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An empirical investigation of the FairTax as an alternative to the federal personal income, corporate income, estate and gift, and payroll taxes

Yingxu Kuang
Louisiana Tech University

AN EMPIRICAL INVESTIGATION OF THE FAIRTAX AS AN ALTERNATIVE TO THE FEDERAL PERSONAL INCOME, CORPORATE INCOME, ESTATE AND GIFT, AND PAYROLL TAXES

by

Yingxu Kuang, M.P.A., M.B.A.

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Supervisor of Dissertation Research

Head of Department

Accounting
Department

Recommendation concurred in:

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Approved:

Director of Graduate Studies

Dean of the College

Approved:

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ABSTRACT

Dissatisfaction with the current federal tax system is fostering serious interest in a national retail sales tax. Specifically, the **FairTax Plan** intends to replace most of the federal taxes with a national retail sales tax and is gaining momentum in Congress because of its purported progressive features. The **FairTax** is promoted as being progressive but there is considerable opposition to this claim.

Using the most recent 2005 Consumer Expenditure Survey (CES) data and estimating lifetime income from a Panel Study of Income Dynamics (PSID) panel tracked over1968-2005, the distribution impacts of the **FairTax Plan** are examined, as well as the current federal tax system it intends to replace, under both annual income and lifetime income approaches. Global measures of progressivity suggest that the current federal tax system is progressive while the **FairTax** is regressive. While the **FairTax Plan** is much less regressive under lifetime income approach, it is still not comparable to the current federal tax system from the aspect of progressivity. Additionally, the current federal tax system produces, in comparison to the **FairTax Plan**, a larger reduction in the inequitable before-tax income distribution. However, both tax systems are found to induce some degree of horizontal inequity, which negate the redistributive effects of the tax systems.

The results of the present study are robust in regard to who currently pays the employer payroll taxes (i.e., the employers or the employees), revenue-neutral sales tax

rate assumptions, and different discount rates, age ranges, and PSID sample selection criteria used for lifetime income estimation.

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CHAPTER 1

INTRODUCTION

Background

In *The Wealth of Nations*, Adam Smith, the father of modern economics, laid out certain criteria for judging tax structures and tax policies. Specifically, he felt that equity, explicitness, simplicity of compliance, and economy of administration should be the cornerstones of any tax system. The current federal tax system is criticized as being too complicated and unfair (Slemrod 2006). Efforts to simplify the current tax system, e.g., *Tax Reform Act of 1986*, are often viewed as ineffectual in creating a fairer or simpler system (Hite and Roberts 1992). For example, the President's Advisory Panel on Federal Tax Reform (2005) points out that "our current tax code is a complicated mess. Instead of clarity, we have opacity. Instead of simplicity, we have complexity. Instead of fair principles we have seemingly arbitrary rules. Instead of contributing to economic growth, it detracts from growth."

Consequently, many federal tax reform plans have been proposed, including a variety of consumption-based plans such as a flat tax, a value-added tax (VAT), and a national retail sales tax. The idea of replacing the federal tax system with a national retail sales tax has been increasingly discussed in the United States since the 1990s. Among the various national retail sales tax proposals, the **FairTax** legislation introduced by House

Representative John Linder and Senator Saxby Chambliss (H. R. 25 / S. 1025) has attracted more cosponsors than any other fundamental tax reform bill. The legislation's formal name is the *Fair Tax Act of 2007* (H. R. 25 / S. 1025) and a number of congressional committees have heard testimony on it.

National Retail Sales Tax

A retail sales tax is a form of consumption tax that is imposed on the final sales of goods and services to consumers. Like other consumption taxes, the retail sales tax does not tax normal returns to savings and investments, and thus, may lead to greater economic growth than our current tax system (the President's Advisory Panel on Federal Tax Reform, 2005).

Currently, there is no national retail sales tax in the United States though sales taxes are assessed by every state except Alaska, Delaware, Montana, New Hampshire, and Oregon. Hawaii has a similar tax although it is charged to businesses instead of consumers. Boortz and Linder (2005) provide a fairly comprehensive list of benefits under the national retail sales tax which is currently receiving the most attention, the **FairTax Plan**. The following are examples of the benefits which they present. First, a national retail sales tax is easier to administer and thereby, more cost efficient for the government. Because forty-five states currently administer sales tax systems, the necessary equipment could easily be provided to the remaining five states that do not. Second, the tax burden per person is lowered because the taxpayer base is broadened. To clarify, a consumption tax system collects from individuals who do not contribute to the current system because of legal or illegal reasons, e.g., tax evaders, illegal immigrants, and tourists.

Since a consumption tax has never been implemented at the federal level, researchers often conjecture about the success of a national retail sales tax by examining the success of state-level sales taxes. Mikeseli (1997) warns that this analysis over-estimates the potential degree of federal compliance since the necessary national retail sales tax rate will be significantly higher than any rate currently in use at the state-level. Additionally, he notes that discrepancies of what is and what is not taxable between the federal and state-level consumption taxes would create compliance problems for businesses.

Prior National Retail Sales Tax Proposals

Garber (1988) declares that "the possibility of enacting a broad-based national sales tax in the U.S. is nil." Nevertheless, interest in converting the current federal tax system into a national retail sales tax system is gaining momentum, as evidenced by the almost perpetual introduction of consumption tax proposals in Congress.

