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Essays in Contemporary Tax Law Changes

A Dissertation
Presented to
the Graduate School of
Clemson University

In Partial Fulfillment
of the Requirements for the Degree
Doctor of Philosophy
Economics

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by
Arpita Biswas
August 2010

Accepted by:
Dr. Paul Wilson, Committee Chair
Dr. Michael Maloney
Dr. John Warner
Dr. Raymond Sauer

Abstract: In the first essay, I provide estimates of price and income elasticities of charitable contributions which reveal substantial differences in giving patterns across different income groups. The paper develops an intertemporal model of giving which predicts that lowering current income taxes induces substitution away from current giving towards giving in future periods. Cragg's Generalized Tobit model applied to Consumer Expenditure data from 1997–2006 provides estimates of income and price elasticities conditioned upon contribution, which range between 0.17 to 0.81 and -0.50 to -1.16 respectively. Empirical analysis shows substantial evidence of intertemporal substitution, implying that if the difference between future and current prices increase by 1 percent, current period giving increases by 0.8 percent.

The second essay is an extension of the first, wherein I provide estimates of how reduction in income tax rates brought about by EGTRRA, 2001 and alternative tax rate regimes affect charitable contributions. Results from difference-in-difference analysis suggests that after Economic Growth Tax Relief Reconciliation Act (EGTRRA), itemizers reduced their contributions by 24% and the likelihood of contributions fell by 10%. While limiting the tax deductibility to 28% reduces price elasticity by 0.02 percentage points, a flat tax rate regime makes contributions 11 percentage points more price elastic compared to the progressive tax rate system.

The third essay focuses on another contemporary tax law change, reduction in capital gains and dividend tax rates brought about by Jobs and Growth Tax Relief and Reconciliation Act, 2003. I study two main impacts of the law change, the effect on portfolio allocation between retirement and non-retirement accounts and the effect on labor supply decisions. Difference-in-difference analysis using Health and Retirement Study finds that for the age group above 55, annual investments in IRA fall by \$175 and the likelihood of holding IRAs fall by 11%. With respect to labor market behavior, annual labor supply for individuals who diversify their assets fall by

41 hours and about 9 individuals drop out of the labor force. Results using planned retirement age as a dependent variable shows increase in expected retirement age, indicating intertemporal substitution of labor supply.

DEDICATION

To my family, with love and gratitude.

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Chapter I

Effect of Income Tax on Charitable Contributions

Abstract: This study provides new estimates of price and income elasticities of charitable contributions which reveal substantial differences in giving patterns across different income groups. The paper develops an intertemporal model of giving which predicts that lowering current income taxes can induce substitution away from current giving towards giving in future periods. Cragg's Generalized Tobit model applied to Consumer Expenditure data from 1997–2006 provides estimates of income and price elasticities conditioned upon contribution, which range between 0.17 to 0.81 and -0.50 to -1.16 respectively. The unconditional income and price elasticities vary from 0.06 to 0.36 and -0.58 to -2.25 respectively. Empirical analysis shows substantial evidence of intertemporal substitution, implying that if the difference between future and current prices increase by 1 percent, current period giving can increase by

0.8 percent.

1.2 Introduction

According to "Giving USA" 2007, charitable giving in the U.S in 2007 was $306 billion, or about 1.8 percent of gross domestic product, of which 82.3 percent was in the form of individual contributions. Individual charitable giving is an important source of financing for higher education, research, health care and various religious and political activities. One major factor driving charitable gifts is the income tax treatment of personal giving, as besides affecting the disposable income, it also alters the price of giving that an individual faces.[1] While there are numerous studies related to elasticity measures of contributions and effect of tax code changes, there are hardly any estimates for the recent time period (since the 1990's) in the literature.[2] Most prior studies use IRS tax data for empirical analysis which concentrates only on itemizers and hence suffers from sample selection bias. To overcome this limitation, this study builds a pooled cross-section using Consumer Expenditure household survey data which provide information on contribution amounts besides other demographic characteristics. Several empirical studies concentrate on estimates conditional upon positive amount of contribution and often ignore that a price change could also instigate a response amongst non-contributors. This paper, utilizes information of both contributors and non-contributors and uses a Generalized Tobit model (Cragg, 1971)

[1] According to IRS Web page (http://www.irs.gov/charities/charitable/), the exempt purposes set forth in section 501(c)(3) are charitable, religious, educational, scientific, literary, testing for public safety, fostering national or international amateur sports competition, and preventing cruelty to children or animals. The term charitable is used in its generally accepted legal sense and includes relief of the poor, the distressed, or the underprivileged; advancement of religion; advancement of education or science; erecting or maintaining public buildings, monuments, or works; lessening the burdens of government; lessening neighborhood tensions; eliminating prejudice and discrimination; defending human and civil rights secured by law; and combating community deterioration and juvenile delinquency.

[2] A recent 2008 NBER working paper by Bakija and Heim finds elasticity measures using IRS tax file data for 1979–2005.

to obtain both conditional as well as unconditional elasticities of contribution. In the presence of limited dependent variable, this model also allows for separate stochastic process for probability and amount of giving. Estimates reveal that the overall conditional price elasticity is -0.50 (indicating a decline in 0.50 percent if price rises by 1 percent) and the income elasticity is 0.25. The unconditional estimates show that "giving" is price elastic, as the price elasticity measure is -1.3. Measures of elasticities differ widely by income categories and the lower income groups are more responsive to price changes and less responsive to income changes, compared to the higher income groups.

Lowering income taxes has two effects on charitable contributions—an income effect and a price effect. The income effect of lower taxes imply higher disposable income which can lead to higher donation. However, lowering taxes also affects the price of charitable giving as deductibility of charitable giving in determining taxable income makes the price of giving less than one.[3] Thus, following simple demand theory, lowering taxes raise the price of giving which is likely to reduce the volume of contributions. These mechanisms imply that a change in taxes will have two opposing effects on charitable giving, a positive income effect and a negative price effect. The theoretical model can indicate the direction of these two effects, but only empirical analysis can provide values to determine which effect dominates— income effect or price effect.

While the measures of elasticity help in understanding the magnitude of change in charitable giving, the analysis is incomplete without accounting for factors which can cause shifts in demand for giving, most importantly, the role of future tax rates. Most decisions are made in a lifetime context and hence it is important that while

[3]For example if a person falls under 30 percent bracket and contributes a \$1 towards charity, then his price of giving (or the opportunity cost) is $(1 - 0.30)$ =70cents.

analyzing how much an individual gives, both current and future tax rates are considered. Also, it is important to understand if higher tax rates raise the overall level of giving or if households just substitute giving by contributing more in periods of higher taxes and lowering it when tax rates fall. This paper builds a simple two-period model of consumption and giving to illustrate how income taxes affect contributions and shows that apart from the current tax rates, expectations about future taxes also affect current giving resulting in an intertemporal substitution of giving. Using exogenous changes in tax rates between 2001 and 2006 due to tax intervention of 2001 as a tool, the study finds that a relative increase in future tax rates by 1 percent can result in an increase in current giving by upto 0.86 percent. The following sections elaborate the effect of current and future tax rates with the help of theoretical and empirical models.

1.3 Literature Review

One of the earliest studies in the field of charitable giving and income taxes was done by Feldstein and Taylor (1976) where they found the price and income elasticities of giving based upon treasury Tax files of 1962 and 1970. Using a simple linear regression model with log specification they found price elasticities range between -1.25 to -1.4 and income elasticities range between 0.76 and 0.79, across different income categories. Separate price elasticities for different income classes show that elasticity increases at the highest income level and over an income of \$20,000 it is greater than 1. Similar analysis was done by Feldstein and Clotfelter using data collected from the Federal Reserve Board in 1963, their price and income elasticity estimates were -1.15 and 0.87.

Watson (1984) did the first analytical study on how timing of charitable con-

tributions gets affected over a life cycle. Important results of the theoretical model are (i) a decrease in income tax rate causes an increase in charitable bequests and (ii) lowering the income tax rate has both an income and substitution effect on charitable givings and if the substitution effect dominates, charitable giving may be delayed to the end of life. While this study presents useful theoretical implications, it lacked empirical evidence.

In a later study Randolph (1995) also addressed the same subject of timing of charitable giving and argues that the tax price effect differs for permanent and transitory income. The marginal price effect is higher for transitory income compared to permanent income which determines the current and future price of giving. These intertemporal issues are emprically addressed using 1979–88 panel of individual tax returns and results show wide variations between permanent and transitory elasticities. For the price elasticities, the permanent elasticity is -0.08 and the transitory elasticity is -2.27. This study indicates that intertemporal income variations alongwith marginal tax rates play a major role in influencing the way people plan their lifetime contributions.

The issue of separating transitory and permanent income and price effects is addressed by Auten et al. (2002) using the method of decomposing the sample variances and covariances into transitory and persistent components. Decomposing the temporary and persistent shocks based upon the argument that transitory shocks affect both variance and autocovariance of growth rate of income, whereas permanent shocks affect only the variance of the growth rate, their technique yields results different from those of Randolph (1995). Estimates using a 15 year panel of Internal Revenue Service data shows that the persistent price elasticity ranges between -0.79 and -1.26 and the transitory counterpart ranges between -0.4 and -0.6. The main conclusion of their research is that persistent shocks have a higher impact compared

to transitory shocks and it is important to consider this factor before implementing any tax reform.

The Internal Revenue Service's data source is most often used in empirical studies on contributions as it is the only source which provides direct information on itemizers. However, it lacks details of household/individual characteristics which are also key determinants of "giving" decisions. There are few studies which have used the details of household characteristics in determining level of contributions and one such study is by Reece and Zeischang (1985) using the Consumer Expenditure survey dataset (CEX). Computing a schedule specifying levels of the marginal price and virtual income for each levels of contribution based upon the deductibility and tax rate schedules, they build a likelihood function for contributions conditional upon income, price and household characteristics. The tax schedule elasticities from Tobit model indicate a decline in giving of about 0.15 percent for every one percent increase in tax rates and the income elasticity using virtual income net of noncharitable deductions is 1.43. In contrast to prior research, their results indicate that charitable giving is a luxury good which responds more to income than to prices.

Another study which uses CEX dataset is by Bradley et al. (2005). Using data from 1982–84 CEX they find that the price elasticity estimates using several semi-parametric methods ranges between -0.48 and -0.78 and are very large relative to parametric methods. They also show that maximum likelihood Tobit estimates are inappropriate and likely to yield biased and inconsistent estimates in absence of normality of disturbances.

1.4 Theoretical Model

This section of the paper develops a two-period two-good economic model of "giving" using a general as well as utility functions. Tax rates influence charitable giving because the price of charitable contributions may not be unity due to deductibility of contributions from taxable income. That is, for individuals who itemize deductions, the price of giving is less than one. Assuming that individuals care about lifetime giving, individuals are likely to substitute giving across time periods based upon the price of giving they face in each period. The following simple theoretical model helps in understanding the results of intertemporal substitution by considering the effect of current and future tax rates on giving.

1.4.1 General two-period model of giving

In this simple two-period model, an individual works and saves in the first period and lives off his savings in the second period. There are no bequests as savings are exhausted in the second period, i.e., the *transversality condition* holds. The first-period budget constraint is

$$y(1-\tau_1) = pc_1 + (1-\tau_1)g_1 + (1-\tau_1)s, \tag{1.1}$$

where y represents the income individual earns in period 1, p denotes the price for (an all composite) consumption good, c_1; τ_1 is the marginal income tax rate and (1-τ_1) is the price of giving g in period 1. In period 1, individuals work and save their earned income in tax deferred accounts (e.g. IRAs and 401(k)); therefore, (1-τ_1)s is the tax deductible contribution made to savings in period 1.[4]

[4]Most individuals prefer saving in tax deferred accounts as (i) it avoids double taxation, (ii) allows for tax deduction in the current period and (iii) Most companies or institutions have a

Assuming no bequest motive, the second period budget constraint is

$$(1-\tau_2)(1+r)s = pc_2 + (1-\tau_2)g_2, \tag{1.2}$$

where consumption in the second-period is given by c_2; τ_2 is the second-period marginal income tax rate and $(1-\tau_2)$ is the price of giving g in period 2. The first period savings s grows at an interest rate of $(1+r)$ and is the only source of income in the second period. The agent's utility function which is assumed to be continuous, bounded and concave are given by $U(c_1, g_1)$ in the first period and $U(c_2, g_2)$ in the second period. Furthermore, assuming that prefernces are time separable, the two-period constraint optimization problem is given by

$$\begin{aligned}\mathcal{L} = U(c_1, g_1) + \frac{1}{1+\rho}U(c_2, g_2) + \\ \lambda[(y(1-\tau_1)) - pc_1 - (1-\tau_1)g_1 - (1-\tau_1)s + \\ (1-\tau_2)(1+r)s - pc_2 - (1-\tau_2)g_2],\end{aligned} \tag{1.3}$$

where $\frac{1}{1+\rho}$ and $\rho > 0$, is the time preference factor. This assumption simple means that all else equal, the individual prefers consumption today over consumption next period.

The marginal utilities of the two periods with respect to consumption and giving are

$$\frac{\partial \mathcal{L}}{\partial c_1} = U_{c_1}(c_1, g_1) = \lambda p, \tag{1.4}$$

$$\frac{\partial \mathcal{L}}{\partial g_1} = U_{g_1}(c_1, g_1) = \lambda(1-\tau_1), \tag{1.5}$$

$$\frac{\partial \mathcal{L}}{\partial c_2} = U_{c_2}(c_2, g_2) = (1+\rho)\lambda p \tag{1.6}$$

perovision to invest in IRAs directly which makes investing easier. According to some statistics reported in the BLS website, approximately 60% households have investment in retirement accounts (www.bls.gov/opub/cwc/cm20050114ar01p1.htm).

and

$$\frac{\partial \mathcal{L}}{\partial g_2} = U_{g_2}(c_2, g_2) \quad = \quad (1+\rho)\lambda(1-\tau_2) \tag{1.7}$$

which shows that the agent's marginal utility of any good, given by $U_{(\cdot)}$, equals the market value of that good. From the first order conditions we can find the intertemporal substitution results for consumption and charitable giving across two periods, which are

$$\frac{U_{c_1}(c_1, g_1)}{U_{c_2}(c_2, g_2)} \quad = \quad \frac{1}{1+\rho} \qquad \text{and} \tag{1.8}$$

$$\frac{U_{g_1}(c_1, g_1)}{U_{g_2}(c_2, g_2)} \quad = \quad \frac{(1-\tau_1)}{(1+\rho)(1-\tau_2)}. \tag{1.9}$$

The left hand side of (1.8) and (1.9) is the subjective marginal rate of substitution (MRS) and the right hand side is the market price ratio. The MRS is measured as the ratio of the discounted present value of marginal utility of an extra unit of second period consumption, $(1+\rho)U_{c_2}$, and the value of one unit less of first period consumption, U_{c_1}. Hence (1.8) shows the gain in present value of marginal utility by moving one unit of consumption from period 1 to 2. Similar results are obtained with respect to "giving" where the MRS of giving equals the price ratio given by the tax rates across two time periods. Simple comparative statics on (1.9) shows

$$\frac{\partial \left(U_{g_1}/U_{g_2}\right)}{(\partial \tau_1)} \quad = \quad -1 \underbrace{\left(\frac{1}{(1+\rho)\,(1-\tau_2)}\right)}_{\geq 0} \leq 0, \tag{1.10}$$

which implies that as first period tax rates decrease, marginal utility of giving in the current period increases relative to the marginal utility in the second period. This result establishes that as current tax rates decrease, individuals tend to substitute away from giving and donate less in the current period relative to the future period. Differentiation with respect to future tax rates gives

$$\frac{\partial(U_{g_1}/U_{g_2})}{\partial\tau_2} = \underbrace{(1-\tau_1)}_{\geq 0}\underbrace{\left(-1\left[(1+\rho)(1-\tau_2)\right]^{-2}(-1)\right)}_{\geq 0} \geq 0. \tag{1.11}$$

indicating that if future tax rates decrease, the marginal utility of giving in the current period decreases relative to period 2 and individual's will have higher incentive to give to charities in the current period and donate less in the future period. Equations (1.10) and (1.11) therefore establish the results for intertemporal subsititution of giving.

