$\frac{de}{dt} = \frac{U_c f_e}{U_{ee} + 2(1-t)f_e U_{ce} + U_{cc}[(1-t)f_e]^2 + (1-t)U_c f_{ee}} \qquad (15)$$

Recall that: $(1-t)U_c f_e + U_e = 0$,

rearranging to solve for f_e yields the following:

$f_{e\,=} - \left(\frac{U_e}{U_c}\right) \cdot \left(\frac{1}{1-t}\right)$, substituting into equation *(15)*,

the following expression for $\frac{de}{dt}$ is obtained:

$$\frac{de}{dt} = \frac{U_c f_e}{U_{ee} + 2U_{ce}(Mrg\ Cost\ of\ Effort) + U_{cc}[Mrg\ Cost\ of\ Effort]^2 + (1-t)U_c f_{ee}}$$

When owner labor effort is zero (e_L*=0)* the marginal cost of effort is greater than the market wage: *Marginal Cost of Effort > w.*

The corresponding second order condition is:

$$U_{ee} + 2U_{ce} + U_{cc} < 0,$$

To ensure utility maximization,

$$U_{ee} + \mu \cdot 2U_{ce} + \mu^2 U_{cc} + (1\text{-}t) + U_c f_{ee} < 0,$$

Solving for the critical value of μ yields the following:

$$2\mu_c U_{ce} + \mu_c^2 U_{cc} + [U_{ee} + (1-t)U_c f_{ee}] = 0,$$

$$\mu_c = \frac{-2U_{ec} \pm \sqrt{4U_{ec}^2 - 4U_{cc}[U_{ee} + (1-t)U_c f_{ee}]}}{4U_{ce}^2}$$

Simplifying,

$\mu_c = -\frac{1}{2U_{ec}} + \frac{1}{2U_{ec}^2}\sqrt{U_{ec}^2 - U_{cc}[U_{ee} + (1-t)U_c f_{ee}]}$, which is clearly negative.

It is possible that over some range of tax rates between the cases when no outside labor is employed and when owners provide only managing effort that both owner labor effort and outside labor can be positive. This occurs up to the point when the marginal costs of managing effort equal the market wage.

Figure 1: The Effect of Tax Changes on Owner's Supply of Effort

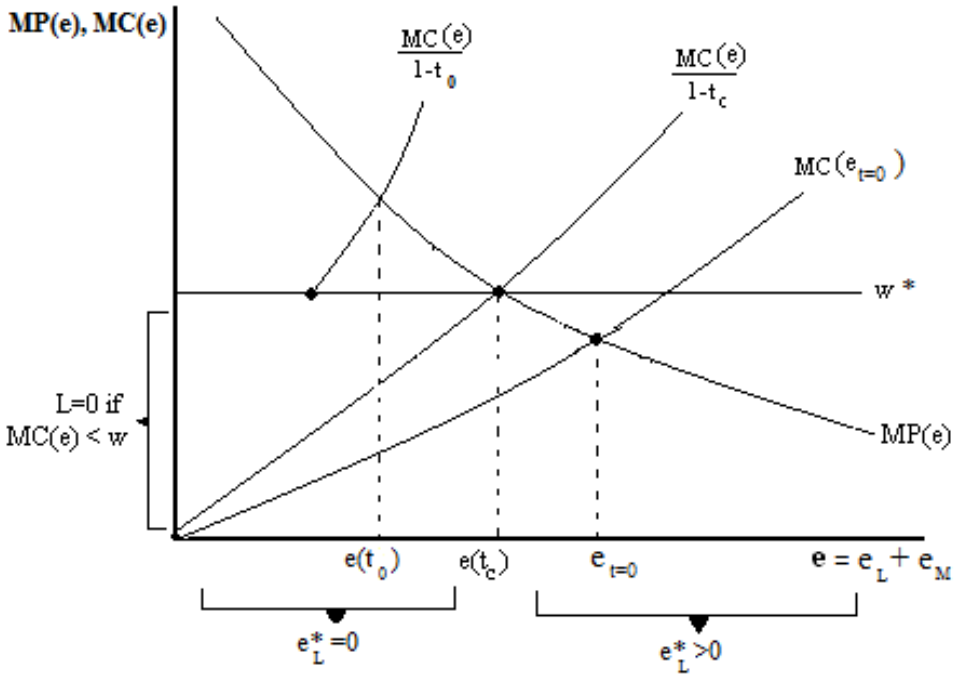

Figure 1 displays the optimal owner effort and outside labor choices for any given sole proprietorship. The value of the marginal product of total owner effort is denoted by the downward sloping curve labeled *MP(e).* Depending on the business owner's marginal product of labor, he may or may not employ outside labor in the firm. The two full upward sloping curves represent the after-tax marginal cost of owner effort under no taxes and then the critical tax rate. The upward sloping $MC(e)/(1-t_0)$ curve represents owners who only exert managing effort, have zero labor effort, and employ outside labor. The horizontal axis measures the total amount, or

quantity, of owner-effort exerted through managing effort and labor effort. The price, or shadow cost, of owner effort is listed on the vertical axis.

Case 1: Firms with zero wage bills may employ outside labor after a tax increase due to the relative price increase of owner-effort as a productive input. For any given firm, there exists a critical tax rate (t_c) such that $t > t_c$ implies $L > 0$. There is also a second critical tax rate (t_0) such that $t > t_0$ implies $e_L = 0$ (for simplicity, this is can be depicted in Figure 1 as $MC(e)/(1-t_0)$ but could occur anywhere to the left of the marginal cost curve for the critical tax rate). As long as $e_L > 0$, the firm owner simply equates his marginal products of managing effort and labor effort $[MP(e_m) = MP(e_L)]$ during maximization. But if $L > 0$, the owner equates the marginal product of his labor effort with the competitive wage because his labor effort and outside labor are perfect substitutes $[MP(e_L) = w]$. It follows that there is a range of tax rates over which all shifts of the after-tax marginal cost curve can cause a one-for-one substitution of managing effort for labor effort (e_m *for* e_L). Once t_0 is exceeded, represented by $MC(e)/(1-t_0)$, the owner does not exert any labor effort; he equates his marginal cost of managing with the marginal product of managing: $e_L = 0$ *and* $MC(e) = MC(e_m) = MP(e_m) > w$.

For firms originally not employing outside labor, Figure 1 shows that production decreases, but the firm owner may substitute outside labor for his labor-effort. When tax rates increase, owner-effort decreases for the firm but the firm's demand for outside labor increases as it moves to a positive wage bill from a previous wage bill of zero. When the critical tax rate is reached or exceeded, owners begin employing outside labor to undertake some of the tasks previously done by the owner. With higher and higher tax rates exceeding the critical rate, owners continue to reduce their labor effort, employ additional outside labor at the tax-

deductable wage, and spend more time managing. This pattern continues until the next critical tax rate t_0 is reached at which owners exert only managing effort.

Case 2: Firms with positive wage bills prior to tax increases are denoted by the upward sloping $MC(e)/(1-t_0)$ curve. The firm owners only exert managing effort and upon tax increases, the marginal cost of managing effort increases and owners spend less time managing. Henceforth, all changes in employment and output are due to the scale effect of reduced managerial effort by the owner. After the tax increase, the business owner reduces his demand for outside labor, *ceteris paribus*.

4 Two-Period Intertemporal Production and Tax Avoidance

A static single time-period is convenient to model but unrealistic when individuals and firms seek to maximize utility and profits over many time periods. When this is the case, the decision-maker must account for current tax rates as well as future tax rates. For business owners producing different goods and services, the storability of their product will directly affect their ability to take advantage of relatively low tax rates in some years.[23]

With two periods and non-storable products, firms employing labor strive to produce and sell in the period of relatively low tax rates. Output and the firm's demand for outside labor increase in periods of relatively low tax rates. Referring back to Figure 1, firms without employed labor which produce non-storable products utilize only owner managing and labor effort. For firms without employees, periods of relatively high tax rates induce a higher probability of employing labor as owners substitute away from owner labor effort. Periods of

[23] I assume tax-payers have rational expectations or perfect foresight; henceforth, future taxes are known with certainty and any deviations are random noise.

relatively low tax rates imply the firms are less likely to employ because owner labor effort is less costly than wages to potential employees.

Firms producing storable products have a more complicated maximization problem. Augmenting the production function in Section 3 to allow for two time periods, I see that firm owners maximize utility subject to the two-period budget constraint. Utility is an increasing function of consumption and decreasing in effort in both periods.

$$U(c_0, c_1, e_0, e_1) \qquad (16)$$

Consumption in both periods is simply after-tax income where after-tax income in the future period includes the production that was stored from the initial period:

$$C_0 = (1-t_0)M_0 \qquad (17)$$

$C_1 = (1-t_1)M_1$, which can also be stated:

$$C_1 = (1-t_1)[\, f(e_1 , L_1 , K_1) - wL_1 - rK_1 + S_0]. \qquad (18)$$

Where income in the initial period is simply production less the amount of production (S_0) that is carried forward to sell in the next period:

$$M_0 = f(e_0 , L_0 , K_0) - wL_0 - rK_0 - S_0] \qquad (19)$$

For the case when future tax rates are expected to decline ($t_1 < t_0$), the owner chooses e_M, e_L, L, K, c_0, c_1, *and* S_0 to maximize utility (*equation 16*) subject to *equations 17 through 19* and the production function, and the nonnegativity constraints $L_0, L_1 \geq 0$. With storable production, the owner's optimization problem becomes:

$$\max_{e_M, e_L, L, K, c_0, c_1, S_0} \mathcal{L} = U(c_0, c_1, e_0, e_1) + \lambda_0\{(1-t_0)(1+r)[f^*(e_0 , L_0 , K_0) - wL_0 - rK_0 - S_0] + (1-t_1)[f^*(e_1 , L_1 , K_1) - wL_1 - rK_1 + S_0] - C_0 - C_1\} + \lambda_1 L_0 + \lambda_2 L_1 \qquad (20)$$