H.R. 3039 introduced on March 6, 1996, in the 104th Congress appears to be one of the first to propose replacing the federal individual income tax, corporate income tax, and estate and gift taxes with a national retail sales tax. Following the introduction of H.R. 3039, there has been a national retail sales tax proposal in each congressional session. Granted, these proposals have differences in items such as the proposed tax rate, intended non-taxable items, taxes to be repealed, and the use of credits. Nonetheless, their persistence on the floor of Congress reflects a substantial amount of interest in alternatives to our current federal tax system.

The FairTax Plan

The **FairTax Plan** was created by Americans For Fair Taxation, an advocacy group formed for the purpose of tax reform. The group developed the plan and the name "**FairTax**" together with economists based on interviews, polls, and focus groups of the general public (en.wikipedia.org). Georgia Republican John Linder first introduced the **FairTax Bill** (H. R. 2525) in July 1999 to the 106th Congress. He has reintroduced substantially the same bill in each subsequent session of Congress. The bill is currently designated as *H.R. 25: Fair Tax Act of 2007* in the House and *S. 1025* in the Senate. Besides the sponsors, Representative Linder and Senator Chambliss, it has 72 cosponsors in the House and 4 cosponsors in the Senate (Thomas 2007). The **FairTax** has generated a large grassroots tax reform movement in recent years led by the nonpartisan group Americans For Fair Taxation. Increased support was created after talk show host Neal Boortz and Representative Linder published *The FairTax Book* (HarperCollins Publishers) in 2005.

Replacement Taxes. The **FairTax** proposal (U.S. Congress, House 2007, H. R. 25; U. S. Congress, Senate 2007, S. 1025) replaces the existing federal personal income, corporate income, estate and gift, capital gains, alternative minimum, Social Security, Medicare, and self-employment taxes with a federal retail sales tax to be levied once at the point of purchase on all new goods and services. Basically, the bill would repeal all federal taxes except excise taxes.

Tax Rate. The sales tax rate, as defined in the legislation, is 23% of the total transaction value of a purchase; in other words, consumers pay to the government 23 cents of every dollar spent. The assessed tax rate is 30% if the **FairTax** is added to the

pre-tax price of a good like traditional U.S. state sales taxes. The 23% rate is called a tax-inclusive rate while the 30% rate is called a tax-exclusive rate. For example, if a new good is purchased at a $100 sales price, there is $30 of tax assessed on the sale. Therefore, the total amount paid for the good is $130. The 23% tax-inclusive rate is computed by dividing the $30 tax by the tax-inclusive sales price of $130. Conversely, the tax-exclusive rate of 30% is computed by dividing the $30 tax by the tax-exclusive sales price of $100. The use of the tax-inclusive number in presenting the rate has been criticized as deceptive by the plan's opponents. For example, ITEP (2004) contends that "H.R. 25 confusingly advertises its sales tax rate as 23 percent, but that's rather disingenuous." On the other hand, proponents argue that the 23% number represents a better comparison to income tax rates which are presented as inclusive rates (fairtax.org).

Taxable Personal Consumption. The **FairTax** is assessed on all retail sales for personal consumption on new goods and services. Used goods sales and business-to-business purchases for production of goods and services are not taxed. A good is considered "used" and not taxable if a consumer already owns it before the **FairTax** takes effect or if the **FairTax** has already been paid on the good. Food produced and consumed on farms never reaches retail markets and is not subject to the FairTax. State and local sales taxes are excluded from the FairTax base to avoid cascading (Bachman et al. 2006). Exports, savings, and financial investing are not taxed. Education tuition expenses are considered an investment rather than final consumption and therefore nontaxable. Credits are provided for tax paid on business use of goods and services, products intended for export and consumption outside the United States, goods purchased with insurance proceeds, bad debts for unpaid invoices, and refunds (fairtax.org).

Personal services such as health care, legal services, haircuts, and auto repairs are subject to the **FairTax**. In comparison, state sales taxes do not generally tax such services. The **FairTax** is levied on internet purchases and retail international purchases that are imported to the United States. The FairTax has special provisions for housing and financial intermediation services (Bachman et al. 2006). With respect to housing, the FairTax is assessed on new home sales but not on existing home sales. Sale of a newly constructed home business or individuals that intend to rent the home is not taxed because it is a business-to-business sale (Gale 2005). Rental payments, home improvement, and realtors' fees are taxable as payments for services. In regard to financial intermediation, the FairTax taxes both explicit and implicit financial intermediation services. Explicit financial intermediation services include fees for brokerage, banking, and other financial services. Implicit financial intermediation services are defined as the difference between the actually paid interest rate and a benchmark Treasury rate. For example, a taxpayer with a mortgage rate of 7% would have 2/7 of the mortgage interest payment subject to tax if the Treasury rate were 5%.

Monthly Tax Rebate. Every household of the United States is also eligible to receive a sales tax rebate each month. This rebate is equal to the product of (1) the sales tax rate of 23% and (2) the family consumption allowance divided by twelve (see Table 1.1). The family consumption allowance is computed per the poverty level published by Department of Health and Human Services poverty guidelines. The monthly rebate is known as "prebate" as it would be paid in advance. To become eligible for the prebate, households would register once a year with their sales tax administering authority, providing the names and social security numbers of each household member (fairtax.org).

The Social Security Administration would disburse the monthly prebate payments in the form of a paper check via U. S. Mail, an electronic funds transfer to a bank account, or a "smartcard" that can be used much like a bank debit card (H.R 25).