1.4.2 Specific Utility Function: Cobb Douglas Model

While the general model is a simple analysis of how giving varies with current and future tax rates, attaching particular functional form to the model will allow us to specify the demand function for giving and further help in identifying the effect of price and income on giving. The following analysis using a two-good, two-period Cobb-Douglas utility function assumes future tax rates are known and is solved using the backward recursion technique. The lifetime utility function for the same is

$$U = c_1^{\alpha} g_1^{\beta} + \frac{1}{1+\rho}\left(c_2^{\alpha} g_2^{\beta}\right). \tag{1.12}$$

In order to break down the dynamic optimization problem into simpler subproblems, the Bellman equation can be written as

$$\max V = \left[U(c_1^{\alpha} g_1^{\beta})\right] + \left[\frac{1}{1+\rho} V_{i,t+1}(s_{t+1})\right], \tag{1.13}$$

where the value function V is solved using backward induction. In the last period, the maximizing function is trivial (as all wealth is consumed) and the value function corresponds to the indirect utility function. We can substitute the policy functions in the Bellman equations and compute the optimization results for the first period. Lagrange for the maximization problem is

$$\mathcal{L}_1 = c_2^{\alpha} g_2^{\beta} + \lambda_2(1-\tau_2)(1+r)s - pc_2 - (1-\tau_2)g_2. \tag{1.14}$$

and the first-order conditions from maximizing (1.14) are;

$$\frac{\partial \mathcal{L}_1}{\partial c_2} = \alpha c_2^{\alpha-1} g_2^{\beta} - \lambda_2 p = 0, \tag{1.15}$$

$$\frac{\partial \mathcal{L}_1}{\partial g_2} = \beta c_2^{\alpha} g_2^{\beta-1} - \lambda_2(1-\tau_2) = 0 \qquad \text{and} \tag{1.16}$$

$$\frac{\partial \mathcal{L}_1}{\partial \lambda_2} = (1-\tau_2)(1+r)s - pc_2 - (1-\tau_2)g_2 = 0. \tag{1.17}$$

Using (1.15), (1.16) and (1.17) we can solve for g_2 and c_2 as a function of the model parameters and savings, yielding

$$g_2 = \frac{\beta}{\alpha+\beta}(1+r)s \qquad \text{and} \tag{1.18}$$

$$c_2 = \frac{\alpha}{\alpha+\beta}\frac{1}{p}(1-\tau_2)(1+r)s. \tag{1.19}$$

which shows that 'consumption' and 'giving' are functions of share of the goods, prices and savings (or second period income). The main results from the second period optimization function given in (1.18) and (1.19) can now be used to determine current period consumption and giving. Replacing c_2 and g_2 obtained from equations (1.18) and (1.19) in equation (1.14) gives the present discounted value of utility as

$$\begin{aligned}\mathcal{L}_2 &= c_1^{\alpha} g_1^{\beta} + \frac{1}{1+\rho}\left(\left[\left(\frac{\alpha}{\alpha+\beta}\right)\frac{1}{p}(1-\tau_2)(1+r)s\right]^{\alpha}\left[\left(\frac{\beta}{\alpha+\beta}\right)(1+r)s\right]^{\beta}\right) \\ &\quad +\lambda_1\left(y(1-\tau_1) - pc_1 - (1-\tau_1)g_1 - (1-\tau_1)s\right).\end{aligned} \tag{1.20}$$

From the first-order conditions we obtain

$$\frac{\partial \mathcal{L}_2}{\partial c_1} = \alpha c_1^{\alpha-1} g_1^{\beta} - \lambda_1 p, \tag{1.21}$$

$$\frac{\partial \mathcal{L}_2}{\partial g_1} = \beta c_1^{\alpha} g_1^{\beta-1} - \lambda_1(1-\tau_1), \tag{1.22}$$

and

$$\begin{aligned}\frac{\partial \mathcal{L}_2}{\partial s} &= \frac{1}{1+\rho}\left[\left(\frac{\alpha}{\alpha+\beta}\left(\frac{1-\tau_2}{p}\right)\right)^{\alpha}\left(\frac{\beta}{\alpha+\beta}\right)^{\beta}(1+r)^{\alpha+\beta}(\alpha+\beta)s^{\alpha+\beta-1}\right] \\ &+ \lambda_1(1-\tau_1).\end{aligned} \tag{1.23}$$

Solving for s gives

$$s = \frac{Ny}{D+N}, \tag{1.24}$$

where

$$N = \left[\left(\beta\left(\frac{\alpha}{\alpha+\beta}\right)^{\alpha}\left(\frac{1-\tau_1}{p}\right)^{\alpha}\left(\frac{\beta}{\alpha+\beta}\right)^{\beta-1}\right)\right]^{\frac{1}{\alpha+\beta-1}} \tag{1.25}$$

and

$$D = \left[\frac{1}{1+\rho} \left(\left(\frac{\alpha}{\alpha+\beta} \left(\frac{1-\tau_2}{p} \right) \right)^{\alpha} \left(\frac{\beta}{\alpha+\beta} \right)^{\beta} (1+r)^{\alpha+\beta} (\alpha+\beta) \right) \right]^{\frac{1}{\alpha+\beta-1}}. \quad (1.26)$$

As can be seen from (1.25) and (1.26), the savings function s is expressed in terms of the parameters of the model, namely current and future tax rates, shares of consumption and giving and the labor income earned in the first period.

From the first-order conditions we can express consumption and giving as a function of savings, i.e.,

$$c_1 = \frac{\alpha}{(\alpha+\beta)}(y-s) \quad (1.27)$$

and

$$g_1 = \frac{\beta}{(\alpha+\beta)}(y-s), \quad (1.28)$$

which in terms of model parameters implies

$$g_1 = \frac{\beta}{(\alpha+\beta)} \left(y - \left(\frac{Ny}{D+N} \right) \right). \quad (1.29)$$

Since g_1 is the variable of interest, differentiating g_1 with respect to y, τ_1 and τ_2 yields

$$\frac{\partial g_1}{\partial y} \geq 0, \quad (1.30)$$

which shows that "giving" is a normal good or, an increase in income would result in an increase in the amount of giving. Differentiating with respect to τ_1 gives

$$\frac{\partial g_1}{\partial \tau_1} \geq 0, \quad (1.31)$$

i.e., as current tax rates increase, the price of giving falls making it cheaper to contribute in the current period. We also find from the giving function that

$$\frac{\partial g_1}{\partial \tau_2} \leq 0, \tag{1.32}$$

or an increase in future tax rates will have a negative effect on current amount of giving. If individuals know that in future tax rates are going to increase, then they will give less in the current period and probably substitute towards more giving in the future. In the following sections these results are analysed in an empirical framework.

1.5 Empirical Procedure

Most of the literature in charitable giving have used OLS loglinear models to obtain estimates of the price and income elasticities of contributions to charities. Table 1 shows the variation in the estimates using OLS models. As an alternative to linear regression models few studies have used Tobit models (e.g., Bradley et al.(2005)). A major drawback of Tobit model (apart from the stochastic nature being very restrictive) is that it restricts the censoring mechanism to be from the same model as that generating the outcome variable.

In this paper, a double-hurdle model or a Generalized Tobit model (Cragg, 1971) is used to analyse the effect of income and tax price on contributions towards charity. The double-hurdle model, considers that households make two decisions with regard to spending for a particular cause, each of which can be determined by a different set of explanatory variables. In order to observe a positive level of contribution, two separate hurdles must be passed. A different latent variable is used to model each decision process, with a probit model to determine participation

and a truncated regression model to determine the level of contribution.[5] The Cragg model, by allowing for separate stochastic processes for the participation and spending decisions makes the model less restrictive compared to the tobit model.

The following is a general formulation of the double hurdle model, in which the participation equation is given by

$$d_t^* = z_t' + \eta_t, \tag{1.33}$$

and the spending equation is

$$y_t^* = x_t'\beta + \epsilon_t. \tag{1.34}$$

In (1.33) d_t^* is a latent participation indicator, y_t^* is latent "giving", z_t and x_t are vectors of explanatory variables, and α and β are conformable vectors of parameters. The error terms η_t and ϵ_t are independentally and normally distributed such that η_t and ϵ_t $\sim$N(0,σ_t). The observed giving relates to the latent giving (y_t^*) such that

$$\begin{aligned} y_t &= y_t^* \text{ if } d_t^* > 0 \\ &= 0 \text{ otherwise.} \end{aligned}$$

It is important to note that the double hurdle model is built upon the normality assumption of the error terms η_t and ϵ_t. The double hurdle model is a more general form of the Tobit model and it reduces to a Tobit model when $z_t = x_t$ and $\alpha = \beta/\sigma_t$. For the generalized double-hurdle model, the probability of observing positive consumption is given by

$$\Pr(y_t > 0) = \Phi(z_t{}'\alpha). \tag{1.35}$$

[5]Since the dependent variable is in logarithms, the coefficient estimates from a truncated regression model is the same as linear regression model

For the linear regression model with censoring or truncation from below at zero, the conditional means are given by

$$\begin{aligned} E[y_t|x_t, y_t > 0] &= E(x'\beta_t|x'\beta_t + \epsilon_t > 0) + E(\epsilon_t|x'\beta_t + \epsilon_t > 0) \\ &= x'\beta_t + E(\epsilon_t|\epsilon_t > -x'\beta_t). \end{aligned} \tag{1.36}$$

The unconditional mean which measures overall average contribution is obtained from the double hurdle model and is given by

$$E(y) = \Pr(y_t > 0)E(y_t|y_t > 0). \tag{1.37}$$

The marginal impact for x_{tj} on unconditional mean is given by

$$\frac{\partial E(y_t)}{\partial x_{tj}} = E(y)\phi(z_t\alpha)\alpha_j + \Phi(z_t\alpha)\frac{\partial E(y_t|y_t > 0)}{\partial x_t j}, \tag{1.38}$$

where

$$\frac{\partial \Phi(z_t\alpha)}{\partial x_{tj}} = \phi(z_t\alpha)z_j \tag{1.39}$$

and $\frac{\partial E(y_t|y_t>0)}{\partial x_t j}$ is the marginal effect obtained from the truncated regression.

The probability of participation (or decision to give a positive amount) is given by a probit model which is a function of individual's income, tax price, age, marital status, sex, and work status, i.e.,

$$Pr(y > 0) = \Phi(\textit{income, tax price,age, marital status, number of dependents, race, sex, work status and year effects}).$$

and similarly the amount of contribution given by a simple linear regression model is a function of the same variables, but since the interest is in finding the elasticities

of price and income, the dependent variable contributions and independent variables income and price are measured in logarithms.[6] Thus, the function for elasticity of giving is given by

log (contributions)= *f(log income, log tax price,age, marital status, number of dependents, race, sex, work status and year effects).*

The following section discusses the data used for empirical analysis, followed by the results from the analysis.

1.6 Data

The data used in this research are from 1997–2006 Consumer Expenditure (CEX) interview survey. The CEX is a rotating panel survey that may begin in any month of the year for a given household. The survey is done quarterly and each household remains in the sample for five interviews and then drops out of the survey. Each quarter 20 percent of the sample is replaced with new set of households.[7] The advantage of CEX dataset over tax files from IRS is that it contains information about annual amounts of contribution, types of contributions (religious, political, educational), demographic attributes like age, educational level, work status, income by sources, race and location. Most importantly, unlike IRS tax files, it contains information about all contributors, not just individuals who itemize their deductions

[6]Since the dependent variable is "log contributions", procedures using a truncated regression model yield the same result as OLS

[7]A rotating panel survey helps reducing the effects of attrition and non-response as well as panel conditioning. Panel conditioning, panel bias, re-interview effects, and time-in-sample bias are synonymously used to describe the phenomenon where repeated questioning of panel members affects their survey responses. It is the reactive effect of prior interviews on current responses. Rotating panel surveys allows respondents who have been in the sample the longest to be replaced with more "inexperienced" and active respondents after a predetermined number of interviews. The temporal overlap of old and new samples facilitates studies of the effects of panel conditioning.

which helps in avoiding sample selection bias.

The sample contains both single–person households as well as married couples. Annual income is calculated by combining all sources of income (both earned as well as non-earned income) and both working as well as retired individuals are kept in the sample. Contributions are defined as sum of giving to educational, social, religious, church and other miscellaneous contributions. Since political contributions are not tax deductible, donations to political organizations have not been considered.

1.6.1 Data Diagnostics

The data collection and reporting of the "contributions" variable has undergone some important changes between 1997 and 2006. Till year 2000 households were asked annual values of income and contributions, i.e., their contribution amount in the past 12 months. Since, questions related to contributions were asked only in the fifth interview, for years 1997-2000, only fifth quarter observation of each household has been included in the dataset. Post 2000, the "contributions" data is collected on a quarterly basis, i.e., each interview households were asked about their contribution in the past three months. A new variable which stated the exact month of contribution was also added to the dataset. Since annual income values are reported and taxes are paid on an annual basis it was important to convert all the variables into their annual values. After 2000, the second interview contributions has been annualized by multiplying the contributions by 4 and the fifth interview contributions have been annualized by adding up all the actual contributions reported in all the past interviews. The dataset was constructed by pooling data from the second interview and fifth interview observations for years after 2000, and including only the fifth interview observation for years before 2001.

However, this method of annualizing quarterly contribution, could give rise to biased results if the actual level of contribution is affected by the month/quarter of contribution. In general, there is a popular belief that most contribution decisions are taken during the end of the year, as donations towards charity helps reducing annual tax burden. Hence, if the second interview reports contributions made during the last quarter of the year, annualizing the data by multiplying the quarterly observation by 4 will overestimate the annual contribution and hence produce biased results. In order to check the possibility of such bias, simple linear regression for dataset before and after 2000, was run to see if the month of contribution has any effect on the ratio of contribution to annual income. The results reveal no significant variation in contribution by month.[8]

Another test was carried on post 2000 data to see if the quarterly contributions reported in the second interview is affected by the income level, contributions in other interviews and year fixed effects. The regression results (see Appendix) show that the contributions made in each quarter are affected by other quarter's contribution and income. This implies mutiplying second interview contribution by 4 and ignoring contribution values from other interviews could lead to some bias. Based on these findings, empirical analysis has been performed on both pooled data (from second and fifth interview) as well as only fifth interview data. Results using only fifth interview data, do not reveal any substantial difference.[9]

[8]The OLS regression and the T-tests results are reported in the Appendix.

[9]Another problem imposed by the dataset was assigning contribution and income to a particular year. First let's consider the case prior to 2001. A household whose second interview occurs in the month of June, the reported annual values of income and contribution are part of both current and past year. In my analysis I have considered a basic rule of thumb and considered any interviews before the month of June as part of the prior year and interviews after June are assigned to the current year. Interviews after 2000 pose a lesser problem as in this case we know each quarter's contribution amount and we also know the month of contribution. So any interview which occurred before the month of February (in that case the last 3 months contribution would have been mostly made in the last year) is assigned to the prior year and interviews after February are assigned to the current year.

1.6.2 Price and Income Variables

The two most important variable in the analysis are price and income. As discussed in the previous section, the tax price for contributors who are non-itemizers is 1 and for itemizers it is

$$P = 1 - (\delta^* \text{marginal tax rate} + \gamma^* \text{state marginal tax rate})$$

where $\delta = 1$ if itemized federal taxes, or 0 otherwise and

$\gamma = 1$ if state allows itemizing, or 0 otherwise.

Although the CEX collects details about tax payments by households, it provides no information on marginal tax rates or itemizers. The marginal tax rates and information on itemized deductions are therefore obtained for each year using the National Bureau of Economic Research (NBER's) tax simulator (TAXSIM) program. TAXSIM refers to a collection of programs and data sets implementing a micro simulation model of U.S. federal and state income tax systems. It takes into account a wide range of factors including wage income, pensions, transfer payments, dependents, mortgage payments, tax year, non-earned income, etc. Based upon 22 different variables available from CEX, TAXSIM provides information of federal and state marginal tax rates, federal and state itemized amounts among other things.

Current price is endogenous as a substantially large charitable contribution, can push the taxpayer to a lower bracket. To reduce this, the marginal tax rate of the "first dollar tax rate" is used, i.e., the tax rate is imputed assuming there had been no charitable contributions. Similarly, disposable income is measured as adjusted gross income minus the tax that would have been paid if no contributions had been made. The correlation between independent variables price and income, can give rise to multicorrelation, however the low standard errors on the estimates show that the estimates are not noisy.

1.6.3 Descriptive Statistics

The total (1997–2006) pooled sample from second and fifth quarter is 127,268 after accounting for outliers in the dataset. About 46 percent of the sample population contributes, and 22 percent itemize their deduction on federal taxes. Only 14 percent of the entire sample can claim deductions on state taxes. The lower number of contributors and itemizers results in large number of dependent variables with zero amount of giving and price of giving as 1. These values are lower than those found in studies using IRS tax files where approximately 30 percent of the population itemizes. The lower number of itemizers in the CES sample possibly owes to the fact that it oversamples lower income groups. The average household income (converted to 2006 dollars) is about $42,000 and the average annual contribution is $969. The amount of giving conditional upon the fact that the household contributes some amount, is $2,100. The average contributing household in USA gave $1,620, or 3.1 percent of household income according to the statistics reported by "Giving and Volunteering in the United States 2001". These statistic included gifts of money, property, stocks, and other items of value.