Taxes enter the optimization problem only through effort and storage of the good. The Kuhn-Tucker conditions are:

$$U_{c_0} = \lambda_0(1+r) \qquad (21a)$$

$$U_{c_1} = \lambda_1 \qquad (21b)$$

$$-U_{e_0} = f_{e_{m_0}}\,(1-t_0)(1+r)\,\lambda_0 \qquad (21c)$$

$$-U_{e_1} = f_{e_{m_1}}\,(1-t_1)\lambda_0 \qquad (21d)$$

$$(1-t_0)(1+r)\,\lambda_0 f_{e_{L_0}} = -(U_{e_0} + \lambda_1), \qquad \text{if } L = 0, \text{ Recall: } \acute{L} = L+e_L \qquad (21e)$$

$$(1-t_1)\,\lambda_0 f_{e_{L_1}} = -(U_{e_1} + \lambda_2), \quad \text{if } L = 0, (\acute{L} = L+e_L) \qquad (21f)$$

$$f_{L_0} = w \text{ if } e_L = 0 \qquad (21g)$$

$$f_{L_1} = w \text{ if } e_L = 0 \qquad (21h)$$

$$f_{k_0} = r \qquad (21i)$$

$$f_{k_1} = r \qquad (21j)$$

$$-(1-t_0)(1+r)\,\lambda_0 + (1-t_1)\,\lambda_0 \text{ which implies: } \frac{1-t_1}{1-t_0} = 1 + r \qquad (21k)$$

Condition 1 The complementary slackness condition requires $\lambda_2 \geq 0$ (or $\lambda_2 = 0$ if $L > 0$) and requires (e_L, e_m, L) to satisfy $L \geq 0$. If $\lambda_2 > 0$, it must be the case that $L = 0$.

The Kuhn-Tucker conditions *(21a-21d)* imply:

$$\frac{U_{c_0}}{U_{c_1}} = \frac{U_{e_0}}{U_{e_1}} \frac{f_{e_{m_1}}}{f_{e_{m_0}}} \frac{1-t_1}{1-t_0},$$

which can be rearranged to solve for the marginal rate of substitution of effort and consumption.

$$\frac{U_{c_1}}{U_{c_0}} \frac{U_{e_0}}{U_{e_1}} \frac{f_{e_{m_1}}}{f_{e_{m_0}}} = \frac{1-t_0}{1-t_1}. \qquad (22)$$

Firms not employing outside labor equate the marginal product of owner managing effort to the marginal product of owner labor effort which will always be less than the competitive market wage (*If L=0,* $f_{e_L} < w * and\ f_{e_L} = f_{e_m}$). I simply differentiate $\frac{f_{e_{m_1}}}{f_{e_{m_0}}}$ (*equation 22*) with

respect to current period taxes (t_0) and future taxes (t_1) to identify how the relative marginal products change in the two periods when one tax rates increases.

$$dt_0 = -\frac{U_{c_1}}{U_{c_0}}\frac{U_{e_0}}{U_{e_1}}\frac{1-t_1}{(1-t_0)^2} < 0 . \qquad (23)$$

$$dt_1 = \frac{U_{c_1}}{U_{c_0}}\frac{U_{e_0}}{U_{e_1}}\frac{1}{1-t_0} > 0 . \qquad (24)$$

Equation 23 shows that for increases in current tax rates, or relative decreases in future tax rates, firms produce in the current period but store the product and sell relatively more in the future when tax rates are relatively low. The marginal product of current effort has declined, or the marginal product of future owner effort has risen.

Equation 24 portrays a similar picture for future tax increases. When future tax rates rise, firms want to produce and sell more today because the marginal product of future effort declines relative to current owner effort. The current and future tax rate comparative statics are identical for both firms with and without outside labor because the effect on owner effort is due to the storability of the product.

5 The Data

Using pooled cross-sectional data, a stratified random sample of all taxpayers in each year is created. Schedule C taxpayers are assumed to respond identically in each year to tax changes, *ceteris paribus*. Reported *wage bill* is used as a proxy for employment because actual employment levels, or the number of employees, are not observed. If firms are less likely to

employ labor following tax increases, they should be more likely to employ labor, *ceteris paribus,* under tax rate decreases.[24]

The data reported on a Schedule C include the aggregate revenues, expenses and net income from the business endeavors of sole proprietors.[25] Schedule C filers can, and legally should, include "odd-job" income from people without formal business names or practices.[26] In 2007, 23.1 million returns included a Schedule C filing.[27] Schedule C entities represent about 70% of all IRS documented businesses over 1988-2007.[28]

Historically, around 70% of Schedule C filers have no wage bills; in 2007, salaries and wages accounted for 12.8% of all expenses. The largest expense by aggregate small business filers is "Other Business Deductions", representing almost 25% of total expenses.[29] This category includes resource depletion, employee benefit programs, legal and professional services[30], pension and profit-sharing plans, meals and entertainment, and home-office business deductions. If tax evasion increases at an increasing rate with higher taxes, the incentive to overstate expenses or understate revenues will bias employment and wage bill observations and coefficient estimates towards zero.

[24] Note: I am never assuming firms behave symmetrically to tax increases and decreases.
[25] Schedule C does not include data for S-Corporations and some LLCs. Single member Limited Liability Corporations (LLCs) can elect to file a Schedule C. In 2005, of the Schedule C filers, roughly 450,000 were registered LLCs. Multi-member LLCs are type of partnership and file a Schedule E under Partnership Income.
[26] For example, an economics professor files a Schedule C to report consulting income but is not technically filed with the Secretary of State as a business. This also includes goods sold on eBay; however, it typically behooves the seller to not file the Schedule C and avoid reporting the income, particularly when the transactions are difficult to track.
[27] If a taxpayer owns several businesses, a Schedule C is filed separately for each business.
[28] C-corporations are included in the aggregate IRS business filings. The number of C-corporations drops from about 12% in 1988 to 5.8% of all filers in 2007. The number of S-corporations rises from 6.6% to 12.5% for 1988 and 2007, respectively.
[29] Source: http://www.irs.gov/pub/irs-soi/09sumbulsolprop.pdf
[30] Legal and professional services include private contractors.

My analysis will focus on Schedule C data and taxpayer characteristics.[31] Data come from the NBER Public Use File on Individual Income-tax Returns from 1992-2005. Each year of data provides a 10% stratified random sample of unaudited and unamended tax returns. High-income households are oversampled and there are no missing values in the dataset[32]. All upper-income returns that are sampled at greater than 10% are sub-sampled at 10% to further protect taxpayer identity.[33] Cross-sectional data capture population changes over time and avoid survival biases associated with a balanced panel.

Using returns only as far back as 1992 is important for several reasons: taxable income is defined differently before 1987 (Old Concept) and after 1987 (New Concept), "salaries paid to employees" is not included in the dataset until 1987, and the effects of the 1986 reforms could linger for several years. Post-1986 data avoids changes in the definition of the taxable-base, thereby allowing a consistent definition of taxable income and cleaner variation presented by the 1993 and 2003 tax reforms.[34]

Taxpayers filing only Schedule E are also excluded because the dataset does not provide any information on salaries or employment for such entities.[35] Taxpayers receiving social security income are dropped from the dataset because potential retirees may operate businesses

[31] Schedule C data have limited personal characteristic variables; however, the data are rich in income and expense variables.

[32] For each year, all of the extreme value AGI filers are not included in the sample because there would be a 10% chance of selection for each filer. Because of the extreme value omissions 45 filers for 2005 are not sampled.

[33] For all filers with AGI greater than $200,000 several codes are completely removed: State Codes, Alimony Paid/Received, and State Sales Tax Deduction. This applies to roughly 25% of firms employing labor and 6% of firms without labor. Marital Status and number of dependents are also modified. For high AGI filers, returns are further modified: the Schedule C fields for salaries and wages, state income-taxes, and real estate taxes are blurred by multivariate blurring when two of the three categories have nonzero numbers. Multivariate blurring is applied to each of the three categories after sub-grouping, the observation is averaged with the two observations closest to it and then the field is replaced with the average value. It is important to remember than one observation never contains the full content of the return and often includes data from more than one return.

[34] Furthermore, the data begin in 1992 in order to mitigate any changes in behavior still occurring from the 1986 rate changes and base changes. Results are not sensitive to including the additional years of 1990 and 1991.

[35] Schedule E includes business income from partnerships and s-corporations.

differently than do non-retirees.[36] Observations with positive AMT[37] liabilities are excluded because they face different marginal and statutory tax rates than peer filers.[38] Unlike prior literature, all business entities are included, not merely those that are profitable.[39] These observations contain valuable information if business losses are one form of sheltering taxable income.[40] Henceforth, for this analysis, loss entities are considered an equilibrium condition, though the results are not affected when the observations are omitted.

5a Data: *Summary Statistics*

Selected summary statistics for the data are presented in Table 1. The average marginal tax rate over all 402,651 Schedule C filers in the sample is 21.6% but is 22.65% for filers employing labor.[42] On average, statutory tax rates decrease slightly over the time period: the average future tax rate for all firms is 20.65%. Small-business owners have an unconditional average annual wage bill of $70,397 that varies significantly over filers, with a standard deviation of $380,083. Sample wage bills range from $0 to $49.8 million, with a 26.57% probability of having a positive wage bill. For employers, the mean wage bill is significantly higher at $264,914 with a standard deviation of $701,504. Such a large variance suggests that truncation is likely and that a truncated model could outperform a standard model for the data.