The President's Advisory Panel for Federal Tax Reform cited the prebate as one of their biggest concerns with the **FairTax**, calling it "the largest (entitlement program) in American history," and contending that it would "make most American families dependent on monthly checks from the federal government for a substantial portion of their incomes." Based on the advisory panel's tax rate and base[1], "the prebate program would cost more than all budgeted spending in 2006 on the Departments of Agriculture, Commerce, Defense, Education, Energy, Homeland Security, Housing and Urban Development, and Interior combined." However, proponents point out that income tax deductions, tax preferences, loopholes, credits, etc., under the current system are estimated at $945 billion by the Joint Committee on Taxation, which is more than the **FairTax** prebate program would cost (fairtax.org). Due to the monthly tax prebates that are used to "untax" purchases up to the poverty level, the effective tax rate calculated based on consumption for any household would be variable. The prebates would have the greatest impact at low spending levels. When a household only spends the amount that is equal to or less than the average poverty level spending, the prebates could lower a household's effective rate to zero or a negative rate.

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[1] The advisory panel's national retail sales tax base differs from the FairTax legislation by creating exemptions not defined in the FairTax proposal.

Table 1.1 2007 FairTax Prebate Schedule

One adult household				Two adult household			
Family Size	Annual Consumption Allowance	Annual Prebate	Monthly Prebate	Family Size	Annual Consumption Allowance	Annual Prebate	Monthly Prebate
1 person	$10,210	$2,348	$196	N/A	N/A	N/A	N/A
and 1 child	$13,690	$3,149	$262	couple	$20,420	$4,697	$391
and 2 children	$17,170	$3,949	$329	and 1 child	$23,900	$5,497	$458
and 3 children	$20,650	$4,750	$396	and 2 children	$27,380	$6,297	$525
and 4 children	$24,130	$5,550	$462	and 3 children	$30,860	$7,098	$591
and 5children	$27,610	$6,350	$529	and 4 children	$34,340	$7,898	$658
and 6 children	$31,090	$7,151	$596	and 5children	$37,820	$8,699	$725
and 7 children	$34,570	$7,951	$663	and 6 children	$41,300	$9,499	$792

Source: www.FairTax.org

Revenue Neutrality. One heated debate surrounding the **FairTax** is the ability to be revenue-neutral, which means whether it would generate the same amount of overall federal tax revenues. Supporters of the **FairTax** claim the 23% rate is revenue-neutral while opponents disagree.

Bachman et al. (2006) conclude that the **FairTax** would be revenue-neutral for the tax year 2007 at a tax-inclusive rate of 23.82% (a tax-exclusive rate of 31.27%) assuming full taxpayer compliance. In addition, the Argus Group and Arduin, Laffer, & Moore Econometrics each provided an analysis that defended the 23% rate (fairtax.org).

In contrast to these studies, Gale (2005) estimates the required tax rate for H.R. 25 over the years 2006-2015 would be 31% tax-inclusive (44% tax-exclusive) assuming full taxpayer compliance. If the tax rate were set at 23% tax-inclusive, the revenue loss would exceed $7 trillion over 2006-2015 relative to current law. Gale (2005) also concludes that if the private consumption tax base in H.R. 25 were eroded by 10% due to tax evasion, tax avoidance, and/or legislative adjustments, the average rate would be 34% tax-inclusive (53% tax-exclusive) for the 10 year period. If 20% of the tax base were eroded, then the 10-year revenue-neutral **FairTax** rate would be 39% tax-inclusive (65% tax-exclusive). Earlier analyses by Citizens for Tax Justice and the Congressional Joint Committee on Taxation also find higher than 23% revenue-neutral rates (ITEP 2004). The President's Advisory Panel for Federal Tax Reform provides an analysis to replace the personal income tax (excluding payroll taxes) with a retail sales tax and estimates a tax-inclusive rate of 25% (34% tax-exclusive) for 2006 (Report of the President's Advisory Panel for Federal Tax Reform, November 2005. p216-217). Considering the

fact that the **FairTax** replaces most federal taxes besides personal income tax, the revenue-neutral rate would need to be substantially higher.

Due to the fact that various analysts use different assumptions, time-frames, and methodologies that result in dramatically different tax rates, direct comparison among the studies is difficult. Instead of assuming revenue neutral or non-neutral, the current study will provide analysis under both the proposed **FairTax** rate and the Gale (2005) rates.

Equity Considerations of the FairTax

Analysis of a federal tax system is often made on the basis of the equity or inequity of the distribution of the resultant tax burden (Iyer 1994). Progression arises from principles of vertical equity which call for "the appropriately unequal tax treatment of unequals." A progressive tax system has been accepted as the normative basis of taxation.

A common criticism of sales taxes is that they are regressive. That is, lower level income households bear a larger than equitable portion of the tax burden because most of their income is spent on essential daily need consumption items. On the other hand, higher level income earners spend a significantly smaller proportion of their income, resulting in a corresponding tax liability that is less than expected under a progressive tax system (ITEP 2004). However, proponents of a national retail sales tax maintain that this assumes all of the sales tax is passed forward to consumers and none is borne by resource owners. Although this position may hold merit, Derrick and Scott (1998) find that when examining the state of Maryland, the state-level sales tax is regressive irrespective of the assumptions regarding sales tax shifting mechanisms.

The proponents of a national retail sales tax maintain that the sales tax can be progressive due to exemptions or rebates. Recent empirical evidence (Kotlikoff and Rapson 2006; Tuerck et al. 2006) indicates that the **FairTax** is a progressive tax system because of its unique features such as the Family Consumption Allowance. Also, the **FairTax** eliminates the payroll tax system. Because prior researchers ascertain the payroll tax structure to be regressive (Pechman et al. 1968), its repeal makes the **FairTax** more progressive. Nonetheless, ITEP (2004) cautions that the **FairTax Plan** results in a regressive tax system despite these features.