Figure 1.1 shows the probability of contribution across different income groups. The higher income groups are more likely to contribute compared to the lower group, though for income groups above $100,000 the probability of contribution does not vary much. The average annual conditional contribution, however, varies a lot by income categories (shown in Figure 1.2). While, income groups below $25,000 contribute about $700 annually, income groups above $250,000 donate as much as $6,000 annually. Table 2 reports the other details of summary statistics.

1.7 Empirical Results

The main results of the analysis, i.e., the probability and elasticity of giving are given by the probit and linear regression models respectively. Same set of variables are used in both participation and giving equations. With respect to specification, different functional specifications including the squares and cubes of price and income yielded almost same parameter estimates and statistical significance. The parameter estimates from both probit and truncated regression models are shown in Table 3.[10] For the truncated regression, the dependent variable is log of contributions; log specifications are used for price and income as well and for the probit model, levels of income and price are used. One of the chief characteristics of Cragg's model is that it allows effect of coefficient estimates to vary across the probit model and the linear regression model. The idea that the propensity to contribute and the amount of contribution are two separate decision making processes is evident from the fact that some variables have significant and opposite effects in the participation and giving equation. While whites have higher probability of contributing, they contribute a lower amount compared to blacks when they contribute. Even though males do not have any significant effect on the propensity to contribute, their conditional contributions are greater compared to females. Amongst other variables, married individuals are more likely to give, as well as give a higher amount compared to singles. Individuals tend to give a higher amount as they age, evidence of this is also found in the sociology literature which indicate that older individuals are more religious and give more to churches and other religious organizations. Finally, the impact of price and income are consistently negative and positive, respectively, across both probit and OLS model. The price of giving has a stronger effect on the probability of giving

[10] A separate analysis using only fifth quarter data was also done. Results are not much different from those using the pooled data from both second and fifth quarter.

compared to the income level of households. The marginal effects from probit regression imply an increase in price by one percent would result in a reduction in giving by 21 percent, whereas an increase in income by one perecnt would lead to an increase in giving by 11 percent.

1.7.1 Elasticity Estimates

The elasticities of giving, both at conditional and unconditional level are presented in tables 4 and 5. The main advantage of using Cragg's model is it allows estimation of unconditional elasticities or a measure of elasticity of the overall population. The price effect on amount of giving indicates a 1% increase in price results in a decrease of conditional level of giving by 0.5% indicating that giving is price inelastic. The positive income effect implies a percentage increase in income results in conditional giving to increase by 0.25%. Thus the empirical results suggests that substitution effect dominates the income effect,i.e., a reduction in tax rates would result in lower amount of giving. The unconditional elasticities are obtained (from equation 1.38) and are -1.33 and 0.11 for price and income respectively. Standard errors have been computed using bootstrapping method and results suggest that the estimates are significant.[11] The strong negative effect of price on probability of giving makes the magnitude of unconditional price elasticity greater compared to the conditional elasticity. On the other hand a weak effect of income on probability of giving makes the unconditional income elasticities lower in magnitude compared to the conditional estimate. The low income elasticities again suggest that giving is not likely to increase much as income increases or decreases or rather economic booms and recessions should not have a huge effect on giving. On the other hand, tax policy

[11] Results have been bootstrapped by repeting the empirical procedure 100 times. Based upon the mean coefficient estimates the standard error has been computed

interventions through its effect on price of giving is likely to have a strong effect on amount of giving.

Placing the results in the context of previous work on this subject, the unconditional price elastcity seems quite close as most earlier studies have put the estimates in the range of -1.09 and -1.40. Bradley et al. use the CEX dataset and estimates from semi–parameteric and censored 2SLS models yield price elaticities in the range of -0.48 to -1.36 and income elasticities in the range of 0.36 to 0.54. Using IRS panel data Auten et al. find that income elasticity ranges between 0.40 to 0.87 and price estimates are between -0.79 and -1.26. The estimates from ths study are quite close to results obtained from IRS panel data and confirms findings of most past studies indicating that giving is less of a luxury good and is more responsive to price than income.[12]

1.7.2 Parameter Heterogeneity across Income Classes

The effect on contributions by different income categories are shown in Tables 4 and 5. There are three broad categories considered: below income level \$40,000, \$40,000 to \$100,000 and above \$100,000. The results show substantial variation by income level. A separate equation was estimated by each income class, thus allowing not only the price and income elasticities, but effect of all other control variables to vary by income class. The estimated price elasticities are very high for the lowest income groups and quite low for the highest income group. All estimates are negative and significant at 5% level of confidence. In all the estimates the unconditional price elasticities are greater in magnitude compared to the conditional estimates. While

[12]Results using weights from Consumer Expenditure Survey are provided in table 1.11. The results using log of conditional amount of contribution as the dependent variable are quite similar to the unweighted regression estimates. By applying these weights the sample estimates have been convereted to population estimates.

the conditional price elasticities vary between -1.16 and 0.01, the unconditional estimates are between -2.25 and -0.58. The lower elasticity of giving as price increases indicates that higher income groups are less responsive to changes in price compared to lower income categories. The income elasticity estimates, on the other hand, indicate that higher income groups are more responsive to income changes, as the income elasticity estimates rise with income levels. The conditional estimates for the lowest (less than $40,000) to highest (greater than $100,000) are between 0.25 and 0.81 and the corresponding unconditional income elasticities are between 0.06 and 0.36. Previous studies have stated that income above $20,000 usually has absolute price elasticity greater than one. This study finds that though that is true for most income classes, the price elasticity can be lower than one in case of very high income classes. The income elasticity is increasing with income in case of both conditional and unconditional estimates, indicating that higher income groups are likely to donate more if their income increases, compared to lower income groups.

1.8 Effect of Future Tax Rates on Current Giving

Temporary fluctuations in tax rates can create transitory variations in the price of giving for an individual. These changes affect the relative price of current and future period giving and creates opportunity to reduce tax liability by retiming giving. Analysing charitable contributions by only considering current price changes fails to account for the fact that contributions can be timed so as to unalter the overall lifetime amount of giving. Both the two period model and Cobb-douglas model developed in this paper, state a negative relationship between future tax rates and current giving. While the theoretical predictions of the life cycle model has been straightforward, there hasn't been clear empirical support of the same. Literature on

intertemporal models of giving like Randolph (1995) shows transitory income has a greater price elasticity compared to permanent income. On the other hand, Auten et. al (2002) finds persistent shocks to income have a higher impact compared to transitory shocks, which results in having a lower transitory price elasticity compared to permanent price elasticity. This section exploits natural variations in marginal tax rates to empirically test how predicted tax rates affect the intertemporal substitution of giving.

The reduction in income tax rates due to the enactment of tax law change of 2001 (EGTRRA) resulted in substantial variation in marginal tax rates between 2001–06. As enacted, all of the changes made by this law sunset after December 31, 2010. As of January 1, 2011, the tax law will revert to where it was before this new legislation was enacted. Individual income tax rates will increase from the 10% – 35% spread that the new law will put in place to the 15% – 39.6% spread that existed before the enactment. An interesting finding of this study is that though the announced individual income tax rates reduced during this period, the marginal tax rates (which is computed after taking into account several factors that affect taxable income) increased which implies that the tax price decreased (refer to Figure 1.3), especially between the years 2003–05. This unexpected result is probably due to the fact that the tax law change introduced several kinds of tax credits alongwith reduced income tax rates which made a large segment of the population eligible for Alternative Minimum Tax (however, that is a question of future research). Therefore, even though the income tax rates reduces, the average marginal tax rates increased. The reduction in tax rates is phased out over the period of 2001–2010 (details given in Table 10) and all future changes in tax rates were made public by 2001. The NBER's tax simulator program allows calculation of future tax rates based upon income in the future period. For the future tax rates expected as of year 't', it is assumed

that taxpayers know about any reform that is enacted in year 't' and those that will take effect from year 't+1'. A further assumption is made that households did not anticipate any tax law changes enacted in year 't' at time period 't-1'. The CEX dataset used in this study lacks panel dimension, as households in the survey are followed at the most for five quarters. This nature of the survey allows limited scope for building income histories and predicting future income.[13] Instead, this paper takes a simple approach and assigns current income to future period by assuming that individuals expect no change in future income. Changes in expected price occur only due to changes in marginal tax rates.

The effect of changes on future tax rates on current giving can be interpreted as intertemporal substitution effect. In order to find this effect, the model estimated is

$$ln(charity) = \alpha + \beta_0 lnY + \beta_1 lnP + \beta_2(lnP_{t+1} - lnP_t) + \beta_3(lnP_t - lnP_{t-1}) + \beta_4 X + \epsilon, \tag{1.40}$$

where $(lnP_{t+1} - lnP_t)$ is difference between future price and current price and $(lnP_t - lnP_{t-1})$ is the difference between current and past price. β_1 measures the long run price elasticity of giving and X is a set of demographic characteristics. If tax price is expected to go up in the future, i.e., a positive price difference, individuals should be expected to give more in the current period and hence β_2 should be positive. $(\beta_1 + \beta_2)$ captures the combined effect on current period contributions due to changes in current price as well as anticipated future changes in price. $(\beta_1 + \beta_2 + \beta_3)$ takes into account the entire intertemporal substitution effect as it considers both past, current and future price effect.

Table 6 reports the price and income elasticity measures for the total sample

[13] See Appendix for methodology and results using predicted income.

of 49,370 contributors, who have positive amount of contribution. The current price elasticity of -0.46 is slightly lower compared to what was found when future effect is ignored. The coefficient estimate of 0.08, shows that a 1 percent expected increase in price in the future would result in an increase in giving by 0.08% in the current period. Though the coefficient estimates are noisy (standard error 0.20), the positive effect corroborates the theoretical predictions. The results also indicate that a rise in current prices will result in lowering current giving by 38%($-46\%+08\%$) due to the combined effect of higher current prices and an even higher expected price in the future. The probability estimates are positive and significant, indicating a 28 percent rise in probability of contribution in the current period due to future expected rise in prices. The past price effect is negative (again corroborating the theoretical predictions), implying that if the current prices are higher compared to the past prices, individuals will give less in the current period. The coefficient estimates is quite large, -0.19, however the effect is not significant. The unconditional estimates of 1.5 obtained using the probit and linear regression results shows a very high magnitude of intertemporal substitution in the population; households respond to a 1% increase in future prices by increasing their giving more than 1% in the current period. For the time period after 2001 (the period in which tax law changes were enacted) both the marginal effects (0.33) and conditional estimates (0.26) are stronger in magnitude, impying that the tax law change created higher incentive for intertemporal substitution.

1.8.1 Two Period Panel Datatset

Post 2000, since the dataset is created by pooling second and fifth interview observations of each household, it allows me to observe each consumer unit for two

successive time-periods. An alternative technique for testing the intertertemporal effect is adopted by creating a two period panel of households who are repeated both in second and fifth interview. The fifth interview observations are considered as current period and future prices are predicted based upon it. The past prices are obtained from the second interview observations. Out of a total sample of 52,601 households who are observed in both time-periods, 19,979 households give in the fifth quarter (current period). The new estimated equation is similar to (1.40) and is given by

$$ln(charity) = \alpha + \beta_1 lnY + \beta_2 lnP + \beta_3(lnP_t - lnP_{t-1}) + \beta_4(lnP_{t+1} - lnP_t) + \beta_5 X + \epsilon. \tag{1.41}$$

The coeefficient estimates of lead price shows a strong significant positive effect, i.e., a one percent change in future price would increase contribution by about 86 percent. The current price elasticity of -0.49 shows that individuals are more responsive to expected future prices than current price. Even, if the tax price rises due to fall in marginal tax rates in the current period, if households know that they are going to face a higher price in the next period, total contributions can rise due to high substitution effect. The probability of contribution also reveal an increase in giving by 50% due to expected increase in future price. The unconditional estimate (found by applying Cragg's model) of 2.9 also shows strong support of intertemporal substitution in the overall sample. However, unexpectedly the past price effect also shows a significant positive effect. If households face a higher price in the current period compared to the past, they should be expected to give lesser in the current period. The positive effect could be due to positive serial correlation of prices over time. If individuals expect to face a higher price as they move into the future, they will tend to give more to charity now before prices increase again in the next time

period.

The results using both full and restricted sample provide strong evidence that future prices do matter in deciding current period giving. A higher expected future price can significantly increase donations to charities even if households face a higher current price relative to past price. The tax law changes of 2001 provides a natural experiment to exploit the variations in tax rates and the NBER's tax simulator program facilitates prediction of future tax rates. Using these two tools to construct future prices, the study finds that individuals can change the timing of giving over their lifetime in order to take tax advantages.

1.9 Conclusion

This paper provides a detailed analysis of the effect of income tax and changes in the income tax laws on charitable giving. The rotating panel survey data for 1997–2006 provides estimates for price and income elasticity and the effect of tax law change in 2001 on total amount of contributions. The Cragg model provides estimates for both conditional and unconditional price and income elasticities. These estimates reveal that individuals are more responsive to price compared to income elasticities. This study also finds substantial difference bewteen conditional and unconditional elasticities with respect to different income categories. The unconditional income elasticity estimates for different income groups range between 0.06 and 0.36 while the price elasticties range from -2.2 to -0.58. The conditional elasticities range from 0.14 to 0.41 for income and -1.16 to 0.10 for price. The lower income group is most reponsive to changes in tax price and the highest income categories has the highest income elasticity.

One of the important findings of this study is the intertemporal substituton

effect of giving. Individual decisions to give are influenced not only by current prices but largely depend on future expected prices. If future tax rates are expected to increase by 1 percent, it can result in increasing giving by 0.86 percent. These intertemporal effects have serious implications for earnings of charitable organizations which primarily depend upon individual donations for its revenue. Due to a temporary fall in marginal tax rates, households will give less in the current period, not only because the current price rises but also because they will tend to substitute towards the future where they face a lower price. While reductions in income tax rates are important to encourage current consumption and investment, policies should be framed to reduce adverse effect on other sectors. For example, a policy which encourages reductions in income tax rates, alongwith an increase in deductibility rate of contributions or allowing tax benefits to non-itemizers can help maintain the volume of contributions in the economy.

1.10 Appendix

1.10.1 Comparative Statics

Comparative Statics from Cobb-Douglas model for finding how changes in current and future tax rates affect contributions.

$$g_1 = \frac{\beta}{(\alpha+\beta)}\left(y - \left(\frac{Ny}{D+N}\right)\right). \tag{1.42}$$

where

$$N = \left[\left(\beta\left(\frac{\alpha}{\alpha+\beta}\right)^{\alpha}\left(\frac{1-\tau_1}{p}\right)^{\alpha}\left(\frac{\beta}{\alpha+\beta}\right)^{\beta-1}\right)\right]^{\frac{1}{\alpha+\beta-1}} \tag{1.43}$$

and

$$D = \left[\frac{1}{1+\rho}\left(\left(\frac{\alpha}{\alpha+\beta}\left(\frac{1-\tau_2}{p}\right)\right)^{\alpha}\left(\frac{\beta}{\alpha+\beta}\right)^{\beta}(1+r)^{\alpha+\beta}(\alpha+\beta)\right)\right]^{\frac{1}{\alpha+\beta-1}}. \tag{1.44}$$

$$\begin{aligned}\frac{\partial g_1}{\partial \tau_1} = -\frac{\beta}{\alpha+\beta}\Bigg[&\left(\frac{y}{D+N}\right)\left(\frac{1}{\alpha+\beta-1}N^{\frac{2-\alpha-\beta}{\alpha+\beta-1}}\right)\left(-\alpha\left(\frac{1-\tau_1}{p}\right)^{\alpha-1}\right) \\ &+Ny\left(D+N\right)^{-1}\left(\frac{1}{\alpha+\beta-1}N^{\frac{2-\alpha-\beta}{\alpha+\beta-1}}\right)\left(-\alpha\left(\frac{1-\tau_1}{p}\right)^{\alpha-1}\right) \geq 0\end{aligned} \tag{1.45}$$

The term inside the bracket is less than zero. Hence we get an overall positive effect.

$$\frac{\partial g_1}{\partial \tau_2} = -\frac{\beta}{\alpha+\beta}\left[(Ny) - Ny\left(D+N\right)^{-1}\left(\frac{1}{\alpha+\beta-1}D^{\frac{2-\alpha-\beta}{\alpha+\beta-1}}\right)\left(-\alpha\left(\frac{1-\tau_1}{p}\right)^{\alpha-1}\right)\right] \leq 0$$

The term inside the bracket is greater than zero. Hence we get an overall positive effect.