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[36] Approximately 50,000 observations are omitted. This is consistent with the literature, if the business is a hobby, the retiree may be less responsive to incentives, or if the owner is preparing to sell or leave the business, behavior may be atypical.

[37] AMT stands for "Alternative Minimum Tax": approximately 2000 observations in each year, or 6% of remaining observations are deleted because of the AMT.

[38] Taxpayers with AMT liabilities do not pay the statutory rates listed in the IRS tax tables.

[39] Loss-entities could serve as a tax-sheltering vehicle but presently past researchers and myself have no way of distinguishing between legitimate businesses and tax-shelters in the dataset.

[40] A Schedule C is filed for each business. A taxpayer may file one or several Schedule C's. Taxes are paid on the net position of all the businesses because the losses of one business offset the taxable income of profitable businesses.

[42] All dollar figures are adjusted for inflation and stated in 2005 real dollars.

Not surprisingly, Schedule C filers report much higher adjusted gross incomes than the average population. With mean AGI of $746,074 and a standard deviation of $4.1 million the data provide much variation over income: ranging from -$337 million to $534 million. These businesses receive up to $2.36 billion in Schedule C Receipts with a mean of $730,894 and standard deviation of $10.1 million. Taxable business income ranges from -$140 million to $50.9 million with a mean of $91,812 and a standard deviation of $625,028.[43]

The raw correlations of the wage bill and the current tax rate and the future tax rate are 0.145 and 0.147, respectively. The current marginal tax rate and the future marginal tax rate are highly correlated with a raw correlation of 0.94.

6a Empirical Analysis allowing for Intertemporal Substitution of Owner-Effort

My interest lies in the probability of a firm employing labor and the firm's level of employment. The Heckman 2-step model uses information on both businesses employing labor (employers) and businesses not employing labor (non-employers) to estimate the conditional wage bill elasticity. It allows for the presence of a limited dependent variable (employing labor) and correlated processes for choosing to employ and then the level of employment, conditional on having chosen to employ.

My goal is to identify the two distinct effects of changes in current tax rates and future tax rates on both the probability of employing labor and total employment. The theoretical framework presented in Section 3 shows that both the probability of employing labor and the

[43] Losses can occur for a number of reasons including: start-up costs, large capital expenditures or depreciation. Start-up costs were limited to $5,000 in excess of revenues for 2009; anything in excess of that is amortized over the next 15-years.

wage bill depend on the specifics of the production function with respect to owner labor-effort, managing-effort and employment of outside labor, as well as the optimal scale of the firm.

The decision to employ labor is made once some threshold is passed. This threshold will depend on the managerial skill of the business owner; the costs associated with employing any labor: the administrative burdens of payroll, employee taxes, current and future tax rates, and access to lines of credit to maintain payroll. When the threshold is reached, the firm employs labor and must then decide how much labor to employ. If firms take equilibrium wages as given, the amount of labor employed varies directly with the wage bill variable.

The amount of labor employed depends on many of the same variables included in the employment decision; however, variables that affect only the fixed costs of employing labor are not included. The two decisions are very closely related, so a flexible framework is needed to allow for any correlation between the two decisions. The Heckman selection model allows for precisely such flexibility.

The first step is to estimate the change in the probability of employing labor, which is explained by the following probit model:

$$y_i^* = \beta_0 \tau_{i,t} + \beta_1 \tau_{i,t+1} + \boldsymbol{X'}\beta + \varepsilon_i \text{ , where } y_i = \begin{cases} 1, & y_i^* > 0 \\ 0, & otherwise. \end{cases} \quad (1)$$

The parameter, β_0, measures the contemporaneous effect of current tax rate changes while β_1 estimates the anticipatory effect of tax rate changes in the next year. The future tax rate parameter, β_1, reflects the ability to shift income (Revenue-Expenses) across consecutive tax periods. Empirically, the future tax rate may or may not be certain but I assume tax-payers have rational expectations; henceforth, future taxes are known with certainty and any deviations are random noise. The data report actual tax rates as proxies for expectations. Tax reforms can

induce both contemporaneous and anticipatory effects. All tax rates are statutory rates which serve as exogenous proxies for marginal tax rates.[44]

The **X**-vector includes variables thought to influence the firm's decision to employ outside labor. The vector β is the conformable parameter vector for the covariates. Capital income (the sum of interest and dividends) and personal property taxes are used to proxy for a taxpayer's assets which may affect a business owner's labor supply, ability to re-invest in the firm and obtain outside financing.[45] Capital income and personal property taxes are included to reflect the capital constraints facing the business. Firms with larger capital stocks will find it easier to obtain loans and lines of credit to fund payrolls.

Depreciation is observed for each Schedule C and serves as an industry proxy because some industries with large depreciation expenses (manufacturing) are less labor-intensive than businesses with small depreciation expenses (consulting or law), which could affect the firm's labor-demand.[46] The number of dependents (exemptions) and marital-status proxy for the business owner's preferences for consumption, labor and leisure. Two indicator variables for the

[44] For more discussion on the effective marginal and statutory rates refer to Section 2.

[45] My proxy for capital income, is a very poor measure of tax-payer wealth but as in previous research, is included as a proxy for the ease of funding: for example, a business owner with large amounts of capital income will receive more offers and lower interest rates from potential lenders than a business owner with limited assets to pledge as collateral. Interest and dividend income is used because such sources are considered more stable than capital gains. Capital gains fluctuate much more than other measures of access to capital and are also very sensitive to capital gains (losses) tax rates and laws. See Feldstein (1997) for a detailed analysis.

[46] Depreciation expenses could be a lagged or jointly-determined variable given both capital and labor are required for production. However, most small firms do not depreciate any assets. For firms with depreciation expenses, any changes in response to current and future tax rates will be very small relative to a firm's total depreciation expense or capital expenditures because depreciated property is typically written off over 5-39 years and not taken until the asset is "ready and available for use". Automobiles are typically depreciated over five years while nonresidential property is depreciated over 39 years. I follow past research and include depreciation because I think the benefits outweigh the costs. See http://www.irs.gov/publications/p946/ch01.html#en_US_2010_publink1000107327 for a full discussion.

presence of other businesses (partnerships and S-corps filed on a Schedule E, and farms filed on a Schedule F) and the amount of Schedule E income are also included in the selection equation[47].

The indicators for other businesses reflect the threshold effect of employing labor.[48] Employing labor includes fixed costs that must be borne by the owner: familiarizing oneself with a payroll system, and learning and maintaining labor-specific regulations and administrative up-keep. Once an owner has undertaken such costs once, it is virtually costless to apply the knowledge to other enterprises.[49] The variable for the level of Schedule E income allows for the success (or loss) of one business to potentially flow through to the other firm operated by the same taxpayer.[50]

The independent variables are used to estimate the inverse Mills ratio which is then used as a variable in the second stage. Consistent with previous literature, state-level fixed effects are not used because 25% of all firms employing labor do not possess a state indicator variable due to blurred data on high-income taxpayers. Omitting the blurred high-income observations to model the State-level fixed-effects substantially skews the results.

The second stage regression includes only the variables in **X** that directly affect the magnitude or level of employment and not the decision to employ. The second stage regression also includes the inverse Mills ratio from the first stage to account for any selection on unobservables by employers:

[47] Schedule E firms are typically owned by one to three people. The S-corporation classification allows up to 100 shareholders; however, S-corporations with more than ten shareholders constitute only 0.06% of all S-corporations.
[48] It would be nice to include an indicator only if labor is actually employed in the other business; however, my data do not provide wage bills for the Schedule E or the Schedule F.
[49] For example, if a taxpayer runs a seasonal farm and files a Schedule F as well as a Schedule C for another business, that taxpayer has already forgone the fixed costs associated with employing labor because farms are relatively labor-intensive. This lowers the initial fixed cost of employing labor in the Schedule C business.
[50] This relationship need not be positive, though it could be: a firm owner with one successful enterprise may be more or less likely to have success in a second endeavor.

$$y_i = \beta_0 \tau_{i,t} + \beta_1 \tau_{i,t+1} + \beta_2 \boldsymbol{X} + \varepsilon_i \qquad (2)$$

The vector X_i includes the same variables included in the probit model but excludes the indicator variables for other businesses, because the variables only affect the decision to employ and not the level of employment. The Schedule E and F indicator variables are the only variables omitted from the second stage regression; this also ensures full identification in the Heckman model.

The current tax rate, future tax rate, capital income, personal property taxes, depreciation expenses, number of dependents, marital status, and the level of Schedule E income constitute X_i. As in the probit model, the coefficients on the two tax variables are separately identified to estimate the impact of contemporary and anticipatory firm responses. The coefficient on the current tax rate reflects contemporaneous behavior responding to current period changes. The effect of a change in the future tax rate is important because it affects business owners' labor-leisure decisions in the current year and reflects their ability to shift income (output) across two periods. This implies the short-run response is larger than the long-run response. *Ceteris paribus*, an increase in the future rate signals that employed labor will be relatively less valuable as a production input in the future than in the present. Decreases in the future tax rate signal that employed labor is relatively less valuable in the current year than in the future year. The parameter β_1 reflects the incentive of business owners to adjust the timing of their own labor, revenues and expenses across time periods to take advantage of relatively low tax rates, or to avoid relatively high tax rates.

6b Estimation

For the full sample of observations in 1992-2005, the Heckman model estimates are reported in Table 2. Column 1 displays the marginal effects from the probit model.[53] Estimates

[53] The observations are distributed evenly through the years with roughly 19,500 observations per year.

over the entire time period (1992-2005) provide a local average treatment effect for small business employment and wage bill decisions responding to marginal tax rate changes.[54] Employment and wage bill estimates will be biased towards zero when higher tax rates induce tax evasion and miss-reporting because owners have the incentive to reduce employment but overstate the wage bill.[55]

The marginal effects of interest show that a one percentage point increase in current tax rates increases the probability of employing outside labor by 1.18%. This represents the contemporaneous response of business owners to current period tax changes. A one percentage point increase in the marginal tax rate next year decreases the probability of employing labor today by 0.70%.[56] The opposite signs on the two tax coefficients relay very different behavioral responses. In the short-run, reflected by current tax rate changes, owners decrease their own labor effort and switch to monitoring outside labor. Conversely, future tax rate changes induce slowed production in the firm and a decrease in the firm's demand for all factors of production: employed labor, capital and owner effort.