However, as discussed in the revenue neutrality section of this paper, different assumptions, time-frames, and methodologies could be the reason for these dramatically different results. For example, Metcalf (1997) finds that sales taxes look much less regressive when assessed via lifetime income rather than the annual income approach employed in most studies. Therefore, the current study will consider both annual income and lifetime income approaches to distribute income and analyze the equity effects of the **FairTax** as an alternative to the current federal tax system.

Significance of the Problem

This research is motivated by two primary factors. First, the possibility of replacing the current federal tax system with a national retail sales tax system was vaulted to the forefront of tax reform discussions after President George W. Bush commented that "it's the kind of interesting idea that we ought to explore more seriously (Gongloff 2004)." Moreover, it receives considerable support from an associated organization called Americans for Fair Tax Taxation, which has over 600,000 members, and the support of organizations such as the National Taxpayers Union (Burton 2004). Second, prior

research consistently finds that taxpayers have a strong preference for progressive tax systems (e.g., Porcano 1984; Hite and Roberts 1991; Copeland and Harmelink 1995; Yelvington 1998). On account of this apparent preference for progressive tax systems, it appears counter intuitive that any sales tax plan garners the requisite support since several researchers (e.g., ITEP 2004) find them to be regressive. As a matter of fact, Slemrod (2006) finds that popular support for tax reforms such as a flat tax or a national retail sales tax is associated with the misconceptions that high-income people would pay more taxes under these reforms and that the distribution of the burden of the existing income tax is regressive. Therefore, an in-depth empirical investigation of the progressivity of both the existing tax system and the **FairTax** proposal is needed on this vital topic.

As discussed in the preceding section, current literature presents mixed results for the progressivity of the **FairTax**. These opposing views may arise because of inadequate distributional analysis of the **FairTax** as compared with the current federal tax system. First, prior research uses either the actual (e.g., Kotlikoff and Rapson 2006; Tuerck et al. 2006) or higher than the actual **FairTax** sales tax rate (e.g., Feenberg et al. 1997; Metcalf 1997; Gale 2005), depending on whether it deems the rate to be revenue-neutral. However, no study to date provides analysis under both rates. Second, the current study is the first to use global progressivity indices to assess the distributional impacts of replacing the current federal tax system with the **FairTax**. Last, most distributional analysis of the **FairTax** has used the annual income approach for analysis while the lifetime income approach could lead to different results (e.g., Metcalf 1997).

Contrasting the results of lifetime income and annual income approaches, this research compares the **FairTax** with the current tax system via global measures of

progressivity. It also provides a timely distributional analysis based on the proposed 23% **FairTax** rate, as well as the higher revenue-neutral rates maintained by Gale (2005), for the current tax system and the **FairTax** that should be of value to policy makers and taxpayers.

Objectives of the Study

The current study is designed to gauge the potential distributional impacts of adopting the **FairTax**. It fills the existing gaps in the literature relating to equity in the national sales tax. It has three major objectives.

The first goal is to assess the progressivity of the **FairTax** using global indices. Instead of addressing general forms of national retail sales tax systems using parameters (i.e., tax rates, tax exempt items, etc.) which are delineated by the researchers (e.g. Feenberg et al. 1997; Metcalf 1997), the current study focuses on the actual components in the legislative proposal entitled the **FairTax**. Additionally, the common methodological approach, e.g., Smith (2001), of employing global tax progressivity measures (i.e., Kakwani 1977; Reynolds-Smolensky 1977; Suits 1977; and Pfähler 1983) are adopted to make a comprehensive inference regarding the degree of progressivity over the entire tax system.

The second objective is to compare the progressivity of the FairTax with the current federal tax system. Additionally, it tests both the current income tax system and the **FairTax** to gauge which system has the greater ability to reduce overall income inequality. This is necessary because Formby et al. (1990) indicate that the redistributive effect of a tax system is comprised of a re-ranking (i.e., horizontal equity) effect in addition to the progressivity effect.

The third objective is to contrast the results under two income distribution approaches: annual income method and lifetime income method. Prior research indicates that these two methods could lead to different results when measuring the progressivity of a tax system. However, as indicated by Fullerton and Rogers, "the fairness of a tax should be evaluated both on how current taxes reflect current ability to pay and on how lifetime taxes reflect lifetime ability to pay"(Fullerton and Rogers 1991, p278). Therefore, both income distribution methods are applied in the current study.

Overview of Research Questions and Methodology

The current study addresses the following research questions:

1. How will the **FairTax Plan** change the distribution of tax burdens for different income groups?
2. Is the **FairTax** regressive or progressive under the annual income approach?
3. What is the progressivity level of the **FairTax** compared to that of the current federal tax system it may replace under the annual income approach?
4. Is the **FairTax** regressive or progressive under the lifetime income approach?
5. What is the progressivity level of the **FairTax** compared to that of the current federal tax system it may replace under the lifetime income approach?
6. How effectively will the **FairTax** reduce inequalities in the distribution of before-tax income compared with the current federal tax system it may replace?

Specifically, the current federal tax system and the **FairTax** are compared by employing the Suits (1977) and Kakwani's (1977) indices to measure the level of progressivity under each system. In addition, the redistribution effect of each tax system

is assessed with the Reynolds-Smolensky (1977) index and Pfähler (1983) index[2], which compares the before and after-tax income distributions.[3]

The primary analysis is performed using the micro-data of the 2005 Consumer Expenditure Survey (CES) which is administered by the Bureau of Labor Statistics, an agency of the U.S. Department of Labor. The CES micro-data allow us to reasonably approximate the amount of taxable consumption, as defined under the *Fair Tax Act of 2007* (H. R. 25 / S. 1025), for each household.