1.10.2 Predicting Future Income

In this section, in order to find the effect of future tax rates is based upon predicted income. The procedure followed to predict income is similar to Carroll (1994) which estimates the age/income cross-sectional profiles by occupation, education and other household characteristics. The households' expected future income is expected to be given by the averaged observed income of households with similar education and occupation. The disposable labor income of individual i at age a in year t is given by

$$Y_{i,t} = Z_{i,t}B_{i,t} + V_{y,i,t}, \tag{1.46}$$

where $V_{y,i,t}$ is given by the idiosyncratic component of the household i in year t, and Z is given by

$$Z_{i,t} = [D_{i,t}, D_{i,t}a_{i,t}] \tag{1.47}$$

and D is the set of dummy variables indicating race, education, occupation and $a_{i,t}$ indicates the age of the household in year t. The above equation is estimated using OLS and from the predicted values of $y_i, t = Z_{i,t}b_y, t$, we can find the idiosyncratic component of income, i.e., $v_{y,i,t} = Y_{i,t} - y_i, t$. Assuming that equation (41) holds true in the future, household's expected future income can be represented as [14]

$$E_tY_{i,t+j} = E_tZ_{i,t+j}B_{y,t+j} + E_tV_{y,i,t+j}. \tag{1.48}$$

[14]Certian assumptions necessary for the equation to hold true are (1) $E_tB_{y,t+j} = B_{y,t}$, i.e., relationship between income and dummy variables do not change over time, (2) if the dummy variables never change over time, then expected income of an individual j years from now is given by $E_tZ_{i,t+j} = [D_{i,t}, D_{i,t}a_{i,t}]$.

The idiosyncratic term is assumed to consist of both transitory and permanent differences in income earning capacity and follows an AR(1) process given by

$$E_t v_{y,i,t+j} = \rho^j v_{y,i,t}. \tag{1.49}$$

Based upon (57) and (58) the present discounted value of future income is given by

$$H_{i,t} = R^{-1} E_t Z_{i,t+j} b_{y,t} + R^{-1} E_t v_{y,i,t+j} \tag{1.50}$$

The serial correlation of income between second and fifth quarter income provides an estimate of ρ which is found to be 0.73. The average future expected wages are \$45,120, slightly lower than the actual wages of \$47,000.[15] The variable "Diff in Fut Price" captures the difference in price between expected future prices and current prices, where the average difference in price is 0.006. The marginal effects from probit and the OLS regression both show a positive and insignificant effect of future price on current contribution. As predicted by the theoretical analysis, a rise in future price (or lower future tax rates) should result in higher current giving. While the measures are positive and in the right direction, the effects are insignificant, implying that the estimates are noisy. Future changes in income though have a significant positive effect on the probability as well as elasticity of giving.

[15]Results for expected wage prediction are available on request

A1: Probit and OLS Regression Estimates for Future Price Effect

Variable	OLS	Marginal Effects
Income	0.25***	0.02***
	(0.03)	(0.0009)
Price	-0.63***	-0.10***
	(0.11)	(0.03)
Diff Price	0.17	0.07***
	(0.14)	(0.02)
No. of Obs	24,383	57,891

Note: * indicates 1 percent level of significance. Income and Price are in log forms in the OLS regression. "Diff Price" measures price difference between the expected and the current. The sample size is reduced as predicted wages (and hence predicted price) were not available for the entire sample.

Table 1.1: Price and Income Elasticities from Prior Studies

	Price Elasticity	Income Elasticity
Feldstein and Taylor: Data: 1962 and 1970 tax files	-1.09 to -1.29	0.76 to 0.70
Clotfelter and Steurele Data: 1975 tax files	-1.27	0.78
Glenday, Gupta and Pawlak Data: Canada tax files for income $\geq$ \$30000	-0.15	—
Feenberg Data: 1987 tax files for income $\leq$ \$200,000	-1.34	0.73
Auten et al. Data: 15 year Panel IRS tax files	-0.79 to -1.26	0.4 to 0.87
Reece and Zeischang Data: Consumer Expenditure 1972-73	-0.15	1.43
Bradley et al. Data: Consumer Expenditure 1982-83	-0.48 to -0.78	

Table 1.2: Summary Statistics

Variable	Mean	Std. Dev	Min	Max
Contributors	0.459	0.498	0	1
Itemizers	0.22	0.398	0	1
State Itemizers	0.139	0.346	0	1
Fed Tax Rate	0.09	0.18	-0.11	0.57
State Tax Rate	0.02	0.031	-0.28	0.79
Price	0.948	0.107	0.28	1.44
Annual Contribution	969	3453	0	100,000
Income	42,198	48,079	-125,386	371,996
Age	47	17.06	18	90
Education	13.09	1.84	0	17

Note: Contribution and income are measured in terms of 2006 dollars. Price is measured in dollars. Age and education are measured in years.

Table 1.3: Probit and OLS Regression Estimates

Variable	Marginal Effects	OLS
Income	0.0011***	0.251***
	(.00004)	(0.008)
Price	-0.214***	-0.509***
	(0.016)	(0.057)
Education	0.030***	0.116***
	(0.0008)	(0.004)
White	0.021***	-0.029
	(0.003)	(0.020)
Married	0.078***	0.227***
	(0.004)	(0.022)
Male	0.004	0.174***
	(0.003)	(0.015)
Age	0.005***	0.020***
	(0.0001)	(0.007)
Dependants	-0.006***	-0.269***
	(0.001)	(0.049)
Working	0.055***	0.125***
	(0.004)	(0.022)
# of Obs	127,268	49,369

Note: In case of linear regression, dependent variable is in log form and price and inome are also in log forms. Standard errors are given in parantheses, *** indicates significance at 1 percent level, ** significance at 5 percent level and * indicates significance at 10 percent level. Year fixed effects were included in both probit and OLS analysis.

Table 1.4: Conditional Elasticities of Income Groups

Variable	Price	Income	Sample Size
Overall	-0.509***	0.25***	49,369
	(0.008)	(0.057)	
Income less than 40, 000	-1.16**	0.17**	20,770
	(0.190)	(0.012)	
Income 40, 000 – 100, 000	-0.298***	0.292***	19,962
	(0.090)	(0.048)	
Income more than 100, 000	0.010	0.81	8635
	(0.093)	(0.058)	

Table 1.5: Unconditional Elasticities of Income Groups

Variable	Price	Income
Overall	-1.331**	0.114**
	(0.487)	(0.019)
Income less than 40, 000	-2.257	0.069
	(0.46)	(0.013)
Income 40, 000 – 100, 000	-1.091	0.117
Income more than 100, 000	-0.585	0.365

Note: Sample size for unconditional elasticities of different income groups is 130,871. Standard errors are given in parantheses, *** indicates significance at 1 percent level and ** significance at 5 percent level.

Table 1.6: Intertemporal Price Effect for Whole Sample

Dependent Variable: Ln Charitable Contribution		
Variable	OLS	Marginal Effects
Income	0.30***	0.08***
	(0.008)	(0.003)
Price	-0.46***	-0.17***
	(0.05)	(0.01)
Diff with Fut Price	0.08	0.28
	(0.20)	(0.05)
Diff with Past Price	−0.21	0.10
	(0.19)	(0.02)
No. of Obs	49,370	127,268

Table 1.7: Intertemporal Price Effect for Panel Sample

Variable	OLS	Marginal Effects
Income	0.28***	0.08***
	(0.01)	(0.003)
Price	-0.49***	-0.18
	(0.09)	(0.02)
Diff with Fut Price	0.86**	0.49***
	(0.31)	(0.08)
Diff with Past Price	0.40**	0.14***
	(0.12)	(0.02)
No. of Obs	19,979	52,601

Note: Standard errors are given in parantheses and *** indicates significance at 1 percent level and ** significance at 5 percent level. Income and Price are in log forms in the OLS regression. Demographic characteristics also included in the regression.

Table 1.8: Regression with Month Effects

Dependent Variable: Ratio of Total Quarterly Charitable Contribution to Income

Variable	Till 2000	After 2000
February	-0.382	0.003
	(0.761)	(0.028)
March	-0.345	0.012
	(0.782)	(0.027)
April	-0.437	0.005
	(0.791)	(0.035)
May	-0.401	0.012
	(0.756)	(0.036)
June	0.420	0.050
	(0.748)	(0.036)
July	-0.421*	0.012
	(0.831)	(0.036)
August	-0.358*	0.004
	(0.796)	(0.036)
September	-0.439	-0.083*
	(0.007)	(0.036)
October	-0.403	-0.003
	(0.003)	(0.040)
November	-0.411	0.124*
	(0.719)	(0.040)
December	-0.272	0.057
	(0.448)	(0.040)

Note: Age and education were used as control variables. Figures in paranthesis are standard errors indicating most of the coefficient estimates are insignificant.

Table 1.9: Effect of Quarterly Contributions

Dependent Variable: Total Quarterly Charitable Contribution		
Variable	Contribution Qr2	Contribution Qr5
Contribution Qr2	—	0.092
		(0.015)
Contribution Qr3	0.282	0.216
	(0.028)	(0.026)
Contribution Qr4	0.419	0.622
	(0.031)	(0.027)
Contribution Qr5	0.112	—
	(0.018)	
Income Qr2	-0.001	0.004
	(0.001)	(0.001)
Income Qr3	0.006	0.0002
	(0.001)	(0.001)

Note: Year fixed effects were used as control variables. Figures in parantheses are standard errors, indicating almost all the coefficient estimates are significant at 1 percent level.

Table 1.10: Probit and Truncated Regression Estimates using Fifth Quarter Data

Dependent Variable: Ln Charitable Contribution		
Variable	Marginal Effects	OLS Regression
Income	0.001	0.265
	(.00006)	(0.010)
Price	-0.177	-0.476
	(0.002)	(0.072)
Education	0.028	0.124
	(0.001)	(0.005)
White	0.020	-0.009
	(0.004)	(0.026)
Married	0.081	0.222
	(0.005)	(0.022)
Male	0.004	0.161
	(0.003)	(0.020)
Age	0.004	0.024
	(0.000)	(0.007)
Dependants	-0.008	0.035
	(0.001)	(0.009)
Working	0.049	0.129
	(0.005)	(0.028)
# of Obs	80,479	30,087

Note: In case of OLSregression, dependent variable is in log form and price and inome are also in log forms. Income is in thousands of dollars. The unconditional price and income elasticities are -1.27 and 0.124 respectively. Year fixed effects were included in both the regression analysis. Figures in parantheses are standard errors, indicating almost all the coefficient estimates are significant at 1 percent level.

Table 1.11: Weighted Probit and Truncated Regression Estimates

Dependent Variable: Ln Charitable Contribution		
Variable	Marginal Effects	OLS Regression
Income	0.11	0.250
	(.00006)	(6^{-4})
Price	-0.19	-0.566
	(0.0001)	(0.0004)
Education	0.028	0.115
	(0.001)	(3^{-4})
White	0.022	-0.06
	(0.0003)	(0.0001)
Married	0.079	0.222
	(3^{-4})	(0.0001)
Male	0.002	0.189
	(2^{-4})	(0.0001)
Age	0.005	0.020
	(0.000)	(4^{-5})
Dependants	-0.008	0.008
	(1^{-5})	(6^{-4})
Working	0.056	0.115
	(3^{-4})	(0.0001)
# of Obs	2,040,315,777	7,72,649,560

Note: In case of OLS regression, dependent variable is in log form and price and inome are also in log forms. Income is in thousands of dollars. Year fixed effects were included in both the regression analysis. Figures in parantheses are standard errors, indicating all the coefficient estimates are significant at 1 percent level.

Figure 1.1: Probability of Contribution

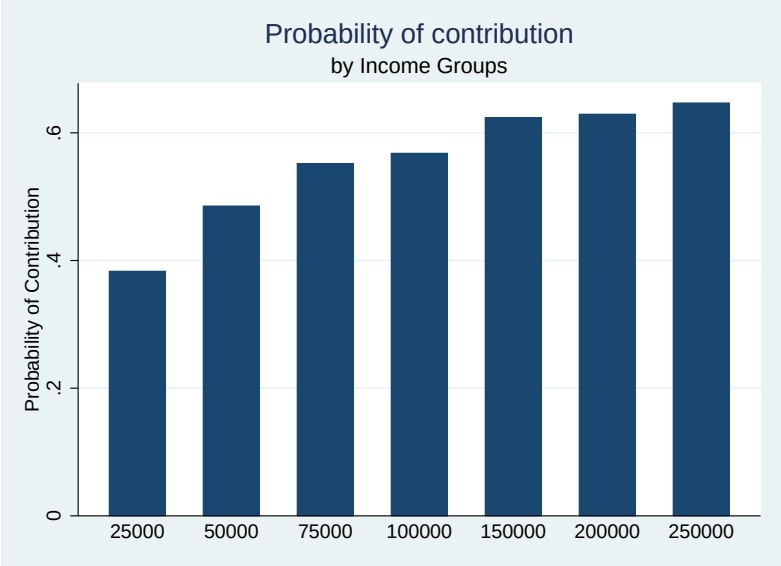


Figure 1.2: Average Yearly Contribution

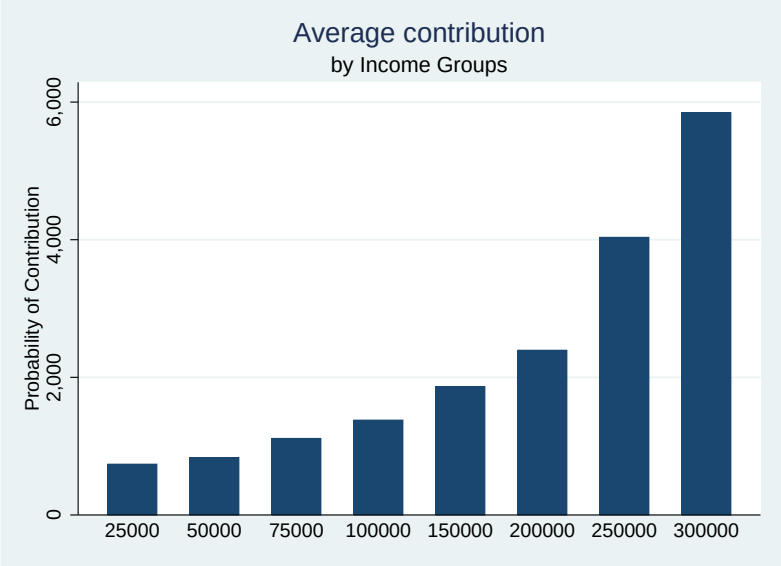


Table 1.12: Changes in Tax Rates due to EGTRRA

Tax rate Prior to July 1, 2001	N/A	15	28	31	36	39.6
Income brackets, 2001	—	$\leq 26,350$	26,251–63,550	63551–132,600	132,601–208,350	$\geq 288,351$
Tax rate July 1, 2001 – 2003	10	15	27	30	35	38.6
Income brackets, 2003	≤ 7000	7001–28,400	28,401–68,800	68,801–148,500	143,300–311,750	$\geq 311,750$
Tax rates 2004-2005	10	15	26	29	34	37.6
Income brackets, 2004	≤ 7150	7151–29,050	29,051–70,350	70,351–146,750	146,751–319,100	$\geq 311,911$
Tax rates 2006-2010	10	15	25	28	33	35
Income brackets, 2006	≤ 7550	7551–30,050	30,051–74,200	74,201–154,800	154,801–336,550	$\geq 336,551$

Figure 1.3: Time Trend of Price

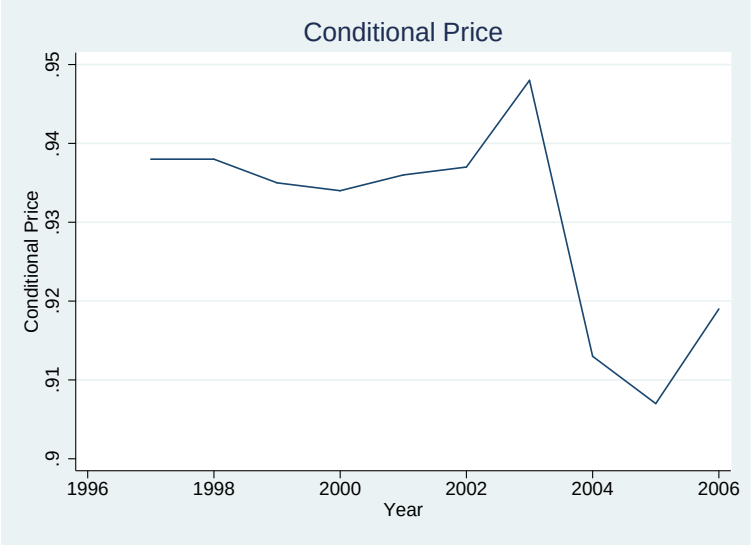
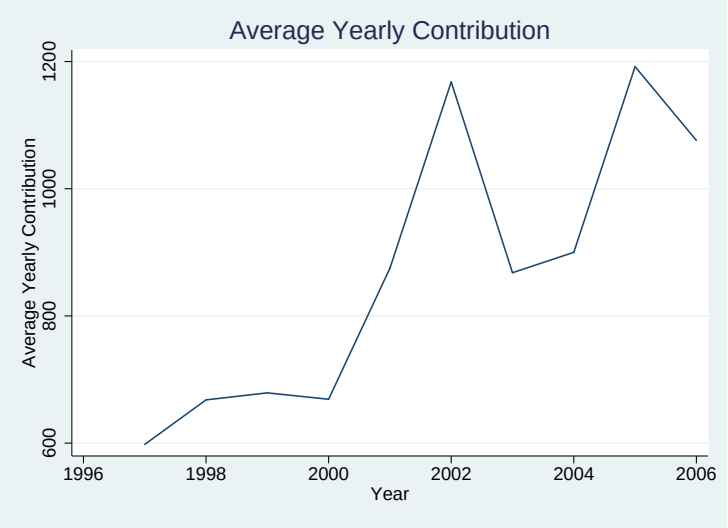


Figure 1.4: Time Trend of Contribution



Chapter II

Effect of Different Income Tax Policies on Charitable Contributions

Abstract: This study analyzes the impact of different income tax policies on the volume and elasticity of contribution. The paper uses a difference-in-difference analysis on data from Consumer Expenditure Survey to identify the group of people who reduced their charitable contributions by the largest amount due to the 2001 income tax law change, EGTRRA. This study also discusses two alternative tax policies, a flat-tax rate regime and 28% deductibility limit and their effect on charitable contributions. Results from empirical analysis suggests that after EGTRRA, itemizers reduced their contribution by 24% and the likelihood of contributions fell by 10%. While, limiting the tax deductibility to 28% reduces contribution by 0.02 percentage points, a flat tax rate regime makes contributions 11 percentage point more price

elastic compared to the progressive tax rate system.