The second stage regression in Column 3 shows that a one percentage point increase in the current tax rate reduces the mean wage bill by $7,678; whereas a one percentage point increase in the future tax rate increases the mean wage bill by $8,707. Given firms take market wages as exogenous, the results from the first and second stages imply that current-period tax increases reduce average wage bills because of lower production and because more owners are

[54] See Figure (5) for exact tax rate changes.
[55] The wage bill, or wage bills, is a tax-deductable business expense.
[56] At first glance the large negative correlation coefficient in the Heckman analysis may seem unusual; however, it simply states that for firms with low probabilities of employing labor, holding the observable variables constant, if the unobservable characteristics increase the firm's probability of employing labor then the firm is likely to have a low wage bill if they actually do employ labor. A similar story can be told for firms with high probabilities of employing labor while holding observed characteristics constant.

going to employ outside labor when the price of outside labor drops relative to the price of owner labor.

Consistent with the two-period model in Section 4, increases in future tax rates make production today more attractive relative to production tomorrow; hence, firms employ more people to boost current period production and shift away from the next period's relatively high taxes. Relatively high marginal tax rates in future periods imply owners' labor effort is relatively less valuable tomorrow than it is today: more leisure is consumed in high tax periods and the owner's managerial effort and employed labor are complements.[57]

The mean and median wage bill elasticities with respect to current tax rate changes are -0.17 and -0.64, respectively. The future tax rate elasticity is 0.18 for the mean and 0.65 for the median. These estimates differ from those by Carroll et al. (2000a), 0.37 for current tax changes, and LaLumia (2008) found insignificant estimates.

Operating another business (limited liability) or farm, which suggests that the fixed costs of employing labor have already been borne by the owner, increases the probability of employing labor in the sole proprietorship by 7.86% and 12.57%, respectively. A $100,000 increase in depreciation expenses increases the probability of employing labor by 25.7%. In the second stage (Column 3), a $1 increase in capital income, depreciation and business income earned outside the sole proprietorship, increases wage bills by $0.22, $0.34 and $0.03, respectively.

None of the estimates reported in Table 2 differ appreciably between the linear and logarithmic specifications. The natural-log specification yields virtually identical estimates and

[57] The time horizon of observations is important to capture the behavioral effects. For this analysis, including two periods is all that is feasible.

thus, are not reported. Furthermore, the density for the logarithm of wage bills is approximately normal, justifying the Heckman assumption of normality. Figure 2 shows the kernel density for wage bills for all observations with firms employing labor. The median wage bill of $264,914 for firms employing labor implies 50% of the distribution occurs well below the sample mean of $89,790.

6c Behavioral Differences by Firm Size

Segmenting the data by gross business receipts lends insight to how differently sized firms respond to tax changes. There are noticeable differences in the data around $250,000 and $3.5 million in gross receipts. As shown in Tables 3a and 3b, small, medium and large firms respond differently to tax changes.

The probit analysis in the upper half of Table 5a shows medium to large firms are more likely to contemporaneously respond to current tax increases by employing outside labor and reducing owner labor effort. Medium and large firms are also more likely to reduce production when future tax rates increase. Firms with gross receipts in excess of $3.5 million are 6.66% less likely to employ labor in the current period if the tax rate is known to increase one percentage point next period.

As expected, the coefficient signs are positive on the farm indicator for all firm sizes but the changing sign on the indicator for other businesses (limited liability firms and S-corporations) is worth noting. Firms with gross receipts of $250,000 or less are 9.63% more likely to employ labor when another business is present. Medium and large firms are respectively 15.66% and 7.37% less likely to employ when another business entity exists. The main difference among the firms is the type of business filing the Schedule C in a given gross receipt

range. My data do not include industry classification, but in the aggregate report produced by the IRS high gross-receipt firms are more likely to include consultants, financial services (insurance, securities brokers, investment banking), and professional sciences than smaller firms which are largely comprised of construction, real estate and leasing, and wholesale and retail trade.[58]

The second stage estimates suggest that medium and large firms are more likely than small firms to shift production to periods of relatively low tax rates, as evidenced by the large positive wage bill coefficients on future tax rates.

Table 3b summarizes elasticity estimates for firms with differently sized gross receipts. The results support Figure 1 previously depicted in Section 3 with regard to current tax changes. Small firms are not as likely as large firms to employ outside labor; small firms are likely to rely solely on the owner's labor-effort prior to tax increases. Current-period tax increases decrease the relative price of outside labor versus owner-effort for small and marginal firms, which do indeed employ more outside labor. Large firms, which are more likely to employ labor initially, cut production and demand for all inputs when current period taxes increase.

Medium and large firms respond similarly to future tax changes, but large firms react more to current tax changes. Large firms have a median wage bill elasticity of -0.20, whereas small firms have a wage bill elasticity of -5.41 with respect to future tax rates, suggesting their production is very sensitive to market expectations and growth incentives.

7 Elasticity Estimates for the Specific Reforms of 1993 and 2001-2003

The nature of the OBRA-93 and EGTRRA are very different with OBRA-93 only increasing marginal tax rates on high income-taxpayers and EGTRRA reducing tax rates on all

[58] See http://www.irs.gov/taxstats/indtaxstats/article/0,,id=134481,00.html for industry data in each year.

income brackets. EGTRRA was phased in gradually over three years, whereas OBRA-93 occurred in a single tax year. These structural differences could affect taxpayer behavior and elasticity estimates. Elasticity estimates are presented in Table 4 for the individual tax reforms, OBRA-93 and EGTRRA and JGTRRA in 2001-2003. Roughly 30% of firms employed outside labor during 1992-1994 as seen in Column 1. Only 25% of observations employed labor in the 2001-2005 sample. The mean and median wage bill elasticities for the 1993 current tax increases are -0.47 and -0.60, respectively. The wage bill elasticity with respect to future tax rates is 0.12 at the mean. The 2001-2005 elasticity estimates reflect more modest responses at -0.27 and -0.31 for the mean and median, respectively. The mean future tax rate elasticity is 0.10 for the 143,054 observations in 2001-2005. The relatively modest estimates for EGTRRA may reflect the gradual nature of the tax reform.

I notice a general decline in the probability of employing labor over time in the sample. This could be due to the rise in popularity of the S-corporation and the decline of Schedule C filers. The decline in employment could be a symptom of the changing business environment with more one-man shops opening due to the rise of the Internet. The kernel densities in Figure 3 and Figure 4 suggest the former explanation is more likely to be supported by the data. The wage bill kernel density estimates for the two time periods look very similar with the exception of firms with wage bills in excess of $5 million. Each year contains approximately the same number of observations but firms with large wage bills appear to be dropping out of the sample between 1994 and 2001. Firms with larger wage bills may be opting for S-corporation status and filing Schedule E instead of Schedule C. As shown in Figures 3 and 4, employers in 1992-1994 were more evenly distributed over the $5 million to $30 million range. In 2001-2005, the majority of employers fall in the $5 million to $10 million range.

Tax-return data only provide wage bills for Schedule C filers; hence, the estimates reflect only sole-proprietorships and single-owner LLCs. To the extent these businesses are similar to S-corporations and partnerships, the results provide an accurate estimate of the employment effects of small businesses. S-corporations tend to be larger than other small business entities whereas most service businesses (doctors, lawyers, dentists) file as partnerships and limited liability corporations. Because of the preferential treatment given to S-corporations under the 1986 tax reforms, the entity has continued to rise in popularity. Future research may want to investigate the behavioral and labor decisions of S-corporations with respect to tax rate changes.

8 Omitted Variable Bias: Implications of excluding the future tax rate

Table 5 compares a Heckman model with both current and future tax rates to a Heckman model with only current tax rates in Columns 1 and 2, respectively. Including only current tax rates biases the marginal effect on employing labor upwards in the first stage, as shown in Column 2 where a one percentage point change in current tax rates implies firms are 5.02% more likely to employ outside labor.

Excluding the future tax variable results in a positive coefficient in the second stage for wage bills instead of the negative coefficient reported in Column 1. Marginal effects and coefficients for the other independent variables change little when future tax rates are excluded. Column 3 reports the least-squares regression using both future and current tax rates. Column 4 omits the future-tax-rate regressor but is otherwise identical to Column 3. Column 4 is most similar to the methodology employed by Carroll et al. (2000a) and LaLumia (2008). The first stage is a probit model independent of the second stage, which is a least-squares regression on only observations with positive wage bills.

The bias occurs from estimating the entire behavioral effect as contemporaneous instead of decomposing the response to also account for the anticipatory effect. Omitting future tax rates as an explanatory variable induces an omitted variable bias that skews the interpretation of the current and future tax rate coefficients and marginal effects but leaves the other coefficients unchanged.

Recall that my Heckman estimates reported in Table 2 report a median wage bill elasticity with respect to current tax rates of 0.65. For comparison, Carroll et al. (2000a) estimated a median wage bill elasticity of 0.37. Carroll et al. (2000a) estimated that a marginal tax increase of 1% decreases the mean probability of hiring workers by 1.2% for a balanced panel in 1986 and 1988. LaLumia (2008) used five-years of panel-data beginning in 1999 and did not find any results of statistical significance for the probability of hiring labor or changes in wage bills. LaLumia (2008) explains that observation weighting and the nature of the two tax reforms accounts for the difference between her estimates and those by Carroll et al. (2000a). The 2001 reforms reduced the tax rates in every bracket but the 1986 reforms focused only on the top income bracket and also broadened the taxable base. Similar to my data, Carroll et al. (2000a) use data with oversampled high-AGI taxpayers whereas LaLumia (2008) uses unweighted data.