Federal personal income, corporate income, estate and gift, and payroll taxes are distributed to each CES household. Federal personal income and payroll taxes are reported by each CES household. Both employee and employer portions of payroll taxes are allocated to each household assuming an inelastic labor supply. But the assumption of elastic labor supply, which means consumers bear only the employee portion of payroll tax, is also applied as an alternative analysis. Estate and gift taxes are distributed according to the methodology used in Feenberg et al. (1997). Corporate income tax is first distributed according to the Feldstein's (1988) approach[4] which assumes that the corporate income tax is born by all those who hold any type of capital assets, not just those who own claims on corporate capital. Corporate income tax is also distributed based on the Congressional Budget Office (CBO) report in August 2006. This report

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[2] The standard tax progressivity measures such as Suits and Kakwani suffer from the "tax scale invariance" problem, which means that a proportional scaling of the tax system will not affect the value of the index. The Pfähler index is not tax scale invariant and therefore can capture the effect of reduced revenues on income distribution. Since some previous studies (e.g., Gale 2005) claim that **FairTax** reform is not revenue neutral, the Pfähler index can do a better job than other measures in this case.

[3] An often overlooked but useful property of the Kakwani index is that by utilizing the appropriate equations in Kakwani (1977), it is also capable of measuring the income inequality reducing the effects of tax systems. Consequently, this property is employed as a robustness check of the Reynolds and Smolensky results.

[4] This methodology is applied by mainstream distributional research such as Caspersen and Metcalf (1994), Feenberg et al (1997), Metcalf (1997), and Metcalf (1999).

estimates that for the corporate income tax in an open economy like the United States, workers could bear as high as 70 percent of the tax burden, while owners of capital would bear around 30 percent.

The distributional impact of the **FairTax** reform is measured using both annual and lifetime income measures to rank households. Panel Study of Income Dynamics (PSID) data for the years 1968-2005 are used to estimate the lifetime income of CES households. By estimating lifetime income using data from both CES and PSID, this approach draws on the strengths of each data set. The PSID has extensive annual income data from which measures of lifetime income can be constructed, and the CES has very good consumption data to approximate the tax base under the **FairTax** at the household level. Specifically, this research follows the Caspersen and Metcalf (1994) methodology. First, income age profiles in the PSID are constructed. The regression includes demographic variables available on both PSID and CES. Second, the estimated coefficients from this regression are applied to households in the CES to calculate an estimate of lifetime income. Last, a **FairTax** liability is computed for each household in the CES, and then the lifetime income distributional analysis can be carried out.

Organization of the Study

This dissertation consists of five chapters. Chapter 1 provides background on the national retail sales tax proposals. Additionally, it highlights the importance of this topic and the motivation of the present study. Chapter 2 reviews the pertinent distributional effects and national retail sales tax research literature that has a direct influence upon the current research. Chapter 3 addresses the research questions and discusses the data bases and research methodology. Chapter 4 presents the results including distributional tables,

global indices, and relevant graphs. Chapter 5 discusses the empirical findings, provides conclusions, and suggests areas of future research. Also, this study's limitations are noted.

CHAPTER 2

LITERATURE REVIEW

Distributional Effects Research

The purpose of distributional effects research is to give interested parties an idea of who bears the economic burden of taxes and how changes to the existing laws will affect specific groups of people (Barry 1994). The relative impact of different tax systems on income inequality is of considerable interest to tax policy researchers. Accordingly, several methodologies are available for evaluating and contrasting tax policies.

Distributional Analysis of the Overall U.S. Tax System

Herriot and Miller (1971) set the stage for future governmental distributional analysis of changes in existing tax policies or laws (Barry 1994). Being the first study to use income quintiles as the unit of analysis for the distribution of taxes, Herriot and Miller (1971) find that the total tax structure has little progressivity below the very highest income levels.

A major step forward in accurately measuring the distribution of taxes is Pechman and Okner (1974) which assesses the 1966 U.S. tax law burden on individuals, including state and local taxes. Pechman and Okner (1974) statistically merge actual tax return data produced by the Statistics of Income (SOI) division of the Internal Revenue Service

(IRS) with data from the Bureau of the Census' Survey of Economic Opportunity (SEO), the precursor to the present-day Current Population Survey (CPS). Use of CPS data enhances the Statistics of Income data with additional non-taxable income and demographic information. Pechman and Okner (1974) examined the distribution of taxes in a single year under eight different sets of assumptions which reflect the range of most economists' beliefs about the incidence of various taxes. Rather than the progressive increments which might be expected, their research indicates an "essentially proportional" tax system existed under the 1966 tax law.

Pechman (1985) extends Pechman and Okner (1974) by analyzing the distribution of total U.S. taxes from 1966 to 1985. Pechman (1985) finds the tax system to be more progressive during the 1970s. However, he also notes that the level of progressivity decreased after the passage of the *Economic Recovery Tax Act of 1981* (ERTA).

The findings in Pechman (1985) are supported by Minarik's (1985) analysis of individual income and payroll tax burdens for hypothetical families of four at multiples of the median income level between 1964 and 1984. Even though the methodology employed by Minarik (1985) of comparing the relative changes in tax rates at the end points of the income scales is less advanced than examining the pre- and post-tax Lorenz curves as done by Pechman (1985), both sets of methodologies reach similar results. Each study provides support for the position that progressivity of the U.S. tax system peaked prior to 1981.