2.1 Introduction

There is a wide amount of literature acknowledging that changes in tax rates are one of the prime determinants of volume of charitable contributions. Most empirical analysis performed in this regard have considered the progressive tax rate system prevalent in US. The progressive tax system implies lower marginal cost of giving as one moves up the income/tax bracket and therefore a dollar's worth of giving is not the same for everyone. This paper considers a situation where such advantages of charitable contributions are absent or muted. I provide analysis of how contributions would be affected in presence of alternative tax policy systems, (i) a flat tax rate regime and (ii) limiting the tax deductions after a certain tax bracket (making it a flat tax after a certain limit) and (iii) also analyse the effects of reduction in the progressive tax rates, using the income tax law change of 2001 as a tool.

While, in my paper on "Effect of Income Taxes on Charitable Contributions", I used a generalized tobit model to estimate the long run price and income elasticities of contribution, in this paper, I perform a difference in difference estimation to analyze how the reduction in tax rates affected the volume of contribution for different households. Besides providing an alternative estimation technique, this empirical analysis provides a better idea of the impact of the law change on contribution of the groups most affected by the intervention.

One of the alternative tax policies discussed in this study is a 15% flat-tax regime and how its effect compares to the effects of a progressive tax system.[1] Proponents of this policy (replacing progressive tax rates with a flat tax rate) argue that

[1]Heritage foundation, 1996 http://www.heritage.org/Research/Reports/1996/12/BG1093nbsp-How-a-Flat-Tax-Would-Affect-Charitable

a flat tax regime would encourage charitable contribution because it would result in more personal income and growth which given the evidence of strong positive income elasticity, would result in higher contributions. Moreover, donations as a percentage of personal income have more or less remained constant at about 2% of personal income in US, inspite of large variations in marginal tax rates. The obvious detrimental effect of a flat-tax regime would be that it increases the cost of giving of individuals in the high tax bracket, the ones who are likely to contribute the most.

An important contemporary issue regarding charitable contributions is, imposing a limit on deduction, especially since the Obama government has proposed to cap the value of itemized deductions to 28 percent from 2011. According to the tax brackets of 2009, single tax filers above $171,000 and married (joint) tax filers above $208,000 income brackets are the ones who face a tax rate above 28 percent and therefore will be adversely affected by the imposition of this cap. Proponents of this proposed policy claim that this would affect only 1.2 percent of all taxpayers who itemize their deduction and hence unlikely to bring about any large variation in annual contributions. Limiting the deductibility to 28 percent would potentially raise tax revenues, but it would also reduce the amount of contribution since people in the higher income (or higher tax bracket) are the ones who make the highest amount of charitable contribution

In the following sections, I discuss the empirical methodology and the results from EGTRRA and the alternative tax policy analyses. I begin with the difference-in-difference analysis to find the effects of the 2001 tax law change and then proceed to discuss the effects on contributions in case of flat tax regime and limit on tax deductibility.

2.2 Effect of 2001 Income Tax Law Change

The enactment of Economic Growth and Tax Relief Reconciliation Act (June, 2001) reduced the income tax rates for every income bracket (amongst other changes). Rate changes are relevant to charitable giving because they affect the "price" of a charitable gift and the amount of after-tax income available for charitable giving. As enacted, all of the changes made by this law sunset after December 31, 2010. As of January 1, 2011, the tax law will revert to where it was before this new legislation was enacted. Individual income tax rates will increase from the 10% – 35% spread to the 15% – 39.6% spread that existed before the enactment. One of the main hypotheses of this study is that a reduction in income tax rate is likely to affect charitable contributions by reducing the price of giving.

The policy change of 2001 provides a transparent source of exogenous variation in price which creates potential for a natural experiment. The major feature of this estimation approach is that it can control for nontax effects that coincide with tax reforms. Given the period between 2001-06 there were considerable amount of business fluctuations, removing the non-tax effects from the analysis, helps in getting a better estimate. In prior literature such experiments have been conducted to study the effects of minimum wage laws (Card and Krueger 1994), effects of immigrants on the employment of natives (Card 1990), effect of military service on earnings (Angrist and Krueger 1994), labor supply and fertility decisions (Angrist and Evans 1996). Research related to natural experiments in the area of investments and tax policy has been conducted by Cummins, Hassett and Hubbard (1994) where they study the effect of tax reforms on labor supply and business level investments. However, this is the only study which conducts a difference in difference analysis to study how changes in income tax rates affect level of contribution.

Difference in difference requires identification of a control group – a group not affected by the law change and a treatment group – a group which is most affected by the law change. However, since EGTRRA was a federal law change, it is difficult to identify a group which was not affected by the law change at all. Therefore, I consider the control group as households which are likely to be least affected by the law change that is people who do not itemize or face a price of giving equal to 1, before the law change. The reduction in tax rates affect the price of giving only for individuals who itemize their tax returns, hence the group which itemize or face a price of giving lower than 1, face biggest change in price and are considered to be in the treatment group.

The difference-in-difference regression specification used in this study to estimate the impact of the change in the tax price on charitable contributions is described as follows

$$(Giving) = \alpha_0 + \alpha_1 Treatment + \alpha_2 After + \alpha_3 (After^* Treatment) + \beta + \epsilon, \quad (2.1)$$

where "Giving" indicates annual charitable contributions, "Treatment" is a dummy variable that equals 1 for the treatment group and 0 for the control group, "After" is a time dummy that is 1 for the years 2001–06 and 0 for the year before 2001. X is a set of control variables including income, age, martial status and number of dependents and ϵ is the error term. It should be noted that the price of giving does not enter the estimation directly, instead, I use the policy change (i.e., tax price of giving increased for the treatment group only) to estimate the price effect indirectly. This feature allows avoiding the identification problem existing in earlier empricial studies. In equation (2.1), the difference in giving for the treatment group before and after the policy change is $\alpha_2 + \alpha_3$, and the difference in giving for the control group

before and after the policy change is α_2. Therefore, α_3 , the difference-in-difference estimator, is the pure tax effect for the treatment group after the policy changes.

2.2.1 Data and Results

I continue to use the same dataset as in earlier analysis, i.e., Consumer Expenditure Survey 1997-2006. The dependent variable is the annual level of contribution which includes both cash and non-cash giving. Since political contributions are not tax deductible, they have not been included in the sample. NBER's tax simulator program is used to find the price of giving before and after the law change in 2001. The details of other demographic characteristics like income, marital status, race, sex are also included in the analysis.[2]

The before law change years are from 1997-2000 and after law change are the years from 2001-06. [3] Before the law change there are 33,383 observations and between 2001 and 2006 there are 93, 885 observations. The large difference in the sample size before and after the law chane is because, before 2001 there is only one observation per household, but from 2001 there are 2 observations per household which were created by using both the second and fifth quarter interview data. The average yearly contribution before law change is $1085, whereas after law change it is $928. Before the law change 6192 households or about 18% of the households itemized their returns (in either federal or state return) and post law change 22,411 or about 24% of the household were eligible to itemize deductions.

Table 2.1 shows the summary statistics by treatment and control group. The key difference between both the groups is that the control group has much lower in-

[2]information about them can be found from section 5

[3]Since the changes in tax rates were announced (and were effective) in 2001, analysis including as well as excluding 2001 from the sample have been performed. However, the results presented here consider including 2001 as the post law change year. The magnitude of the coefficeints are less strong when the year 2001 is excluded from the analysis.

come of $28,000 compared to the treatment group's average income of $73,000. This is not surprising since most households who itemize their deductions typically lie in the high income group. Table 2.2 represents the results from difference-in-difference estimation. The key variable is "After*Treatment", which is the difference-in-difference estimate representing the policy effect on the treatment group. The coefficient estimate imply that after the policy was implemented, itemizers reduced their annual contribution by $456. The average annual contribution for this group before the law change was about $1882, which implies that post intervention there was a reduction of 24% in annual contribution. Amongst the other variables, "time" indicates that after the law change, average annual contribution for all households in the sample increased by $200 and the "group" variable indicates that average contribution of the treatment group is $671 more compared to the control group.

Regressions were also run considering the "probability of contribution" as the dependent variable and the results are presented in table 2.2. Results suggest that post intervention, itemizers are about 10% less likely to contribute to charity. Households which itemize deductions have a higher probability of contribution and an average contributor in the treatment group (itemizers) is 13% more likely to contribute than a contributor in the control group. Empirical estimates also reveal that post policy change, the average likelihood of contribution for all households in the sample fell by 2%.

The results from DID estimation clearly suggest that post 2001 income tax law change, there was negative impact on the amount of contribution for all households, especially for itemizers, the group which contributes the largest in terms of charitable gifts. These results further substantiate the strong negative price elasticity results found in earlier empirical analysis, implying that the negative price effect is much stronger than the positive income effect. The difference in difference estimate

provides information about how the level of giving was affected by EGTRRA and also avoids identification problem existing in earlier analysis. Use of panel data will help in finding better results, as it will allow the possibility of following the same household across time. Future study will focus on performing panel data analysis using data from IRS individual tax return data.

2.3 Alternative Tax Policies

This section provides analysis of how contributions will be affected if the government adopts certain alternative tax policies. I deal with two tax policies which are currently under debate (i) limiting the tax deductibility to 28 percent and (ii) incorporating a flat tax regime of 15 percent. I provide empirical analysis of how the overall elasticity estimates would be affected if these regimes are incorporated.[4]

(i) Limiting Tax Deductibility to 28 percent

The Obama government proposes to limit tax deductibility to 28% to raise revenues to support the healthcare reform.[5] According to the current administration, the reduction in tax credit for itemized deductions and mortgage interest would raise $318-billion over 10 years, which can be utilized to finance $630-billion reserve fund designed to help make health care more affordable and available. Putting a cap on the deductibility would affect taxpayers above the 28% bracket – currently, individuals who are in the 33% and 35% tax bracket. The taxpolicy center argues that "the proposal would limit the value of deductions for about one-third of taxpayers in the top income quintile in 2012, raising their taxes by an average of more than $1,200.

[4]I provide elasticity estimates, because it helps me in comparing my results with the elasticity estimates from the progressive tax rate system

[5]http://www.taxpolicycenter.org/taxtopics/2010-Budget-limit-value-of-itemized-deductions.cfm

About 85 percent of taxpayers in the top 1 percent would pay more tax, an average increase of more than $15,000."

In this paper I use a simple analysis to estimate how the elasticties of contributions would be affected, if such a cap is imposed. In my analysis, I do not make any predictions about contributions after 2010, i.e., when the cap would be in effect. The point is to compare the results with the current "no-cap" scenario to build an idea of the impact of the deductibility limit. For this purpose, I use a sample of households from CEX dataset between 1997–2006. There are 2048 households who have an income greater than $171,000 (in terms of 2006 dollars for years 1997-2006), which is about 1.6 percent of the whole sample. The average contribution for people in this income bracket is $4033, which is almost three times the average contribution of the entire sample.

The methodology adopted here tests to see how the elasticity of contribution would be affected if the deductibility is limited to 28 percent. Information about price and marginal tax rates are obtained from the TAXSIM program of NBER. The price of giving is replaced with 0.72 cents (1−0.28) for any household that faces a tax rate of greater than 28 percent and itemizes their deduction. Using a linear regression model given by

$$\log(\text{contributions}) = f(\log \text{income}, \log \text{tax price}, \text{age}, \text{marital status}, \text{number of dependents}, \text{race}, \text{sex}, \text{work status and year effects}),$$

results in table 2.3 suggest that the price elasticity of giving is −0.48. Which implies that a fall in price by 1% would result in increasing giving by 0.48%. My earlier empirical analysis using the same data set showed that the conditional price elasticity of giving for all households is −0.50. Thus, imposing a maximum of 28 percent deductibility results in lower price elasticity of giving compared to a situation where

households can claim deduction according to their tax brackets. Results suggest that there won't be a large reduction in the volume of giving if the maximum deductibility regime is imposed. It can perhaps be argued that incorporating this tax policy would help the government effectively raise their tax revenues, without hurting the overall contributions, significantly. However, it is important to note here that the price elasticity of giving largely varies across different income groups and earlier analysis showed that higher income groups are less price responsive compared to lower income groups. It is not possible to run a separate regression for income group above $171,000, since most people in this group itemize and restricting their price of giving to 0.72 cents creates identification problem due to very low variation in price.

(ii) Incorporating a 15 percent flat-tax regime

One of the primary reasons, policy makers like flat-tax rate with respect to charitable contributions is that, flat-tax rate would increase personal income and hence help in increasing contribution. Moreover, given that the percentage of income donated to charities historically has been so constant, inspite of large deviations in marginal tax rates, a sure way to increase charitable donations is to increase personal income.[6] On the other hand, a flat-tax rate could raise the tax burden on the lower income households and therefore is more unpopular. This section prforms empirical analysis to study the impact of flat tax rates purely with respect to how it affects charitable contributions (and does not make any other welfare effect arguments).

To analyze how the flat tax rate would affect the volume of contribution, I replace marginal tax rates which are greater than zero with a tax rate of 15%, i.e., a price of giving of 85 cents for households who itemize their deductions. Using

[6]http://www.heritage.org/Research/Reports/1996/12/BG1093nbsp-How-a-Flat-Tax-Would-Affect-Charitable

data from CEX 1997-2006 and applying linear regression analysis reveals that the price elasticity of giving is -0.61 (given in table 2.3), which is much larger than the -0.5 price elasticity estimate I find by using the current progressive tax regime. Therefore, a flat tax system would make contributions more price elastic compared to the progressive system. However, these results do not consider that income and price alasticities vary by income categories. Earlier results have shown that higher income (or higher tax bracket) households have very high income elasticities, therefore given that individuals in the tax bracket above 15% would have higher disposable income in flat tax rate system and it could potentially result in higher volume of contribution.

2.4 Conclusion and Future Research

This study provides interesting analyses on the effects of a contemporary income tax law change and alternative tax policies on the volume and elasticity of contribution. In the recent literature, there hasn't been any study which has discussed these issues and therefore this study provides us with a tool to critically analyze certain contemporary policies. While, the effect of taxes on charitable contributions has been largely researched in the past, this study helps in quantifying the effects of changes in progressive and flat tax rate regimes.