9 Specification Testing: The Bias of OLS on Positive Wage bill Observations

The Heckman specification allows for the possibility of unobserved differences between employers and non-employers. Some owners are more likely to employ workers because of the nature of their business. For example, a cleaning business is more likely to have staff employees than an economic consultant or a tax accountant. Furthermore, business owners with better

managerial skills are more likely to employ outside labor and are likely to employ more workers than a poor manager. The Heckman allows for such possibilities and estimates the relationship. The assumption of independence used by Carroll et al (2000a) and LaLumia (2008) implicitly assumes all business owners are equally efficient managers. Independence also assumes all firms, regardless of industry affiliation and size, are equally likely to employ. My theoretical model and empirical results find the assumption of independence unrealistic.

Table 6 summarizes results from the truncated and standard OLS regression and contrasts the estimates with the tobit and Heckman specifications. Column 1 restates the second stage estimates from the Heckman results reported in Table 2.

The tobit model in Column 2 assumes both the participation and spending equations are drawn from the same distribution with identical covariates. Tobit estimates are presented as a specification test. Similar to the Heckman specification, the tobit allows for correlation between the two equations but imposes strict assumptions about the type of relationship.

The tobit is nested in the Heckman as the special case when the correlation coefficient, rho, equals 1. This assumes the selection and expense decisions are perfectly correlated. The tobit estimates for current and future marginal tax rates are $6,810 and -$2,391, respectively, which differ dramatically from the Heckman estimates of -$7,678 and $8,707. The tobit estimates often have different signs than the Heckman estimates; this is indicative of the positive relationship assumed in the tobit model instead of the estimated correlation of -0.95.

A likelihood ratio test examining the Heckman and tobit model fails to reject the null hypothesis that the Heckman is the true model at 0.01%; therefore, the Heckman model is preferred to the more restrictive tobit.

Columns 3 and 4 show the different covariate estimates for a least-squares regression on positive wage bill observations and a standard least-squares regression on all observations. As mentioned earlier, truncated data with a large variance are typically analyzed efficiently using a truncated model instead of standard OLS. As expected, standard OLS is outperformed by least-squares estimation on only positive observations.

Standard OLS in Column 3 weights employers and nonemployers equally and shows the mean result of a tax change on the entire sample. Past research estimates a probit model for the probability of employing labor that would be identical to the first stage estimates in the Heckman model. For the wage bill response, past research simply performs OLS on positive wage-bill observations, this method is displayed in Column 4. The Column 4 estimates are calculated under the false assumption of no correlation between the selection and wage bill equations. Least-squares estimation on positive observations assumes that the two decisions are independent, whereas the Heckman model allows for independence while accommodating potential correlation. The least-squares method biases the estimates towards finding no result. Failing to account for employer selection on unobservables produces very different estimates with much lower magnitudes and sometimes opposite signs.

10 Conclusion

Changes in tax rates have intertemporal effects. Focusing only on contemporaneous adjustments underestimates the true behavioral responses of business owners to tax changes. My analysis has decomposed the total effect of changing tax rates into two important parts: current responses and preparations for the future. The future-tax coefficient provides an estimate for the ability to shift income and entrepreneurial effort across consecutive tax periods. Modeling

separate tax rates helps to separate the contemporaneous responses to current tax changes from the anticipatory reactions to future tax changes.

Using pooled cross-sectional tax return data from 1992-2005, I estimate the small business probability of employing labor and employment level for Schedule C filers with respect to statutory tax-rate changes. Economic theory predicts that small businesses using productive inputs of owner-effort, labor and capital may be more or less likely to employ labor after tax increases due to the relative price increase of owner-effort and the substitutability of owner-labor and tax-deductable outside labor.

My findings support the theoretical model that employing labor involves variable wage and monitoring costs, in addition to the fixed costs of payroll systems and administration. From the probit estimates of the Heckman 2-step analysis, a one percentage point increase in current tax rates increases the probability of employing outside labor by 1.18 percent. This represents the contemporaneous response of business owners to current period tax changes. A one percentage point increase in the marginal tax rate next year decreases the probability of employing labor today by 0.70 percent.

In the short-run (reflected by current tax rate changes), owners decrease their own labor effort and switch to monitoring outside labor. Conversely, future tax rate changes induce slowed production in the firm and a decrease in the firm's demand for all factors of production. The mean and median wage bill elasticities with respect to current tax rates are -0.17 and -0.64, respectively. The comparable elasticities with respect to future tax rates are 0.18 for the mean and 0.65 for the median. These estimates are almost double the largest estimates reported in the previous literature.

Given that wages paid in the labor market are competitive, the results from the first and second stages together show that current-period tax increases reduce average wage bills because of lower production, while some owners substitute toward hired labor when its price drops relative to the price of the owner's own labor. Increases in future tax rates make production today more attractive relative to production tomorrow, indicating that firms anticipating higher future taxes shift production intertemporally.

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Table 1a
Summary Statistics for Schedule-C Tax Filers 1992-2005

Summary Statistics include the median, mean, minimum and maximum for observations employing labor, and those not employing labor, for all years included in the dataset.

Variable	Median	Mean	Std. Dev.	Minimum	Maximum
Marginal Tax Rate (τ)	27.00%	21.60%	14.43%	0%	39.60%
Future Marginal Tax Rate (τ+1)	25.00%	20.65%	15.21%	0%	39.60%
Probability of Employing Labor	0%	26.57%	44.17%	0%	100%
Wage Bill	$0	$70,397	$380,083	$0	$49,800,000
Adjusted Gross Income (AGI)	$90,443	$746,074	$4,134,146	-$337,000,000	$534,000,000
Gross Receipts (Schedule-C)	$49,180	$730,894	$10,100,000	-$3,079,748	$2,360,000,000
Depreciation	$133	$17,527	$121,255	$0	$19,000,000
Capital Income	$1,001	$65,230	$541,515	$0	$79,600,000
Taxable Business Income (Schedule-C)	$9,005	$91,812	$625,028	-$140,000,000	$50,900,000
Observations	402,651				

Note: Gross receipts are negative due to firms electing to use accrual accounting methods.

Table 1b

Summary Statistics for Schedule-C Tax Filers Conditional on Employing, or not Employing, Labor 1992-2005

Summary Statistics for employers are substantially larger than for non-employers, particularly for median and mean AGI, gross receipts, depreciation and taxable Schedule C business income. Schedule C businesses with large gross receipts but not employing labor include firms in consulting, finance and insurance, and professional, scientific and technical services.

Variable	Median	Mean	Std. Dev.	Minimum	Maximum
Conditional on Employing Labor					
Marginal Tax Rate (τ)	28.00%	22.65%	14.14%	0.00%	39.60%
Future Marginal Tax Rate (τ+1)	27.50%	21.47%	15.07%	0.00%	39.60%
Wage Bill	$89,790	$264,914	$701,504	$1	$49,800,000
Adjusted Gross Income (AGI)	$118,068	$437,067	$3,854,542	-$337,000,000	$440,000,000
Gross Receipts (Schedule-C)	$621,010	$1,628,747	$6,653,973	-$2,714,034	$1,120,000,000
Depreciation	$10,835	$45,042	$179,785	$0	$14,600,000
Capital Income	$1,343	$47,506	$531,592	$0	$79,600,000
Taxable Business Income (Schedule-C)	$63,312	$191,003	$758,471	-$63,600,000	$43,200,000
Observations	106,999				
Conditional on not Employing Labor					
Marginal Tax Rate (τ)	25.00%	21.22%	14.51%	0.00%	39.60%
Future Marginal Tax Rate (τ+1)	15.00%	20.36%	15.25%	0.00%	39.60%
Wage Bill	-	-	-	-	-
Adjusted Gross Income (AGI)	$79,472	$857,907	$4,225,226	-$246,000,000	$534,000,000
Gross Receipts (Schedule-C)	$20,565	$405,956	$11,100,000	-$3,079,748	$2,360,000,000
Depreciation	$0	$7,569	$89,179	$0	$19,000,000
Capital Income	$855	$71,645	$544,921	$0	$75,300,000
Taxable Business Income (Schedule-C)	$4,796	$55,914	$564,799	-$140,000,000	$50,900,000
Observations	295,652				

Note: Gross receipts are negative due to firms electing to use accrual accounting methods.

Table 2
Heckman Selection 2-Step Estimates for Wage Bill of Schedule-C Business-Owners Employing Labor for the years 1992-2005

Columns 1and 3 display results from the Heckman Selection 2-step model for employment and wage bill responses to changing tax rates. Column 1 displays the marginal effects from the first-stage of the Heckman estimation (a probit model). All marginal effects in Column 1 are changes in the probability of employing labor for a one-unit change in the independent variable. A current tax increase of 1 percentage point increases the probability of employing labor in the current period by 1.18%. All dollar denominated variables are in $100,000s so a $100,000 increase in Capital Income, decreases the probability of employing labor by 1.16%. Running another business, whether an S-corp or a farm, increases the probability of employing labor by 7.86% and 12.57%, respectively. For the second-stage presented in Column 3, all coefficients show the dollar increase in the wage bill for a 1 unit change in the independent variable, given the firm employs labor. Conditional on employing labor, a 1 percentage point increase in the current tax rate decreases wage bills by $7678.47, reflecting the scale effect of lower production at higher marginal tax rates. The positive coefficient on the future tax rate reflects the intertemporal substitution as labor and production become relatively more valuable today and less valuable tomorrow when tomorrow's tax rates are expected to increase. A $1 increase in Depreciation Expenses increases salary expenses by $0.34. Mean and median elasticities are reported for each specification. Controls for the marital status, number of dependents, and property taxes are also included. The Wald Test is significant at 0.01%.