Distributional Analysis of Payroll Taxes

Although empirical evidence indicates that the overall U.S. tax system fluctuates in terms of progressivity levels, the extant literature consistently finds payroll taxes to be

regressive (e.g., Pechman et al. 1968; Brittain 1972; Okner 1975). Payroll taxes are found to cancel out efforts to increase the level of tax progressivity through income tax reforms. Ricketts (1990) empirically tests the interaction of the 1980s' payroll and income tax reforms to assess their hypothesized net impact on the progressivity of the overall tax system. Two data sources are employed: for 1980, the Arthur Young/University of Michigan Taxpayer Panel data; for 1984 and 1988, the 1984 Internal Revenue Service Tax Model File. While the information on tax liabilities is directly available from this file for 1984, the 1988 tax liabilities are simulated. The Suits index is used to measure the vertical equity. Ricketts (1990) notes a decrease in the overall progressivity of the U.S. tax system during the 1980s because additional payroll taxes negate progressive income tax reforms.

In a similar fashion, the *U.S. Congressional Budget Office* (CBO 1987) concludes that despite progressive measures in the income tax system from 1984 to 1988, the overall progressivity of the tax system is lower than in 1977 because of increases in payroll taxes.

Iyer (1994) evaluates the vertical and horizontal equity effects of payroll taxation and taxation of social security benefits. A sample of taxpayers was collected from the IRS panel of individual taxpayers for the years 1984 through 1988. Mean income distributions were generated from these years and the payroll and income tax liabilities were simulated for the years 1989-1993. The payroll taxes were also computed based on two incidence assumptions: (1) half of the employer's portion of the tax is borne by the employee; and (2) the employer's portion of the tax is fully borne by the employee. The results indicate that the payroll tax was a moderately regressive tax during the period

1984 through 1988. The imposition of the payroll tax caused a significant reduction in the progressivity of the income distribution. The regressive effects of the payroll tax dominated the progressive effects of the income tax.

Distributional Effects of Tax Reform Proposals

Enis and Craig. Enis and Craig (1984) analyze the redistributional impact of a true flat tax which eliminates all exclusions, deductions, and credits. The IRS National Tax Model for tax year 1977, which consists of a stratified systematic sample of 155,212 individual income tax returns, is the data source for Enis and Craig (1984). The average effective rate is used to compare the tax burdens under this true flat tax system with that of the present system. The average tax rate is computed for each tax return sampled in this research, and the mean and median of these rates are computed for ten income classes in order to obtain the average effective rates for these groups.

The empirically-derived flat rate is 12.72 percent, under which the flat tax would yield the same tax revenue as under the existing system. The comparative analysis is performed on two groups: all tax returns and families with dependent children. The returns are grouped into decile rankings based upon expanded income. The analysis consists of the construction of tables and three-dimensional computer representations contrasting the distribution of the tax burden under current and flat structures. The results indicate that a true flat tax will transfer substantial taxes from the rich to the poor. Such findings are offered as a benchmark against which alternative tax reform proposals can be compared.

The average effective rate used in Enis and Craig (1984) is one of the pointwise measures of progressivity, i.e., estimates of the progressivity of a tax at several points of

interest along the income scale. Compared to global indices, such as the Suits index and Kakwani's index, pointwise measures will encounter difficulty in interpreting overall results as pointwise measures will vary at different points along the income scale.

Iyer et al. Iyer et al. (1996) investigate the distributional effects of replacing the current income tax system with two prototype flat tax systems. Specifically, using the current income tax system as a benchmark for comparison, Iyer et al. (1996) examine the vertical equity or progressivity effects of the Armey-Shelby-Craig flat tax and the Specter flat tax proposals as follows: (1) how each flat tax will change the distribution of tax burdens for various groups of taxpayers; (2) the overall progressivity of each flat tax, and (3) how effectively each flat tax will reduce inequalities in the distribution of before-tax income.

The sample data is obtained from the Statistics of Income Panel of Individual Returns (SOI panel) which is part of the Ernst & Young/University of Michigan Tax Research Data Base. Data from the years 1987-1990 is chosen. The final sample consists of a panel of 15,316 taxpayers, 5,350 of whom reported business income from schedules C, E, or F to Form 1040. The Suits index and Kakwani's index, along with the relevant graphs, are used to measure the progressivity of the tax systems. As indicated by the authors, because different indexes bear different features and limitations, "neither can an ideal index of progressivity or income inequality be presumed to exist, nor can any one index be judged unequivocally superior to the others." The use of multiple indexes in Iyer et al. (1996) helps to make the results more robust.

The results indicate that replacing the current tax system with either flat tax system would result in a modest increase in the average tax rate for taxpayers in the first

income decile. For the remaining taxpayers, switching to either flat tax system results in reductions in the average tax rate that tend to increase as income increases. Regarding overall progressivity, the results vary according to whether or not taxpayers report business income. For taxpayers reporting business income, the two flat tax systems are partially regressive and the current income tax system is the most progressive. For taxpayers reporting no business income, however, the Armey-Shelby-Craig system is most progressive. For both groups of taxpayers, both flat tax proposals moderate before-tax income inequity modestly, but neither moderates income inequity as effectively as the current income tax system.