Using difference-in-difference analysis, the results show that after the reduction in income tax rates, households which itemize their deduction reduce their annual contribution by upto 24% and the probability of contribution also reduces by 10%. The results from limiting tax deductibility reveal that imposing a cap would not have a large effect on the volume of contribution. Since the higher income households are more sensitive to changes in income than prices, a deductibility limit of 28% would change the price elasticity to -0.48 from the -0.50 estimate in case of no deductibil-

ity. This paper also analyzes changes in volume of contribution in case a flat tax regime is imposed. The response to changes in price is much larger in case of flat tax rate regime compared the progressive tax rate system. The price elasticty estimate is -0.61, about 11 percentage point larger compared to the progressive tax rate system.

One of the possible channels of extension to this study would be to predict the values of contribution after 2010 and base the alternative tax policy analysis on those values. This would be largely facilitated by use of panel data as cross-section data does not allow much scope for building income histories required to make good predictions. Also, following the same household over time, would help in getting better estimate of how the 2001 income tax law change affected household contributions.

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Table 2.1: Summary Statistics for Treatment and Control Group

Itemizers (Treatment Group)				
Variable	Mean	Std. Dev	Min	Max
Income	73194	5632	−100,309	300,000
Price	0.76	0.08	0.28	0.99
Education	14	1.70	0	17
Age	44.4	11.5	18	88
Married	0.58	0.49	0	1
Male	0.51	0.49	0	1
White	0.85	0.34	0	1
Contribution	1506	4535	0	100,000
# of Obs	28603			
Non-itemizers (Control Group)				
Income	27945	32574	−90,000	300,000
Education	13	1.81	0	17
Age	48.33	18.13	18	90
Married	0.46	0.49	0	1
Male	0.47	0.49	0	1
White	0.81	0.38	0	1
Contribution	813	3050	0	100,000
# of obs	98499			

Table 2.2: DID Estimates from Linear Regression and Probit Analysis

Dependent Variable: Annual Charitable Contribution

Variable	DID Regression	Marginal Effects
Time	201.5	−0.22
	(59.1)	(0.007)
Group	671.48	0.13
	(55.8)	(0.007)
DID	−456.2	−0.097
	(61.1)	(0.008)
Income	0.005	0.0001
	(0.0003)	(0.00001)
Working	149.5	0.055
	(30.72)	(0.004)
Male	241.5	0.002‘
	(23.14)	(0.003)
White	114.01	0.022
	(30.72)	(0.003)
Age	23.45	0.005
	(0.73)	(0.0001)
Education	233.34	0.031
	(1.19)	(0.0008)
# of Obs	127,268	127,268

Note: In case of DIDregression, dependent variable is in log form and price and inome are also in log forms. Income is in thousands of dollars. Year fixed effects were included in both the regression analysis. Figures in parantheses are standard errors, which shows that all variables are significant at 1% level, except for those marked ‘.

Table 2.3: Estimates from Alternative Tax Policies

Dependent Variable: Ln Charitable Contribution		
Variable	28% Deductibility	Flat Tax Rate
Ln Income	0.255	0.26
	(0.008)	(0.008)
Ln Price	−0.48	−0.61
	(0.06)	(0.108)
Age	0.02	0.019
	(0.0005)	(0.0005)
Dependents	0.021	0.023
	(0.007)	(0.007)
Working	0.127	0.128
	(0.022)	(0.022)
Male	0.174	0.17
	(0.015)	(0.015)
White	−0.02	−0.03
	(0.02)	(0.02)
Married	0.244	0.25
	(0.127)	(0.016)
Education	0.117	0.118
	(0.004)	(0.004)
# of Obs	127,268	127,268

Note: In case of DIDregression, dependent variable is in log form and price and inome are also in log forms. Income is in thousands of dollars. Year fixed effects were included in both the regression analysis. Figures in parantheses are standard errors, which shows that all variables are significant at 1% level.

Chapter III

Effect of Capital Gains Tax on Portfolio Allocation and Labor Supply

Abstract: This study analyzes how lowering tax rates on stock and bond market investments brought about by the Jobs Growth and Tax Reconciliation Relief Act (2003) affect savings and work decisions of older Americans. In particular, I focus on how lowering capital gains tax affect portfolio allocation in income tax payable and capital gains tax payable assets. Furthermore, this study uses the exogenous increase in wealth due to lower taxes on investment to find the effect of wealth on labor supply decision and thereby provide a solution to the underlying issue of endogeneity of wealth in labor supply model. Difference in difference analysis using Health and Retirement Study finds substantial impact on labor supply decisions as well as portfolio choices. Annual investments in IRA fall by $ 175 and the likeelihood of holding IRA falls by 11%. With respect to labor market behavior, annual labor supply for the treated group falls by 41 hours and about 9 individuals drop out of the labor

force. Results using planned retirement age as a dependent variable shows increase in expected retirement age, indicating intertemporal substitution of labor supply.

3.1 Introduction

Though there is huge amount of evidence that wealth and hence policies aimed at affecting wealth play a central role in determining labor force participation, the pure effect of wealth on retirement decisions is difficult to ascertain due to strong endogeneity issues. Lack of strong source of exogenous variation and small and insignificant coefficients have often led to the conclusion that individual preferences characterize labor market behavior more than fluctuations in market or financial performance (Colie and Levine, 2004). The goal of my research work is to provide with strong exogenous sources of variation in wealth which will help in teasing out the pure wealth effect on retirement. The source that I concentrate on further provides insights about portfolio reallocation between income tax payable and capital gains tax payable assets, namely, Individual Retirement Accounts (IRA) and non-individual retirement accounts (NIRA).

This particular source of variation is the federal law change, Jobs and Growth Tax Relief Act (JGTRRA) – passed by the United States Congress on May, 2003. The law affected investments in different kinds of accounts by reducing the capital gains tax rate and the tax rate on dividends. The tax rate on long-term capital gains for individuals in the income tax bracket of 25% and above was lowered from 20% to 15% and from 15% to 5% for the low income bracket. Along with tax rates on capital gains, JGTRRA also changed the tax payable on dividends. Before the law change the tax code did not differentiate between dividend income and other types of income, i.e., dividends were treated as ordinary income and could be taxed at a rate as high as 38.6%. After the enactment of the law, dividends got the same treatment

as capital gains and hence were taxed at a rate as low as 5 percent for the lower income tax bracket people (15% and 10% tax brackets) and 15% for the rest. The pre JGTRRA rates return in 2011. While the enactment of JGTRRA changed the tax rates on capital gains and dividend income it left the income tax rates unchanged.[1]

The main hypothesis of this research is that this difference in tax rates creates a higher incentive for individuals to invest in capital gains tax payable assets versus income tax payable assets. The income tax payable asset considered here are investments made in individual retirement accounts (IRA) which are a primary source of retirement savings for most Americans. Besides being income tax payable, investments made into IRA can be tax deferred, i.e., one can choose to pay taxes on investments at the time of withdrawal. The capital gains tax payable assets are any investment in the stock market outside IRAs for which we would expect to find higher investments post enactment of JGTRRA.

Lowering capital gains taxes makes investments cheaper and provides higher after tax return which implies wealth gain. I use this exogenous variation in wealth caused by a natural experiment to study the effect it has on labor supply decisions, particularly of Americans aged 55 years and older. Though the impact of wealth on labor supply is undeniable, the endogeneity of wealth makes it difficult to ascertain the pure wealth effect. The wealth gain made possible due to the tax law change provides with a tool to instrument wealth and solve the underlying endogeneity issue. However, it is difficult to provide theoretical prediction regarding the labor supply results. While, lower tax rates create higher incentive to work, the income effect of higher wealth would result in more leisure consumption. These opposing effects

[1]It should be noted that the enactment of EGTRRA in 2001 reduced the income tax rates across all brackets. JGTRRA accelerates the individual marginal tax rate cuts that were not scheduled to take effect until 2004 and 2006 under the EGTRRA of 2001. Rates above 15% will generally decline about 2 percentage points. The highest rate, formerly 38.6%, drops 3.6 percentage points.

makes it hard to ascertain if there would be a rise or fall in labor supply and can only be established through empirical analysis.

My research work provides few key contributions to the literature on retirement. First, it provides a valid instrument to study the pure effect of wealth on labor supply, which is difficult to ascertain otherwise due to endogeneity issues. The unanticipated law change provides an exogenous variation in wealth and hence acts as an instrument for teasing out the wealth effect. Second, I examine the consequences of policy intervention which had the main intention of improving investment and recovering the stock market and how in the process of achieving its intended purpose it affected investment in accounts which are a source of retirement income. The third contribution is towards real data analysis of which there is very limited evidence in this literature. There has been considerable research done in the field of allocation of wealth between IRA and non IRA accounts. Some of them have categorized further by dealing in front loaded and back loaded plans like Roth IRA and traditional IRA (Burman, Gale and Weiner, 2001) and others (like Poterba, 2007) have concentrated on defined contribution and defined benefit plans. The scanty amount of literature regarding the effect of JGTRRA on portfolio allocation has mostly relied upon simulation analysis. This research is the first to do a micro level study of the impact of the law change, which is made possible by the extensive data collected by Health and Retirement Study on different kinds of investments, labor supply variables and personal characteristics.

In order to estimate the effect of the law change on retirement planning, I perform difference in difference analysis using data from 2002 and 2006 the Health and Retirement Study (HRS). My results indicate that the law change resulted in lower investment in IRA and having 7% lesser number of IRAs. There is a significant impact on the total labor supply measured in total number of hours and labor force

participation variables. Apart from using actual retirement age, this research work makes use of an alternative retirement variable planned retirement age. Though the planned retirement age is an expected measure rather than being a real measure in some sense it is more useful as it allows analysis of whether the temporary law change had any bearing on decisions to be carried out only in the future.

3.2 The Law Change: JGTRRA

During the Bush (W) administration there were quite a few sunset laws passed, one of which was the JGTRRA. The main focus of JGTRRA was to reduce the cost of borrowing capital and encourage investment which was in a slump during 2001–2003. Among other provisions, the act accelerated certain tax changes passed in the Economic Growth and Tax Relief Reconciliation Act of 2001, increased the exemption amount for the individual Alternative Minimum Tax, and lowered taxes of income from dividends and capital gains. The tax rate on long-term capital gains (defined as gains on assets held for more than one year) for individuals in the income tax bracket of 25% and above was lowered from 20% to 15%. For the low income category, i.e., individuals in the 15% and below tax bracket, the rate on capital gains tax was 5% until Dec 2007.[2] The pre JGTRRA rates return in 2009; the maximum rate was to return to 20%, and the rate for the two lowest tax brackets was to return to 10%.

Along with tax rates on capital gains, JGTRRA also changed the tax payable on dividends. Before the law change, the tax code did not differentiate between dividend income and other types of income, i.e., dividends were treated as ordinary income and could be taxed at a rate as high as 38.6%, which is the highest tax bracket in the country. After the enactment of the law, dividends got the same treatment

[2]This tax category further gained by the enactment of the Tax Increase Prevention and Reconciliation Act of 2006 (TIPRA) which reduced the tax rate to 0% (for 2008 2010).

as capital gains and hence were taxed at a rate as low as 5 percent for the lower income tax bracket people (15% and 10% tax brackets). Reports indicate JGTRRA achieved its intended goal – dividend payments increased from an average of $410 in 2003 to $518 in the third quarter of 2005, an increase of 24 percent. Dividend income increased by a similar margin ($750 to $1000) during the same time period. The Congressional Budget Office estimates that the average taxation of dividends was 12 percent during the JGTRRA period and is expected to shoot up to 28 percent once JGTRRA provisions expire.

While the enactment of JGTRRA changed the tax rates on capital gains and dividend/interest income, it did not have much effect on income tax rates. It is not hard to predict that JGTRRA created a higher incentive for investment in stock market, especially for individuals in the high income tax bracket. Under the given scenario, it is particularly interesting to investigate how the law affected an individuals portfolio allocation between capital gains tax payable and income tax payable assets. Mainly, I focus on the allocation of assets in taxable accounts (like investments in stocks and bonds) and tax deferred account (investment in Individual Retirement Accounts) and how it affects wealth accumulation. As mentioned before, it also provides with a tool to study the exogenous effect of wealth on labor supply.

3.3 Individual Retirement Accounts

Individual Retirement Accounts (IRAs) were established by the Employee Retirement Security Act (ERISA) of 1974 to create an opportunity that would enable qualifying individuals to save and invest for retirement (these accounts are now termed as traditional IRAs). IRAs allow most Americans, subject to income limitations, to invest up to a maximum of $5,000 per year ($6,000 if you are aged 50 or older) in a

tax-sheltered account. Contributions towards IRA receive tax deductions which make it an attractive option to invest. Money in IRA can be invested in stocks, bonds, and mutual funds.

In U.S. most tax incentives savings plans are "front loaded" – which means contributions are tax deductible, account balances accrue tax free and qualified withdrawals are taxed as ordinary income. Withdrawals made before the age of 59 and half are charged a 10% penalty and individuals must begin receiving minimum distributions when one reaches 70 and half. Traditional IRA, 401(k) plans and Keogh plans all satisfy these conditions and until 1997, these were the only retirement saving plans offered.

The Tax Payer Relief Act 1997 created a new variant of retirement accounts, termed as Roth IRA.[3] The basic difference between traditional IRA and Roth IRA is while traditional allows for contributions to be tax deductible, Roth IRA does not provide any tax concession on contributions instead it allows for withdrawals from the account at a tax free rate. This particular feature of Roth IRA it is most often termed as "back-loaded plan". Also, a particular advantage of Roth over the traditional is that one does not require one to reach a particular age to qualify for penalty free withdrawals or need to start taking minimum distributions at a particular age. Though they differ in their tax treatment both plans permit balances to grow tax free and hence such accounts are referred as tax deferred accounts (TDA).

Apart from holding money in IRA, individuals can hold money in another variant of retirement accounts: the 401(k) accounts. While the ones that I have mentioned so far are only individual sponsored accounts, 401 accounts are mostly sponsored by employers as well. It is a salary reduction plan, where employees must choose a percentage of their salary to contribute to the plan, and the plan spells out

[3]Table 4 gives explains the differences in Roth and Traditional.

the extent of employer matching. Employee taxable salaries are reduced by these contributions, the contributions are invested, and any earnings are tax-deferred, until the employee draws the money out at retirement and at that time withdrawal are charged ordinary income tax. Although both the programs (401 and IRA) have the same basic structure, 401(k) plans have an advantage over IRA as it usually allows for higher level of contributions compared to IRA and it also allows for borrowing from the account (as long as one pays it back) without penalty. However, compared to IRAs 401(K) allows for lesser number of options in which one could invest.

3.4 Literature Review

This section discusses prior literature on portfolio choice and exogeneous effect of wealth on labor supply. Burman, Gale and Weiner (2001) particularly examine retirement savers choice between different kind of retirement accounts, i.e., front loaded and back loaded plans. Over the period 1982-1995 they examine how changes in marginal tax rates have affected individuals wealth holdings. They find that though on an average the effective tax rate on traditional IRAs was lower compared to Roth IRA (as individuals usually have lower tax rates once retired), their sample of tax payers benefitted by investing in Roth IRA, due to differences in effective contribution limits in both plans.

While Burman et al.analyzes assets held inside the retirement account, Poterba (2004) compares different asset components held inside and outside tax deferred accounts. He highlights the idea that taxes due on assets withdrawn from TDAs might make investment of same amount less valuable in TDA compared to other tax payable accounts. Simulation analysis for both high and low income tax payers suggests equivalent taxable wealth varies substantially as a function of the rate of return, tax

rate and investment horizon. In order to realize same amount of wealth from TDA as from taxable account, individuals often extend their holding period of assets in TDAs. Poterba also considers portfolio choices after the enactment of JGTRRA and finds that the value of a dollar held in stocks or bonds in TDA is lower relative to a dollar held outside TDA. Results are sensitive to time horizon of investments and only at very long horizons, 50 years or more, a dollar in TDA may generate equivalent wealth as in other taxable account.

Poterba et al (2007) studies investments in 401 accounts and the division of wealth in defined benefit (DB) and defined contribution (DC) plans.[4] They use data from Health and Retirement Study to explore how asset returns, earnings histories and retirement plan characteristics contribute to the variation in retirement wealth outcomes. Simulations done by randomly assigning individuals a share of wage which they contribute toward DC plans and comparing them with DB plans reveal that average retirement wealth accrual under DC plans exceed average accruals under DB plans.

In another paper, Poterba Venti and Wise (2007) match HRS data with social security earnings history and obtained life time earnings for individuals who reached the age 65 before 2000. Simulation results reveal that without cash outs or management fees, the projected average value of 401 (k) assets at retirement would increase from $33,045 in 2000 to $308,356 by 2040.[5] Simultaneously, they also find a decline

[4]A defined contribution plan provides an individual account for each participant. The benefits are based on the amount contributed into the plan and are also affected by income, expenses, gains and loses. There are no promises of a set monthly benefit at retirement. Some examples of defined contribution plans include 401(k) plans, 403(b) plans, employee stock ownership plans and profit sharing plans. A defined benefit plan promises the participant a specific monthly benefit at retirement and may state this as an exact dollar amount.