	(1)	*(2)*	*(3)*	*(4)*
Independent Variables	*Heckman First-Stage Coefficient*	*Standard Error*	*Heckman Second-Stage Coefficient*	*Standard Error*
Current Tax Rate	**1.18*** **	*(0.04)*	**-7,678.47*** **	*(538.44)*
Future Tax Rate	**-0.70*** **	*(0.04)*	**8,707.42*** **	*(491.92)*
Capital Income	-1.16***	*(0.06)*	0.22***	*(0.01)*
Depreciation	25.70***	*(0.20)*	0.34***	*(0.03)*
Non-Schedule C Business Income	0.36***	*(0.02)*	0.03***	*(0.00)*
Other Businesses: Indicator	7.86***	*(0.47)*	-	-
Other Business: Farm Indicator	12.57***	*(0.86)*	-	-
Constant	-2.21***	*(0.08)*	2,811,514***	*(137586)*
Correlation Coefficient (ρ)	-0.95			
Likelihood Ratio	20,289			
R^2	0.044			
Wald Test (prob>chi^2)	3734.9***	*(0.00)*		
Observations	402,554		402,554	
Wage Bill Current Tax-Rate Elasticity				
Mean Elasticity			-0.17	
Median Elasticity			-0.64	
Wage Bill Future Tax-Rate Elasticity				
Mean Elasticity			0.18	
Median Elasticity			0.65	

Note: All std. errors are adjusted standard errors. (***) indicated significance at 0.01%. Elasticities are average point-estimates that use the mean or median salary expense, respectively.

Table 3a

Behavioral Differences by Firm Size, as Measured by Gross Business Receipts

The overall dataset on Schedule-C business filers is divided by the level of gross business receipts. Heckman estimates for observations with gross business receipts under $250,000 are presented in Column 1 while companies with receipts of at least $250k but less than $3.5million are in Column 2 and those with receipts of $3.5million and up are presented in Column 3. The three columns relay that differently sized firms do in fact respond differently to personal income tax changes. Larger firms are much more sensitive to changes in tax rates than small firms. Larger firms are also more likely to time production by intertemporally substituting away from producing in years of relatively high tax rates, as evidenced by the positive coefficients on Future Tax Rates in Columns 2 and 3 for the second stage Heckman estimates. For permanent tax increases (the coefficient on current marginal tax rate), small firms are dominated by the change in the relative price of owner-effort and actually increase employment; whereas the decreased production by larger firms dominates the change in the relative price of owner-effort. The fourth column re-states the findings from Table 2 in the overall model. The probit coefficients are marginal effects at the mean for current and future tax rates. All columns include the standard controls for marital status, the number of dependents and personal property taxes. All dollars are inflation-adjusted, chained 2005 dollars.

	(1) *Observations Receipts < $250k*	*(2)* *Observations $250k ≤ Receipts < $3.5m*	*(3)* *Observations Receipts ≥ $3.5m*	*(4)* All Observations
First-Stage Probit:				
Current Marginal Tax Rate	0.33***	1.25***	1.01***	1.18***
(Std Error)	(0.06)	(0.01)	(0.31)	(0.04)
Future Marginal Tax Rate	-1.29***	-1.57***	-6.66**	-0.70***
(Std Error)	(0.06)	(0.00)	(2.97)	(0.04)
Non-Schedule C Business Income	0.180	-0.17***	-0.04	0.36***
(Std. Error)	(0.22)	(0.03)	(0.05)	(0.02)
Other Businesses: Indicator	9.63***	-15.66***	-7.37**	7.86***
(Std. Error)	(0.70)	(0.88)	(2.78)	(0.47)
Other Business: Farm Indicator	10.51***	6.89***	12.13**	12.57***
(Std. Error)	(1.28)	(1.60)	(4.42)	(0.86)
	(1) *Observations Receipts < $250k*	*(2)* *Observations $250k ≤ Receipts < $3.5m*	*(3)* *Observations Receipts ≥ $3.5m*	*(4)* *All Observations*
Second-Stage Regression:				
Current Marginal Tax Rate	827.09***	-751.74***	-10,104.70**	-7,678.47***
(Std Error)	(233.74)	(210.05)	(5117.24)	(538.44)
Future Marginal Tax Rate	-2652.91***	1470.13***	7398.44***	8,707.42***
(Std Error)	(315.91)	(211.19)	(4818.91)	(491.92)
Capital Income	0.01***	-0.003	0.617***	0.22***
(Std Error)	(0.00)	(0.003)	(0.03)	(0.01)
Depreciation	2.19***	0.36***	0.370***	0.34***
(Std Error)	(0.04)	(0.01)	(0.06)	(0.03)
S-Corp Business Income	-0.01***	-0.001	0.078***	0.03***
(Std Error)	(0.00)	(0.00)	(0.01)	(0.00)
Correlation Coefficient (ρ)	0.937	0.086	-0.882	-0.953
Pseudo-R^2	0.019	0.033	0.028	0.044
Observations	286,437	102,949	13,168	402,554

Note: (***) denotes significance at 0.01%, (**) denotes significance at 5% and (*) at 10%.

Table 3b

Robustness Check: Cutting the Data by Firm Size, as Measured by Gross Business Receipts

The elasticity estimates using the coefficients reported in Table 5a are reported for "small", "medium" and "large" firms, by gross business receipts, for all observations in the 1992-2005 dataset. Larger firms are much more likely to employ labor than small firms and have wage bills that are more sensitive to changes in current tax rates. Medium and large firms respond identically in magnitudes to increases in future taxes. Median elasticities are not reported in Column 1 because the median wage bill for small firms in the dataset is $0, which yeilds an elasticity estimate of 7.75 for both current and future tax rates.

	(1) *Observations Receipts < $3.5m*	*(2)* *Observations $250k ≤ Receipts Receipts ≥ $3.5m*	*(3)* *Observations Receipts ≥ $3.5m*	*(4)* *All Observations*
Probability of Employing Labor:				
Mean:	9.99%	66.29%	76.89%	25.00%
Wage Bill Current Tax-Rate Elasticity				
Mean Elasticity	1.03	-0.03	-0.08	-0.17
Median Elasticity	-	-0.10	-0.20	-0.64
Wage Bill Future Tax-Rate Elasticity				
Mean Elasticity	-5.41	0.06	0.06	0.18
Median Elasticity	-	0.17	0.14	0.65
Observations	286,437	102,949	13,168	402,554

Note: Elasticities are average point-estimates that use the mean or median salary expense for the respective observations.

Table 4

Elasticity Estimates for Specific Tax Reforms (OBRA-93 and EGTRRA-JGTRRA 2001-2003)

Subsets of the overall dataset on Schedule-C business filers are exploited to isolate the short-run effects of the 1993 tax increases (OBRA-93) and 2001-2003 tax decreases (EGTRRA & JGTRRA) using the Heckman 2-step Model. Observations appearing in 1992-1994 surround the 1993 tax increases while observations in 2000-2005 surround the gradual tax decreases in 2001-2003. Mean and median wage bill elasticity estimates for the respective tax increases (1993) and decreases(2001-2003) are reported. The elasticity estimates for tax increases of 1993 are statistically different than the tax decreases in 2001-2003 for current tax rates but not for future tax rates. The third column re-states the estimates from Table 2 in the overall model.

	(1) 1992-1994	*(2)* 2001-2005	*(3)* All Observations
Probability of Employing Labor:			
Mean:	29.78%	24.68%	26.57%
Wage Bill Current Tax-Rate Elasticity			
Mean Elasticity	-0.47	-0.27	-0.17
Median Elasticity	-0.60	-0.31	-0.64
Wage Bill Future Tax-Rate Elasticity			
Mean Elasticity	0.117	0.103	0.18
Median Elasticity	0.096	0.127	0.65
Observations	99,091	143,054	402,554

Note: Elasticities are average point-estimates that use the mean or median salary expense for the respective observations.

Table 5

Omitted Variable Bias: The Implications of Omitting Future Tax Rates when Modelling the Employment and Wage Bill Responses of Small Businesses to Tax Rate Changes

Table 4 compares a Heckman model with both current and future tax rates to a Heckman model with only current tax rates in Columns 1 and 2, respectively. Including only current tax rates biases the marginal effect on employing labor upwards in the first stage, as shown in Column 2 where a 1 percentage point change in current tax rates implies firms are 5.02% more likely to employ outside labor. Excluding the future tax variable results in a positive coefficient in the second stage for the wage bill, instead of the negative coefficient found in Column 1. Marginal effects and coefficients for the other independent variables change little when future tax rates are excluded. Columns 3 reports the least squares regression using both future and current tax rates and Column 4 is identical to Column 3 but excludes future tax rates. Column 4 is most similar to the methodology employed by previous authors where the first stage is a probit model that is independent from the second stage least squares regression on only observations with positive wage bills. The bias occurs from estimating the entire behavioral effect as contemporaneous instead of decomposing the response to account for the anticipatory effect as well. Omitting future tax rates as an explanatory variable induces an omitted variable bias that skews the interpretation of only the coefficients and marginal effects of interest.