Distributional Effects: Lifetime Income Approach

Fullerton and Rogers. Fullerton and Rogers (1993) question the typical annual income approach taken by most other distributional effects studies. As noted by Fullerton and Rogers (1993), "the group with the lowest annual income is a mixed bag. It includes some young workers just starting their careers who will likely earn more later, some retirees who had earned more earlier, some people with volatile incomes who just had a bad year, and finally the perennially poor." Consequently, Fullerton and Rogers ranked individuals based on the present value of their potential lifetime earnings adjusted for age. Using Panel Study of Income Dynamics (PSID) provided by the University of Michigan to create age-income profiles, Fullerton and Rogers (1993) describe a unique computational dynamic general equilibrium model that incorporates a complete set of major U. S. taxes, models households in many age cohorts, and allows for different lifetime incomes for households within and across cohorts. Fullerton and Rogers (1993)

are the first to use panel data, rather than annual survey or actual but static data, in the distributional analysis literature.

The authors first estimate age-wage profiles based on PSID data. Wage rates are regressed on time, the age of each individual, the age squared, the age cubed, and various demographic variables. The results of this regression describe how a person's earnings potential changes over time as a consequence of age and other factors. Lifetime income for each person can be calculated by summing up the discounted values of estimated wages.

The findings are presented in comparison to a proportion tax levied on all endowments of labor that would raise the same amount of revenue. Lifetime tax burdens of the entire U.S. tax system are found to be roughly proportional for the middle 96 percent of households while progressive at the very bottom and very top of the income distribution. Consistent with previous studies, they also find that the personal income tax is progressive, sales and excise taxes are regressive, and the payroll tax is the most regressive.

Caspersen and Metcalf. Caspersen and Metcalf (1994) measure the lifetime incidence of a value added tax (VAT) using data from the Panel Study of Income Dynamics (PSID) and the Consumer Expenditure Survey (CES) for the year 1988. Estimating lifetime income using data from both CES and PSID draws on the strengths of each data set. The PSID has rich annual income data from which measures of lifetime income can be constructed while the CES has extensive coverage of consumption data with which the tax base for a VAT at the household level can be created.

Caspersen and Metcalf (1994) use the following methods to estimate lifetime income: First, construct income age profiles in the PSID from which the present discounted value of earned income and gifts for a household are computed; Second, take the estimated coefficients from this regression and apply them to households in the CES to calculate an estimate of lifetime income; and Last, compute a VAT tax liability in the CES and carry out the distributional analysis using the measures of lifetime income.

Using two different measures of lifetime income, with fixed effects adjustment and without fixed effects adjustment, Caspersen and Metcalf (1994) find that a broad-based VAT would be only modestly regressive. Meanwhile, using annual income to measure economic well-being makes a VAT look quite regressive. By using current consumption as a proxy for lifetime income, it makes the VAT proportional.

Metcalf (1999). Metcalf (1999) measures the distributional impact of a green tax reform, i.e., a shift toward greater reliance on environmental taxes, using both annual and lifetime income measures to rank households. Three adjustments are made to the 1994 CES data: First, use the National Medical Expenditure Survey (NMES) to adjust medical spending; Second, use the National Income and Product Accounts (NIPAs) to match aggregate numbers; and Last, corporate taxes are distributed following the methodology of Feldstein (1988) which assumes that corporate taxes are borne by capital income. The alternative incidence assumption, i.e., half the burden falls on capital income and half on labor, is also tested. Using the same lifetime income measure as Caspersen and Metcalf (1994), Metcalf (1999) finds that an environmental tax reform can be designed to have a negligible impact on income distribution when the funds are rebated to households through reductions in the payroll tax and personal income tax.

Maxwell. Maxwell (2003) uses a PSID panel of 705 households tracked over 1970-1993 to estimate household lifetime income profiles that are used to predict lifetime income for 1995 CES sample of 638 households. Household income is assumed to be a function of economic and demographic variables. An exact maximum likelihood method is used to remove the first order autocorrelation in the PSID regression. When applying the parameter estimates from the PSID regression to the CES sample, a two-part income profile is generated for each CES household. The first part of the profile ranges from age 20 to the 1995 age of the household head, which is brought forward to 1995 as a present value; and the second part ranges from 1995 age of the head to age 80, which is brought to 1995 as a present value. The 1995 present value of each household's lifetime income is determined by adding the two profiles and 1995 predicted income. Total lifetime income is then annualized by calculating a weighted average annuity equivalent. Both annual and lifetime income estimates are used to determine the incidence of Oklahoma's state sales tax. Additional incidence estimates associated with exempting food and adding select services to the state sales tax base are analyzed. Findings based on an annual income perspective show Oklahoma's sales tax to be regressive, yet roughly proportional over a wide range of lifetime income quintiles. Exempting food and adding select services reduce the regressivity of the sales tax.

Summary of Distributional Effects Research

Empirical evidence indicates that the overall U.S. tax system fluctuates in terms of progressivity levels. Payroll taxes seemingly act to cancel out efforts to increase the level of tax progressivity through income tax reforms. Various tax reform proposals, such as a flat tax and VAT, are generally found to be regressive which could transfer tax

burdens from the rich to the poor. However, more recent literature examines the incidence of taxes over time periods longer than one year, as annual incidence may differ from lifetime incidence because of life-cycle effects, inheritances, and transitory shocks. The extant literature that applies the lifetime income approach finds that income taxes appear to be less progressive in a lifetime cycle framework, while consumption-based taxes, such as a sales tax and VAT, appear to be less regressive.

National Retail Sales Tax (NRST) Research

The discussion of potentially shifting from the current federal tax system to a national retail sales tax (NRST) is not a new topic among researchers. In fact, the subject of the personal consumption tax appears to have originated in the 1940s. The movement may have been re-ignited in the 1980s and 1990s when the income tax system was criticized by a number of economists (e.g., Break 1984) for leading to substantial economic losses, inefficiencies, and the inability to correct itself because of the public's increasing belief that it is not a fair tax system.