[5]The primary reason for this huge increase in 401 (k) wealth is as the program began in 1982 individuals investing in 401 could contribute towards it for only partial part of their work life. By 2040 there would be newer cohorts who would have the option of investing in 401 for their entire work period.

in DB plans - indicating that 401(k) plans will dominate pensions in the future.

Most studies which have looked at the portfolio allocation choice between tax deferred and other taxable accounts have mainly concentrated on differences in savings between two accounts and hence differences in wealth accumulation. Few extensions of this analysis, has been mostly with respect to the effect it has on consumption. Dammon et al. (2004) construct a theoretical model to examine the effects of borrowing and short sale restrictions, tax-exempt bonds and liquidity shocks on the optimal asset location policy. They derive some general results regarding what investment strategy would provide higher retirement consumption. In order to analyze the optimal asset allocation and location strategy they perform simulations which reveal that investors have a strong preference for locating taxable bonds in TDA and equity in taxable account.

While the retirement literature does an in-depth analysis of how pension funds, medical benefits and other forms of financial support affect retirement, there hasnt been much done on the effect of savings in retirement accounts on retirement planning. Joulfaian and Wilhelm (1994) look at the exogenous effect of wealth on labor market behavior by studying the effect of inheritances on retirement behavior. Their findings suggest working age individuals who receive large amount of inheritances are likely to exit the labor force.

Imbens, Rubin and Sacerdote (2001) model exogenous variation in wealth by looking at lottery winnings and its effect on labor market behavior. They do find substantial impact in the form on reduced labor earnings and the most prominent effect is for the age category 55-65. Kezdi and Sevak (2004) use CPS data to model the impact of dividend income on retirement. They found during the years 2001 and 2002 when the economy was going through a boom period individuals with considerable amount of resources in stock market delayed their retirement. The counterintuitive

result of individuals retiring during boom period implies that individual preference characterize labor market behavior more than fluctuation in market performance.

3.5 Why Diversify

Before presenting the theoretical model of retirement and wealth allocation it is important to understand that a central problem confronting investors is how to allocate their portfolio efficiently so as to maximize their returns. The problem is both of how much to invest and where to invest to optimize wealth. It is important to understand that individuals have incentives and disincentives of investing in both types of account and hence the question of diversification gains even more importance. Investors would like to make these decisions to reduce the tax burden of owning financial assets while maintaining an optimal diversification of assets. In this paper I examine the portfolio allocation decision made by an individual when he has access to investment in both taxable and tax deferred account.[6] In particular, I analyze how a change in the capital gains tax law (JGTRRA) affects the diversification of portfolio between tax deferred and taxable accounts and then extend the analysis to find its effect on labor market outcomes.

The ability to invest in TDAs is valuable to investors as it allows them to reduce the burden of tax on asset returns. Retirement accounts provides one with the means to save for the future and the high penalty rates for withdrawals made before the age of 59 and half ensures that the individual has decent amount of savings after retirement. True, withdrawals are taxed at ordinary income tax rate but at least it avoids the burden of taxation both in the form of income tax and capital gains tax, which is characteristic of investments outside TDA.

[6]In the sample of individuals I consider, about 17% have accounts in both IRA and non IRA, 37% have accounts only in IRA and 65% have investments outside IRA.

The biggest advantage of taxable account over TDA is that it allows for borrowing without a penalty. However, unlike TDAs it does not provide any tax sheltering. Investment in stocks and bonds outside IRAs imply that one not only pays income tax on the amount he invests he also pays capital gains taxes once he realizes his assets. There is another factor which provides a reason for diversification between IRA and non IRA and has been by far neglected in prior literature. Losses made in investments made to retirement accounts can be recognized if and only if (i) the full amount in all traditional IRA accounts is distributed and (ii) the total distribution is less than the basis in traditional IRA account.[7] The general set of rules are: (i) capital losses first go to off-set capital gains, (ii) if there are remaining capital losses, another three thousand ($3000) can be used to off-set ordinary income and (ii) any remaining capital loss is carried forward to future years. Thus, the differential treatment of losses in IRA and non IRA makes investments outside retirement accounts a safer bet in case of losses (or investments in risky assets).

Given these drawbacks and advantages of the two different investment accounts, it is justified to assume that a rational person would prefer to diversify his assets between these two assets in order to optimize his portfolio (rather than investing entirely in one account). Having discussed about the advantages and disadvantages of investing in TDA and tax payable accounts, I now turn to the formal theoretical model of retirement which considers the diversification of an individuals portfolio between the two kinds of assets.

[7]Total basis in IRA is determined by the following factors: (1) Contributions made to IRA during the year (2) Value of all IRAs at the end of the year (3) Distributions from IRA made during the year not including rollovers and (4) Net amount converted from traditional IRA to Roth IRA On the other hand losses made in non IRA can usually be written off subjected to AGI and capital gains.

3.6 Theoretical Model

This section develops an economic model of wealth allocation (in IRA and non-IRA) and labor supply behavior in an intertemporal environment. Individuals make a choice between leisure and consumption and save for their future needs by investing either in IRA or outside IRA. The main idea here is to build a theoretical model which would give a prediction of how changes in tax law affect portfolio allocation.

In the multi-period model of lifetime wealth allocation the consumer is viewed as making the choice of: allocation of wealth towards retirement account(s), allocation of wealth to stocks/bonds/ assets outside retirement accounts and decision to work. Individuals start with an initial endowment of IRA and non-IRA assets given by W^0_{IRA} and W^0_{NIRA} and each period they make contributions to IRA and non-IRA, i.e., A^t_{IRA} and A^t_{NIRA}. In a simple three-period model, the present discounted value of lifetime utility is

$$U = [lnC_t + ln(1 - l_t)] + \beta\left[(lnC_{t+1} + ln(1 - l_{t+1})\right] + \beta^2\left[lnC_{t+2} + ln(1 - l_{t+2})\right], \quad (3.1)$$

where C_n is the consumption and $(1 - l_n)$ is the hours of leisure consumed in time period 'n'. The budget contraint for each of the time periods are given as follows

$$w_t l_t(1 - \tau_t) + W_0^{IRA} + W_0^{NIRA} = C_t + (1 - \tau_t)A_t^{IRA} + A_t^{NIRA}. \quad (3.2)$$

In the above equation, the price of consumption has been normalized to 1 and the real wage w_t is taxed at an income tax rate of τ. Also, since contributions to IRA are tax deductible, $\tau^* A_t^{IRA}$ represent tax savings in this time period. In the second period, investments grow at an interest rate 'r' and withdrawals from IRA and non-IRA wealth are charged a rate of 'τ' and 'τ'_g respectively. Therefore, the second period

budget constraint is

$$w_{t+1}l_{t+1}(1-\tau_{t+1}) + \left[(1+r_{t+1})(1-\tau_{t+1})(W_0^{IRA}+A_t^{IRA})\right] + \left[(1+r_{t+1})(1-\tau_{t+1}^g)(W_0^{NIRA}+A_t^{NIRA})\right]$$
$$= C_{t+1} + (1-\tau_{t+1})A_{t+1}^{IRA} + A_{t+1}^{NIRA} \quad (3.$$

In this model, I assume that there are no bequest and the individual retires by the end of second period and hence there are no labor income either. Individuals consume off their savings and the final period budget constraint is given by:

$$\left[(1+r_{t+2})(1-\tau_{t+2})(W_0^{IRA}+A_t^{IRA}+A_{t+1}^{IRA})\right] + \left[(1+r_{t+2})(1-\tau_{t+2}^g)(W_0^{NIRA}+A_t^{NIRA}+A_{t+1}^{NIRA})\right]$$
$$= C_{t+2} \quad (3.4)$$

Given the utility function and the three-period budget constraint, an individual's maximzation is represented by the following Lagrange function

$$\mathcal{L} = [lnC_t + ln(1-l_t)] + \beta\left[(lnC_{t+1} + ln(1-l_{t+1})\right] + \beta^2\left[lnC_{t+2} + ln(1-l_{t+2})\right]$$
$$+\lambda_t\left(w_t l_t(1-\tau_t) + W_0^{IRA} + W_0^{NIRA}\right.$$
$$+w_{t+1}l_{t+1}(1-\tau_{t+1}) + \left[(1+r_{t+1})(1-\tau_{t+1})(W_0^{IRA}+A_t^{IRA})\right] + \left[(1+r_{t+1})(1-\tau_{t+1}^g)(W_0^{NIRA}+A_t^{NIRA})\right]$$
$$+\left[(1+r_{t+2})(1-\tau_{t+2})(W_0^{IRA}+A_t^{IRA}+A_{t+1}^{IRA})\right] + \left[(1+r_{t+2})(1-\tau_{t+2}^g)(W_0^{NIRA}+A_t^{NIRA}+A_{t+1}^{NIRA})\right]$$
$$-\left[C_t + C_{t+1} + C_{t+2} + (1-\tau_t)A_t^{IRA} + A_t^{NIRA} + +(1-\tau_{t+1})A_{t+1}^{IRA} + A_{t+1}^{NIRA}\right]$$

The first-order conditions w.r.t consumption for the above maximization prob-

lem is

$$U_{c_t} = \frac{1}{c_t} - \lambda_t \tag{3.6}$$

$$U_{c_{t+1}} = \frac{1}{c_{t+1}} - \lambda_{t+1} \tag{3.7}$$

$$U_{c_{t+2}} = \frac{1}{c_{t+2}} - \lambda_{t+2} \tag{3.8}$$

Similarly, w.r.t leisure consumption, the F.O.C's are

$$U_{(1-l)_t} = \frac{1}{(1-l)_t} - \lambda_t w_t(1-\tau_t) \tag{3.9}$$

$$U_{(1-l)_{t+1}} = \frac{1}{(1-l)_{t+1}} - \lambda_{t+1} w_{t+1}(1-\tau_{t+1}) \tag{3.10}$$

$$U_{(1-l)_{t+2}} = \frac{1}{(1-l)_{t+2}} - \lambda_{t+2} w_{t+2}(1-\tau_{t+2}) \tag{3.11}$$

Finally, with respect to contributions to the types of assets in the model

$$U_{A_t^{IRA}} = \lambda_t \left(-(1-\tau_t) + (1+r)(1-\tau_{t+1})\right) \tag{3.12}$$

$$U_{A_{t+1}^{IRA}} = \lambda_t \left(-(1-\tau_{t+1}) + (1+r)(1-\tau_{t+2})\right) \tag{3.13}$$

$$U_{A_t^{NIRA}} = \lambda_t \left(-1 + (1+r)(1-\tau_{t+1}^g)\right) \tag{3.14}$$

$$U_{A_{t+1}^{NIRA}} = \lambda_t \left(-1 + (1+r)(1-\tau_{t+2}^g)\right) \tag{3.15}$$

Given the first order conditions we can conclude:

$$\frac{\partial U_{A_t^{IRA}} / \partial U_{A_t^{NIRA}}}{\partial \tau_t^g} < 0, ^8 \tag{3.16}$$

i.e., as the capital gains tax increase, the marginal utility of contribution in

[8]The details of the calculation are shown in footnotes. The result is based on the assumption that there are no large variations in income tax rates between two time periods

IRA relative to non-IRA decreases, implying individuals start reallocating their assets away from non-IRA towards IRA. This is the main result of the theoretical model, as it establishes effect of changes in capital gains tax on portfolio reallocation. The next section discusses the methodology which will help in establish the results of the theoretical model, empirically.

3.7 Empirical Methodology

There are very few studies which have done empirical analysis on the effect of capital gains tax law change on portfolio allocation. Through simulation analysis, Poterba (2007) shows that when individual holds equities rather than bonds, a dollar invested through a TDA is less valuable, relative to a dollar invested outside a TDA. Results also suggest that as the marginal tax rates increase, investors need a longer investment horizon to match a dollar's wealth in TDA to wealth outside TDA. However, if the marginal tax rate is sufficiently lower compared to the dividend tax rate, it requires a shorter investment horizon to match investments in retirement accounts to investments in the stock market.

With respect to studies on effect of taxes on portfolio allocation, Scholz (1994) employs the Survey of Consumer Finance panel from 1983 and 1989 to investigate the effects of Tax Reform Act of 1986 (which had a substantial effect on both income tax and capital gains tax rates). Though the tax cuts were substantial, Scholz finds limited evidence of changes in household portfolios.

While, Poterba's is the only study which analyzes the impact of capital gains tax change on portfolio allocation, there are several empirical studies which have looked into how JGTRRA affected corporate policies. Poterba (2007) finds that due to the law change the after-tax value of dividends relative to capital gains would rise

by more than five percentage points.

A study by Desai and Dharmapala (2007) investigates how taxes influence portfolio choices by exploring the response to the distinctive treatment of foreign dividends in the Jobs and Growth Tax Relief Reconciliation Act (JGTRRA). The paper uses a difference-in-difference analysis to compare US equity holdings in affected and unaffected countries. They find that the international investment response to JGTRRA has an elasticity of -1.6, which suggests that taxes play a large role in shaping international portfolio choices as well.

Undoubtedly, there are several dimensions of the impact of capital tax law change, however, in this paper, I empirically study two main aspects — (i) how the reduction in capital gains tax affected portfolio allocation between IRA and non-IRA assets and (ii) the impact of tax reduction on labor supply. To perform this analysis, I use the difference-in-difference methodology, discussed in the next sub-section.

3.7.1 Difference-in-Difference Technique

The enactment of JGTRRA encouraged investment in the stock market through two channels – the reduction of dividend tax which prior to the law change was charged at the same rate as income tax and also the reduction of capital gains tax. To study the effects of the law change on portfolio allocation and labor supply, the data has been categorized into two sections – before the law change, year 2002 and after the law change, i.e., 2006. Using Meyer's notation, the model is given as

$$y_{it}^{j} = \alpha + \alpha_1 d_t + \alpha_2 d_j + \beta d_t^j + \epsilon_{it}^{j}, \tag{3.17}$$

where 'd_t' represents the time-period after the law change, i.e., after 2003, d_j represents the treated group, i.e., the group which had investments both in stock market

and IRA before the law change and finally d_t^j is the dummy variable for being in the treated group post-intervention. The idea behind this approach is that α_1 summarizes the way both groups $j = 0$ and $j = 1$ are influenced by time. There may be time-invariant differences in overall means between groups which is captured by α_2. The identifying assumption is that β should be 0 in the absence of treatment, or

$$E[\epsilon_{it}^j | d_t^j] = 0. \tag{3.18}$$

The difference-in-difference estimate is given as

$$\begin{aligned} \overline{\beta}_{dd} &= \Delta\overline{y}_0^1 - \Delta\overline{y}_0^0 \\ &= \overline{y}_1^1 - \overline{y}_0^1 - \left(\overline{y}_1^0 - \overline{y}_0^0\right) \end{aligned} \tag{3.19}$$

The comparison years are 2002 (Pre JGTRRA) and 2006 (post JGTRRA). Since the 2004 dataset consists of data from both 2003–04, it is not included in the analysis. In the estimation, the treatment group is individuals who had stock and IRA holding in 2002; the control group is individuals who did not have any investments either in IRA or in stock market or both, in 2002. To elaborate the specification in equation 3.19:

$$\begin{aligned} y_{i0}^1 &= \text{effect on treatment group before the law change} \\ y_{i1}^1 &= \text{effect on treatment group before after the law change} \\ y_{i0}^0 &= \text{effect on control group before the law change} \\ y_{i1}^0 &= \text{effect on control group after the law change} \end{aligned}$$

Given JGTRRA was a federal law change, recognizing a particular control group on the basis of state or particular socio-economic factors is difficult. For the current analysis I consider the control group as individuals who did not have any

investment and the treated group who were diversifying their portfolio or had investments in both forms of portfolio choices. It can be rightfully argued that any person who did not have any stock or IRA holding was also affected by the law change and hence they ought to be considered. However, the purpose of this research work is to identify a particular section in the economy which is likely to be most affected by the law change. Since the intended purpose of the empirical analysis is to find evidence of portfolio reallocation and also to see if people who changed their portfolio choices adjusted their labor market behavior as well, considering a group of people who faced the obvious effect, i.e., individuals who were diversifying their assets is an important and a crucial exercise.