	(1)	*(2)*	*(3)*	*(4)*
Independent Variables	*Heckman Current & Future Tax Rates*	*Heckman Current Tax Rates*	*Least Squares Wage Bill >0 Current & Future Tax Rates*	*Least Squares Wage Bill >0 Current Tax Rates*
First-Stage (Probit)				
Current Tax Rate	1.18***	5.02***	1.18***	5.02***
(Std. Error)	*(0.04)*	*(0.00)*	*(0.04)*	*(0.00)*
Future Tax Rate	-0.70***	-	-0.70***	-
(Std. Error)	*(0.04)*		*(0.04)*	
Constant	-2.21***	-2.20***	-2.21***	-2.20***
(Std. Error)	*(0.08)*	*(0.08)*	*(0.08)*	
Observations	402,554	402,554	106,970	106,970
R^2 *(Pseudo-R^2)*	*0.044*	*0.043*	0.096	0.095
Second-Stage (Regression)				
Current Tax Rate	-7,678.47***	925.81***	29.17	3357.63***
(Std. Error)	*(538.44)*	*(199.6)*	*(50.18)*	*(193.84)*
Future Tax Rate	8,707.42***	-	3409.02***	-
(Std. Error)	*(491.92)*		*(460.93)*	
Capital Income	0.22***	0.22***	0.11	0.11
(Std. Error)	*(0.01)*	*(0.01)*	*(0.08)*	*(0.08)*
Depreciation	0.34***	0.35***	1.04***	1.05***
(Std. Error)	*(0.03)*	*(0.03)*	*(0.13)*	*(0.13)*
Non-Schedule C Business Income	0.03***	0.03***	0.01	0.01
(Std. Error)	*(0.00)*	*(0.01)*	*(0.01)*	*(0.01)*
Other Businesses: Indicator	-	-	38.74***	41,135***
(Std. Error)			*(5.13)*	*(5184.39)*
Other Business: Farm Indicator	-	-	-27.118***	-26,460***
(Std. Error)			*(9.86)*	*(9882)*
Constant	2,811,514***	2,796,106***	14,573	15,623
(Std. Error)	*(137,586)*	*(137,700)*	*(18,373)*	(18,414)
Correlation Coefficient (ρ)	-0.95	-0.95	0	0
Likelihood Ratio	20,289	19,988		
Observations	402,554	402,554	106,970	106,970

Note: All std. errors are robust or adjusted standard errors depending on which is appropriate. (***) indicated significance at 0.01%, (**) indicates significance at 5% and (*) denotes significance at 10%. The correlation coefficient is reported in Columns 1 and 2 for the Heckman. least squares assumes a correlation coefficient=0 when a probit model is estimated for the first stage - the probit estimates are identical to the first stage in the corresponding Heckman models.

Table 6

Specification Testing: Comparision of Heckman Estimates to the Tobit, OLS and OLS on Positive models

Column 1 re-states the second-stage estimates from the Heckman results reported in Table 2. Columns 2-4 present results from different specifications of the model. Current and Future tax rate coefficients are reported in $dollars and all other dollar denomiated variables are reported in $100,000s. Columns 3 and 4 show the results from a standard OLS regression on all observations, even those not employing labor and an OLS regression on only observations employing labor, the latter is the specification used in past research. Truncated OLS does not account for any correlation between the employment and salary expense decisions. Standard OLS shows the mean effect of increasing tax rates on the entire population regardless of if an observation employs labor or not. Mean and median elasticities are reported for each specification. In Columns 1 and 2, we see that the additional restrictions added by the Tobit model lead to a reverse in signs for the elasticity estimates. Additional controls for the number of dependents, marital status and property taxes are used in all model specifications. The Wald Test is reported for the Heckman specification and is significant at 0.01%. The Tobit model is nested in the Heckman 2-Step; a Likelihood Ratio test fails to reject the null hypothesis that the Heckman is the true model at 0.01%.

	(1)	*(2)*	*(3)*	*(4)*
Independent Variables	*Heckman 2nd-Stage Estimates*	*Tobit Estimates*	*OLS All Observations Estimates*	*OLS on Positve Wage Bill >0 Estimates*
Current Tax Rate	**-7,678.47*** **	6,810.47***	575.86***	29.17
(Std. Error)	*(538.44)*	*(493.2)*	*(168.71)*	*(50.18)*
Future Tax Rate	**8,707.42*** **	-2,391.15***	649.14***	3,409.02***
(Std. Error)	*(491.92)*	*(399.64)*	*(161.00)*	*(460.93)*
Capital Income	0.22***	-1.08***	0.024	0.11
(Std. Error)	*(0.01)*	(2.26)	(0.02)	(0.08)
Depreciation	0.34***	1.34***	0.76***	1.04***
(Std. Error)	*(0.03)*	(0.05)	(0.09)	(0.13)
Non-Schedule C Business Income	0.03***	-0.02***	-0.003	0.01
(Std. Error)	*(0.00)*	(0.00)	(0.00)	(0.01)
Other Businesses: Indicator	-	70.113***	12.33***	38.74***
(Std. Error)	-	(4.35)	(2.05)	(5.13)
Other Business: Farm Indicator	-	79.321***	6.00**	-27.118***
(Std. Error)	-	(6.68)	(3.05)	(9.86)
Constant	2,811,514***	-1,841,021***	2,540	14,573
(Std. Error)	*(137,586)*	(89,067)	(4,577)	(18,373)
Correlation Coefficient (ρ)*	-0.95	1	-	0
Likelihood Ratio	20,289	-1,721,643		
R^2	0.044	0.006	0.066	0.096
Observations	402,554	402,554	402,554	106,970
Wage Bill Current Tax-Rate Elasticity				
Mean Elasticity	-0.170	0.148	0.013	0.001
Median Elasticity	-0.637	0.521	0.046	0.002
Wage Bill Future Tax-Rate Elasticity				
Mean Elasticity	0.178	-0.051	0.014	0.072
Median Elasticity	0.647	-0.192	0.051	0.265

Note: All std. errors are robust or adjusted standard errors depending on which is appropriate. (***) indicated significance at 0.01%, (**) indicates significance at 5% and (*) denotes significance at 10%. The correlation coefficient is reported in Column 1 for the Heckman, the Tobit assumes a correlation coefficient of 1 and truncated OLS used in previous studies assumes a correlation coefficient=0 when a probit model is estimated for the first stage - the probit estimates are identical to the first stage in the Heckman model, refer to Table 2 to review. Elasticities are average point-estimates that use the mean or median wage bill for the respective observations. The pseudo-log likehood is reported for the Tobit instead of the likelihood ratio in Column 2.

Figure 1: The Effect of Tax Changes on Firm's Demand for Labor

Figure 1 displays the optimal owner-effort and labor choices for any given sole proprietorship. The value of the marginal product of owner effort is denoted by the downward sloping curve labeled *MP(e).* The two full upward sloping curves represent the after-tax marginal cost of owner effort under no taxes and then the critical tax rate (t_c). The upward sloping $MC(e)/(1-t_0)$ curve represents owners who only exert managing effort, have zero labor effort, and employ outside labor. The horizontal axis measures the total amount, or quantity, of owner-effort exerted through managing effort and labor effort. The shadow price of owner effort is listed on the vertical axis.

Case 1: Firms with zero wage bills may employ outside labor after a tax increase due to the relative price increase of owner-effort as a productive input. For any given firm, there exists a critical tax rate (t_c) such that $t > t_c$ implies $L > 0$. There is also a second critical tax rate (t_0) such that $t > t_0$ implies $e_L = 0$. As long as $e_L > 0$, the firm owner simply equates his marginal products of managing effort and labor effort $[MP(e_m) = MP(e_L)]$ during maximization. But if $L > 0$, the owner equates the marginal product of his labor effort with the competitive wage because his labor effort and outside labor are perfect substitutes $[MP(e_L) = w]$. It follows that there is a range of tax rates over which all shifts of the after-tax marginal cost curve can cause a one-for-one substitution of managing effort for labor effort (e_m for e_L). Once t_0 is exceeded, the owner does not exert any labor effort; he equates his marginal cost of managing with the marginal product of managing: $e_L = 0$ *and* $MC(e) = MC(e_m) = MP(e_m) > w$.

Case 2: Firms with positive wage bills prior to tax increases are denoted by the upward sloping $MC(e)/(1-t_0)$ curve. The firm owners only exert managing effort and upon tax increases, the marginal cost of managing effort increases and owners spend less time managing. Henceforth, all changes in employment and output are due to the scale effect of reduced effort which reduces production. After the tax increase, the business owner reduces his demand for outside labor, *ceteris paribus.*