3.7.2 Issues with DID

In this study, JGTRRA is treated as a natural experiment that changed the tax treatment of assets located in investments in stock market but not that of investments inside tax deferred accounts. Natural experiments allow the study of the effects of exogenous variation in explanatory variable that in other situations is endogenously related to the dependent variable. In this case it allows tthe study of how the policy intervention affected portfolio allocation and also helps in empirically teasing out the exogeneous effect of wealth on labor supply. Such experiments have been conducted in cases where there are changes in minimum wage laws (Card and Krueger 1994), effects of immigrants on the employment of natives (Card 1990), effect of military service on earnings (Angrist and Krueger 1994), labor supply and fertility decisions (Angrist and Evans 1996). Research related to natural experiments in the area of investments and tax policy has been conducted by Cummins, Hassett and Hubbard (1994) where they study the effect of tax reforms on labor supply and business level

investments.

There are some caveats associated with the empirical methodology. First of all, the framework assumes that an individual invests in both tax-deferred accounts and the stock market,i.e., top-bracket US investor. In reality, some US investors are in lower income brackets and much investment occurs through tax-exempt accounts. Individuals who have a strong prefernce for current consumption and haven't capped out their investments in IRA, can continue to invest only in IRA, even if the capital gains tax reduces.

Secondly, The enactment of EGTRRA in 2001 which reduced income tax rates across all tax brackets, is also likely to affect investments in IRA. Reductions in tax rates are likely to reduce investments in traditional IRA, on which one receives tax deduction upfront, but it can encourage investments in Roth IRA on which taxes are paid at the time of investment. Since the data that I am referring to (details given in next secion) does not identify the two separate kinds of accounts, the prevalence of income tax reduction during the same time period is likely to create some bias.

The IRS sets the annual contribution limit for IRA each year. The maximum limit has undergone some changes during the period of analysis. Till 2001, the limit was $2000, increased to $3000 between 2002 and 2004 and then again it increased to $4000 between 2005 and 2007. These increase in limits for tax deductible accounts,, creates higher incentive to invest in IRA even if JGTRRA reduced the cost of investment outside IRA.

Finally, as also noted by Desai and Dharmapala (2007), it is possible that firm's payout policies changed in response to JGTRRA. If they did, then it can bias the findings as the payouts could change in a manner that mitigate the tax cut effects. In addition, the temporary nature of the tax law change and the uncertainty about its expiry date could also weaken the findings.

3.8 Dataset

Since the objective of the paper is to find the effect of law change on portfolio allocation and retirement decisions, the dataset used in this research is the Health and Retirement Study (HRS). The Health and Retirement Study is by far the richest data source for studies related to retirement behavior. It started in 1992 and surveys more than 22,000 Americans over the age of 50 every two years. The study provides detailed information regarding physical and mental health, insurance coverage, financial status, family support systems, labor market status, and retirement planning. Other details about contributions and withdrawals towards IRA and non-IRA are also provided. Variables regarding income, housing and education are provided in details. There are several studies which have used the HRS for research purposes. For example, Barsky et al. (1997) measures preference parameters relating to risk tolerance, time preference, and intertemporal substitution, Moore and Mitchell (1997) explore asset holdings among a nationally representative sample of people on the verge of retirement, Gustman and Steimeier (1997) analyze the effect of pensions on savings. Though there are several studies which have looked into wealth holdings and retirement decisions using HRS, none have explicitly looked at the portfolio allocation between TDA and non-TDA.

Since HRS is a panel dataset it allows for tracking people over time. Summary statistics using panel data from years 2002 and 2006 indicate that IRA holding reduced to 37 percent in 2006 compared to 39 percent in 2002. However, the total amount invested in IRA increased by around three thousand dollars on an average for 2006. The total investment outside tax deferred account fell by about 5%. The total labor supply measured by multiplying the total number of hours in a week and the number of weeks worked fell from 2833 in 2002 to 1754 in 2006 on an average.

Simple cross tabulations between IRA holdings and holding outside tax deferred accounts indicate that in 2002, 8,846 individuals do not have any IRAs, 6,591 do not have any stock holdings and about 1,875 have investments in both types of accounts. These 1,875 people are considered in the treated group. Similar results are also found for the year 2006. These cross tabulations imply that post law change, number of people having stock investments increased and number of individuals having IRAs decreased. Overall the proportion of individuals holding IRA is lesser relative to non IRA. Table 3.6 provides summary statistics and explanations on pooled data from 2002 HRS (before law change) and 2006 HRS (after the law change) to give an idea of the range of variables available in Health and Retirement Study.

3.9 Results

There are three main categories of results, i.e., (i) with respect to changes made in IRA, (ii) with respect to changes in stock or outside IRA investments and (iii) with respect to labor supply and labor force participation. In all the cases, the treatment group are households who have investments both in IRA and non-IRA as they are the ones who are diversifying their assets in two competing investment choices. Individuals who have no stocks or IRA investments are the ones considered in the control group.[9] All estimates are categorized into pre and post tax law change time period and the "difference" column shows the difference between post and pre law change outcome or the difference between the treated and control group outcome. The numbers in bold indicate the difference-in-difference result.

[9]It should be noted that specifications with different treatment and control groups were tried. For example, (a) treatment group with households who "atleast" have some stock investments, (b) control group with households who do not diversify (but could have some investments in either stock market or IRAs). The results reported and discussed here are the ones which had the best fit and also support the theoretical predictions.

To analyze how the law change affected IRA investments, three different specifications were tried: (i) new investments in IRA, (ii) total wealth in IRA and (iii) likelihood of holding an IRA. Table 3.7 elaborates the result considerng "new investments in IRA" as the dependent variable. The difference-in-difference estimate is -175, implying that compared to the control group, the treated group reduced their annual investment in IRA by \$175 after the law change. This confirms our theoretical reasoning, which predicts that due to the reduction in capital gains, individuals would divert their investments away from IRA. The analysis takes into account only those households who are at or below the IRA contribution limit set by the internal Revenue Services and therefore has only 27,049 observations. The results also reveal that post JGTRRA, investments in IRA for the treated group fell by \$132. Given that, the treated group consists of people who diversify their assets this is an indication of portfolio reallocation.

Tables 3.8 and 3.9 show the results with respect to total IRA wealth and likelihood of holding IRAs. Both the results reveal that the law change created a negative impact on IRA wealth and proportion of people of having an IRA account. The difference in difference result suggests that the average IRA wealth fell by \$5972 and the number of people having IRA post law change fell by 11%. Also, the treated group had a decline in wealth holdings and IRA accounts, whereas the asset holding and probability of holding IRA increased for the control group. The three different specifications all support the predictions that IRA wealth and accounts reduce after the reduction in capital gains and dividend taxes, for households which diversify their assets.

The second set of results are with respect to changes in stock holdings and stock value. One of the main reasons for implementing JGTRRA was to revive the economy from recession by encouraging investment in the stock market. The reduc-

tion in capital gains tax was between 5% to 10% and for dividend taxes, the reduction in tax rates could be as high as 20% for high income individuals. Given these incentives, we would expect diversification in favor of stock market. Results from table 3.11 provides eveidence of that. The treated group increased their stock value by $17,858 and compared to the control group they had $19,030 in outside IRA stock investments. Although, it is possible that stock values were increasing due to stock appreciation and hence it cannot be said with certainty that the empirical result is purely due to diversification of assets from IRA wealth. However, results from table 3.10 also support the prediction that post law change there was an increase in stock holdings and the difference-in-difference result shows and increase of 0.01%.

To find the exogeneous effect of law change on labor supply, three different dependent variables were analysed; (i) total hours worked, (ii) labor force participation and (iii) planned retirement. The results are interesting, because the temporary nature of the law change creates different response in the current period and future period. Results from tables 3.12 and 3.13 show that compared to the control group, the treated group reduced their annual hours of work and labor force participation. While the average annual reduction in hours worked is 41 hours, the LFP reduces by 0.03 percentage points. The results are quite large as they imply a reduction of week's work and about 9 workers drop out of the labor force. This also shows that the wealth gain made by diversification of assets creates a strong positive income effect which results in reduction of labor supply.

"Planned retirement age" is one of the interesting information that is collected by the Health and Retirement Study. It takes into account expectations and gives an idea of how an individual predicts to behave in the future. Though there are very few individuals reporting their planned retirement age (only 2035 observations), the results imply that people in the treated group postpone their retirement by 1.16

years. While both control and treated group postpone their retirement, the effect is much larger in case of treated group. The fact that the treated group (or people who are most likely to be affected by the law change) reduce their current labor supply (or labor force participation) and increase their future labor supply, shows evidence of intertemporal substitution of labor supply. The strong income effect in the current period due to temporary reduction in taxes makes individual consume more leisure in the current period and replace it with higher labor supply in the future, probably when the tax law change expires.

3.10 Conclusion and Future Research

This paper opens up new direction of research on the effects of JGTRRA. While there are several studies which discuss how the dividend payout and stock market investments increased post-intervention, there is hardly any which has looked into the portfolio reallocation and labor supply aspects. This study establishes a significantly large impact of reduction in capital gains and dividend taxes due to JGTRRA. It shows both in a theoretical and empirical framework that an exogeneous change in taxes can result in substantial changes in portfolio choices and labor supply. Apart from analysing the effects of law change with respect to investments and labor market, this research work also identifies an exogeneous variation in wealth, which helps in understanding the pure effect of wealth on labor market behavior. In particular, investors who have assets both in retirement and non-retirement accounts, tend to reallocate their assets more towards capital gains payable assets (as opposed to income tax payable assets) and reduce their current period labor supply. Since this paper is the first one to do real data analysis on the impact of JGTRRA on portfolio allocation and labor supply, there is no prior to compare it with. The results support

the predictions made by Poterba (2007) that JGTRRA would reduce value of assets held in retirement accounts and it would take longer investment horizon for a dollar's wealth in IRA to equal a dollar's wealth held in outside IRA.

There are varoius ways in which the current research can be extended. In this study I consider individuals above the age of 55, the analysis could also be extended to the younger cohort using datasets like Survey of Consumer Finance. Moreover, in this analysis, I consider only one treatment and control group. Since, it's a federal law change, finding a control group which is unaffected by the law change is difficult. However, several different treatment and control groups can be tried to make the findings of this paper more convincing. Another channel of future research would be the theoretical model. Currently, the theoretical model is a simple three-period model and does not take into account the changing limits of IRA contribution. Taking into account, the limits of contribution help in further identifying why and when diversification between assets occur. Also, there is no uncertainty built into the model. As long as the uncertainty is with respect to overall economic changes (like recessions and housing market bubble), the portfolio diversification results might not be largely affected. However, we also need to consider that JGTRRA is a temporary change and there was uncertainty with respect to the exact time frame of how long the law change would remain effective. These uncertainties could mute the expected effects of increased investments in stock market.

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Table 3.1: Before and After Law Change

Variable	Pre-JGTRRA	Post-JGTRRA
Income Tax	τ_0:from 15% – 39.6%	τ_1:from 10% – 35%
Capital Gains Tax	τ_0^g: 8%, 10% and 20%	τ_1^g: 5% and 15%
Dividend Tax	τ_0^d from 15% – 39.6%	τ_1^d: 5% and 15%
Law Change Effect	τ_0^d=τ_0	τ_1^d=τ_1^g, $\tau_1^d < \tau_0^d$, $\tau_1^g < \tau_0^g$

Note: Superscripts represent the time period and the subscripts represent the type of taxes; g for capital gains, d for dividend taxes; income tax remained same throughout the period

Table 3.2: Returns and Tax Rates on Different Kinds of Investment

Variable	Return on Stocks	Return on Bonds	Tax on Stocks	Tax on Bonds
For Taxable Account	g+d	r	τ_g, τ_d	τ
For Tax Deferred Account	g+d	r	τ	τ

Note: (g+d) are capital gains and dividends; r: market rate of interest on bonds

Table 3.3: Differences between a Traditional and Roth IRA

Questions	Traditional IRA	Roth IRA
Limit on when I can set up an IRA	You must not be aged $70^{1/2}$ by the end of the year	you can be of any age
Is there any contribution limit	For 2007, you can contribute $4000 or $5000 if you are 50	Same as in traditional
Deduct Contributions?	Yes. How much depends upon income,filing status, other pension a/c, SSB	No. You can never deduct contributions
Distribution restrictions	Must begin receiving distributions by April 1 of the year following the year you reach $70^{1/2}$	No restrictions on taking distributions
Tax Treatment	Distributions are taxed as ordinary income	Distributions are not taxed. Taxes paid on contributions

Table 3.4: Cross Tabulations Between IRA and non-IRA holdings: Year 2002

	Have Stocks	Don't Have stocks	Total
Don't Have IRA	6,202	2,644	8,846
Have IRA	1,875	3,947	5,822
Total	8,077	6,591	14,688

Table 3.5: Cross Tabulations Between IRA and non-IRA holdings: Year 2006

	Have Stocks	Don't Have stocks	Total
Don't Have IRA	7,609	1,515	9,124
Have IRA	2,961	2,583	5,544
Total	10,570	4,098	14,668

Table 3.6: Summary Statistics

Variable	Mean	Std. Dev
Education	12	3.36
Hrs Per Wk	36	15.18
Weeks Worked	48	9.27
Planned Ret. Age	64	4.57
Working	0.28	0.45
IRA Statistics		
Have IRA	0.36	0.48
Total IRA Amt	88,515	146,654
IRA Withdrawn	13,993	23,483
IRA Addition	8,541	15,914
Stock Investment		
Stock Value	63,415	99,515
CDS Invmt	49,733	94,478
Bond Value	95,046	173,718
Stock Income	7,341	29,601
CDS Income	2,501	6,774
Stock Invmt	0.31	0.46
Bond Invmt	0.07	0.26
CDS Invmt	0.2	0.4
Other Assets	62,295	131,645

Note: The total number of observations is 29,336 except in case of planned retirement age where there are 2,035 observation due to large number of missing values. The population considered here is above the age group 55.

Table 3.7: DID Estimates for New Investments in IRA

	Before Law Change	After Law Change	DIfference
Treated	1021	889	-132
Control	618	661	43
			(8.96)
Difference	403	228	**−175**
			(25.97)

Note: The total number of observations is 3,762 and R–squared is 0.04. The other controls considered here are education, gender and age. All values are significant at 1% level.

Table 3.8: DID Estimates for Total Wealth in IRA

	Before Law Change	After Law Change	DIfference
Treated	122,240	120,983	−1257
Control	61,930	66,645	4715
			(1077)
Difference	60,310	54,338	**−5972**
			(2509)

Note: The total number of observations is 4,519 and R–squared is 0.06. The other controls considered here are education, gender and age. All values are in 2002 constant dollars and significant at 1% level.

Table 3.9: DID Estimates for Having an IRA

	Before Law Change	After Law Change	DIfference
Treated	0.59	0.55	−0.04
Control	0.18	0.25	0.07
			(0.005)
Difference	0.41	0.30	**−0.11**
			(0.01)

Note: The total number of observations is 4,519 and R–squared is 0.09. No other controls included (as LPM gave values greater than 1). All values are significant at 1% level.

Table 3.10: DID Estimates for Having Stocks

	Before Law Change	After Law Change	DIfference
Treated	0.99	0.99	−0.00
Control	0.09	0.08	−0.01
			(0.002)
Difference	0.90	0.91	**0.01**
			(0.008)

Note: The total number of observations is 4,519 and R–squared is 0.56. No other controls included (as LPM gave values greater than 1). All values, except DID effect are significant at 1% level.

Table 3.11: DID Estimates for Total Stock Value

	Before Law Change	After Law Change	DIfference
Treated	134,170	152,028	17,858
Control	10,476	9304	−1172
			(1116)
Difference	123,694	142,724	**19,030**
			(3141)

Note: The total number of observations is 4,519 and R–squared is 0.16. No other controls included. All values are significant at 1% level except for the time effect.

Table 3.12: DID Estimates for Total Hours Worked

	Before Law Change	After Law Change	DIfference
Treated	708	863	155
Control	522	718	196
			(11.1)
Difference	186	145	−41
			(31.2)

Note: The total number of observations is 4,519. Except for the DID effect, all results are significant at 1% level.

Table 3.13: DID Estimates for Labor Force Participation

	Before Law Change	After Law Change	DIfference
Treated	0.35	0.45	0.10
Control	0.25	0.38	0.13
			(0.005)
Difference	0.10	0.07	−0.03
			(0.014)

Note: The total number of observations is 4,519 and R-squared is 0.02. All results are significant at 1% level.

Table 3.14: DID Estimates for Planned Retirement Age

	Before Law Change	After Law Change	DIfference
Treated	63.12	64.34	1.22
Control	64	64.06	0.06
			(0.21)
Difference	−0.88	0.28	1.16
			(0.51)

Note: The total number of observations is 2035 and R-squared is 0.004. None of the results are significant.