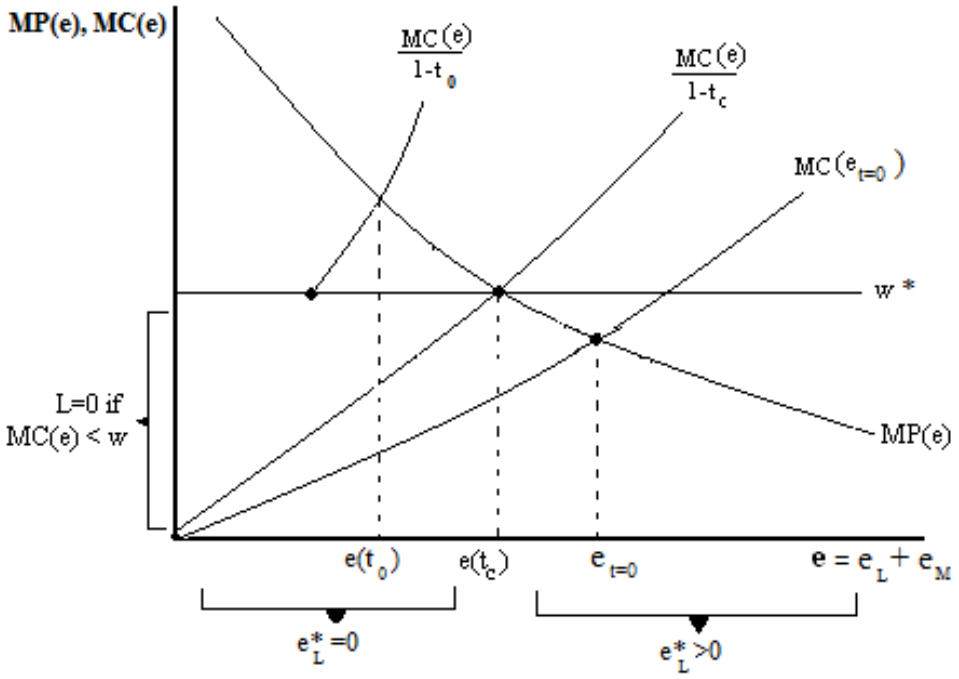

Figure 2: Wage Bill Kernel Density Estimate

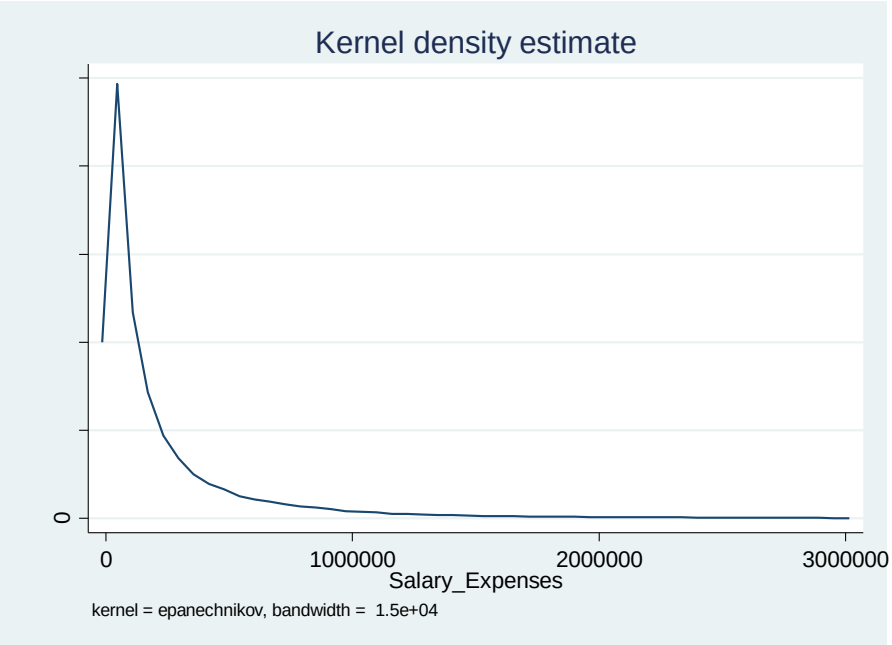

Figure 3: Kernel Density Estimate for Wage Bill > $5million, 1992-1994

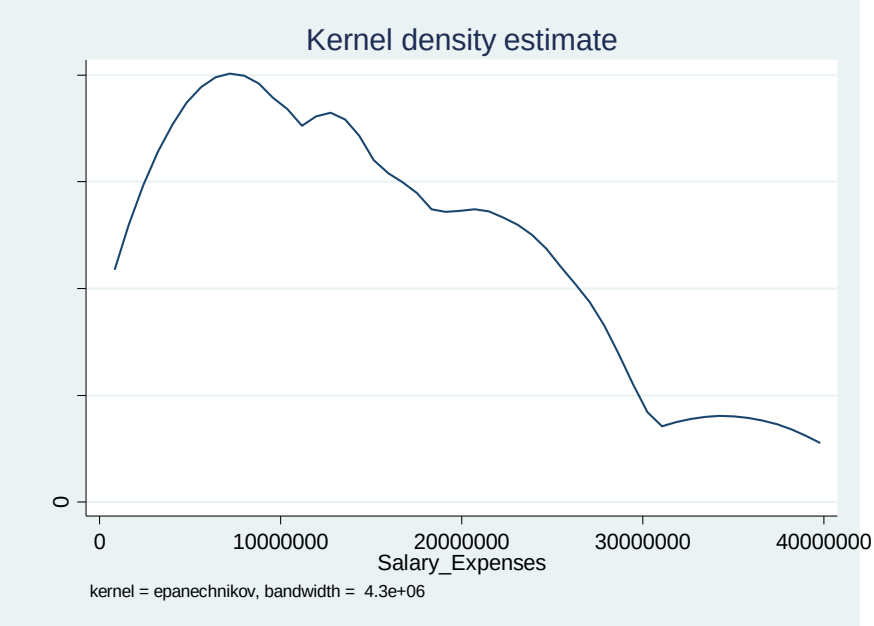

Figure 4: Kernel Density Estimate for Wage Bill > $5million, 2001-2005

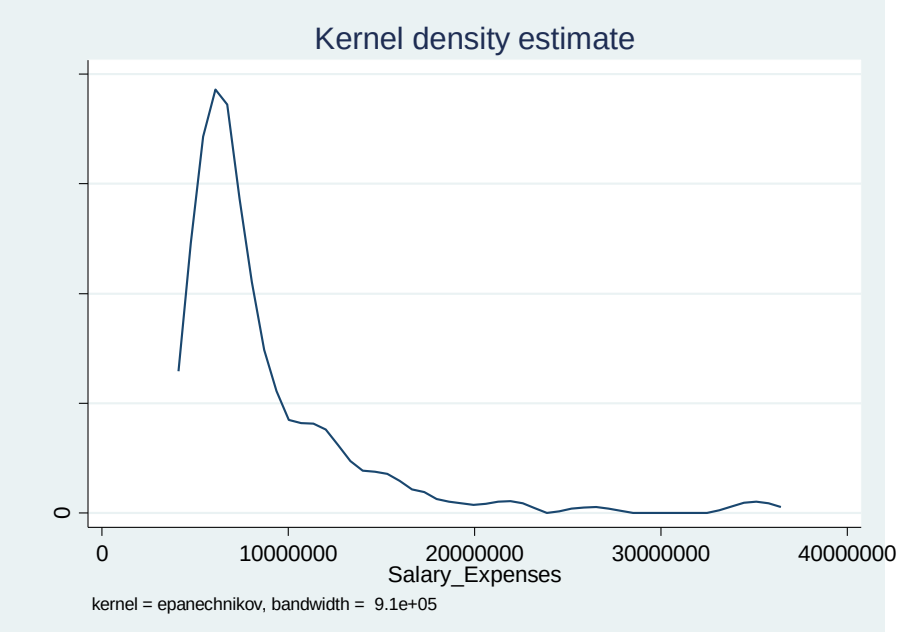

Figure 5 - Historical Tax Brackets and Tax Rates

Personal Income Tax Brackets 1988-2005 for Married filing Jointly

1988-1990*

Marginal Tax Rate	Income Brackets	
	Over	*But Not Over*
15.0%	$0	$29,750
28.0%	$29,750	$71,900
33.0%	$71,900	$149,250
28.0%	$149,250	-

1991-1992*

Marginal Tax Rate	Income Brackets	
	Over	*But Not Over*
15.0%	$0	$34,000
28.0%	$34,000	$82,150
31.0%	$82,150	-

1993-2000*

Marginal Tax Rate	Income Brackets	
	Over	*But Not Over*
15.0%	$0	$36,900
28.0%	$36,900	$89,150
31.0%	$89,150	$140,000
36.0%	$140,000	$250,000
39.6%	$250,000	-

2001

Marginal Tax Rate	Income Brackets	
	Over	*But Not Over*
15.0%	$0	$45,200
27.5%	$45,200	$109,250
30.5%	$109,250	$166,500
35.5%	$166,500	$297,350
39.1%	$297,350	-

2002

Marginal Tax Rate	Income Brackets	
	Over	*But Not Over*
10.0%	$0	$12,000
15.0%	$12,000	$46,700
27.0%	$46,700	$112,850
30.0%	$112,850	$171,950
35.0%	$171,950	$307,050
38.6%	$307,050	-

2003-2005*

Marginal Tax Rate	Income Brackets	
	Over	*But Not Over*
10.0%	$0	$14,000
15.0%	$14,000	$56,800
25.0%	$56,800	$114,650
28.0%	$114,650	$174,700
33.0%	$174,700	$311,950
35.0%	$311,950	-

*Income ranges are listed for the first year and are adjusted for inflation in consecutive years.

Figure 6 – Anticipated Tax Brackets and Tax Rates 2001-2010

Proposed Changes in Tax Rates 2001-2010 (under EGTRRA 2001) for Married Filing Jointly

Tax Rate prior to July 1, 2001			Tax Rate July 1, 2001 -2003			Tax Rates 2004-2005			Tax Rates 2006-2010		
Marginal	Income Brackets		Marginal	Income Brackets		Marginal	Income Brackets		Marginal	Income Brackets	
Tax Rate	*Over*	*But Not Over*	Tax Rate	*Over*	*But Not Over*	Tax Rate	*Over*	*But Not Over*	Tax Rate	*Over*	*But Not Over*
0.0%	$0	$26,350	10.0%	$0	$12,000	10.0%	$0	$14,300	10.0%	$0	$14,000
15.0%	$26,350	$63,550	15.0%	$12,000	$46,700	15.0%	$14,300	$58,100	15.0%	$14,000	$56,800
28.0%	$63,550	$132,600	27.0%	$46,700	$112,850	26.0%	$58,100	$117,250	25.0%	$56,800	$114,650
31.0%	$132,600	$208,350	30.0%	$112,850	$171,950	29.0%	$117,250	$178,650	28.0%	$114,650	$174,700
36.0%	$208,350	$288,351	35.0%	$171,950	$307,050	34.0%	$178,650	$319,100	33.0%	$174,700	$311,950
39.6%	$288,351	-	38.6%	$307,050	-	37.6%	$319,100	-	35.0%	$311,950	-

*Income ranges are listed for the first year only.