Distributional NRST Research Prior to FairTax

Feenberg et al. Using sample tax returns from the 1990 IRS Statistics of Income (SOI) file, Feenberg et al. (1997) examine the distributional effects of replacing the federal income tax with a consumption tax under numerous hypothetical retail sales tax systems. For example, assessed systems included various combinations of potential tax exempt items (i.e., food, shelter, and medical services) as well as what current taxes would be replaced by a national retail sales tax, i.e., current income tax or the income tax and payroll tax. Of relevance for the current study, analysis is performed on a retail sales tax system that would integrate a "demogrant provision." Specifically, households would

receive payments equal to the retail sales tax rate times the respective poverty threshold of their family size as determined by the U.S. Bureau of the Census (1992). Amongst the hypothetical retail sales tax systems assessed in Feenberg et al. (1997), the demogrant provision plan is closest to the **FairTax**. When examining the average tax paid as a percentage of income under the demogrant provision plan, a 45.4 percent tax rate is assumed to make the system revenue neutral in relation to the current system. This is a substantially higher rate than the 30 percent proposed under the **FairTax**. The results were reported under the demogrant provision as average taxes paid as a percentage of consumption as well as a percentage of income for eleven different groupings of households based on their amount of consumption or income. The average taxes as a percentage of consumption increased as the level of consumption increased indicating a progressive relationship. When households are ranked by annual income, however, the results show that the tax burden on high income households is generally lower under the retail sales tax than under the income tax.

Metcalf (1997). Metcalf (1997) measures the lifetime incidence of a shift from the current income tax to a NRST. Using 1994 CES data, Metcalf (1997) finds that the incidence of the tax burden under a NRST reform depends on the measure of household well-being. Ranking households by annual or lifetime income makes a substantial difference. "If annual income is used to rank households, the tax reform looks very regressive. If lifetime income is used to rank households, the tax reform continues to look regressive, though much less so than when the annual income approach is used. If a universal rebate tied to poverty thresholds is coupled with the national sales tax, as is the case in the Schaefer-Tauzin bill (H.R. 2001), the sales tax is about as progressive as the

current income tax. Alternatively, if a payroll tax rebate is provided to low-income families, the new system is only slightly less progressive than the current income tax system." (Metcalf 1997, p1) Consequently, the author claims that a national sales tax replacement for the income tax is not inherently regressive and the universal rebate option could make a national sales tax non-regressive. Metcalf (1997) uses the income profiles constructed in Caspersen and Metcalf (1994) to estimate lifetime income. The income measures from Caspersen and Metcalf (1994) are updated to 1994 dollars using the CPI. The PSID data used in these two studies for lifetime income estimation are from years before 1988. All households, including those spanning very short lifecycle of a household head, are used for lifetime income estimation, which could lead to biased coefficients in the model.[5]

Other NRST Literature. Researchers also assess the implications of potential shifts in tax policy based on several NRST proposals. For instance, Burton and Mastromarco (1996) discuss the transitional considerations of implementing the H.R. 3039 proposal of 1996. Meanwhile, Murray (1997) notes that under H.R. 3039 the opportunities for tax avoidance and evasion would be sustained, not eliminated. More recently, Gale (2001) examines H.R. 3039 and H.R. 2001 of 1997 as to the impact on the complexity of the current tax system, e.g., costs, benefits, and causes of complexity.

Distributional Analysis on FairTax

Institute on Taxation and Economic Policy (ITEP 2004). ITEP (2004) represents the initial research on the distributional effects of adopting the **FairTax Plan**

[5] These two studies do not actually specify which years of the PSID data are used, or what are the sample selection criteria. But since Caspersen and Metcalf (1994) use CES 1988 for the primary analysis, it is logical to assume the data are from years before 1988. Also, since the number of observations in the PSID

(H.R. 25). Using ITEP state-by-state microsimulation tax model, ITEP (2004) strongly indicates that the current federal tax system is progressive while the **FairTax** is regressive. They claim that a national sales tax would shift the tax burden away from the high-income taxpayers and onto low- and middle-income taxpayers as well as shift aggregate taxes away from better-off states and onto poorer states and those with a high proportion of elderly residents. Specifically, ITEP (2004) highlights the following points: (1) In virtually every state, the bottom 80 percent of taxpayers would pay 51 percent more in sales taxes than they now pay in federal taxes that the proposed national sales tax would replace; in contrast, the best-off one percent of all taxpayers nationwide would get average tax reductions of about $225,000 each per year; (2) Under a national sales tax, 37 states would pay more in aggregate taxes while only13 states and the District of Columbia would pay less, among which over half of the total tax reduction would go to California and New York.

Supporters of the **FairTax** counter that the ITEP (2004) tests are biased due to political motivations (Burton 2004). Although the political motivations are beyond the scope of this endeavor, some concerns regarding the ITEP (2004) methodology are discussed below.

First, claiming that the 30% tax-exclusive sales tax rate is not high enough to create a revenue-neutral tax system transition, ITEP (2004) calculates the required break-even sales tax rate would be between 45% and 53%. As a result, the tax liabilities under the **FairTax Plan** in ITEP (2004) are computed on a sales tax rate at least 150 percent larger than the rate stipulated in the proposed legislation. Undoubtedly, the feasibility of

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regression model are 134,217 (Caspersen and Metcalf 1994, p738), households with short time-period information seem to have not been deleted.

the **FairTax**'s proposed sales tax rate is an important question that merits empirical investigation. Nevertheless, the distributional effects of the **FairTax** in its actual legislative format need to be assessed before tests are performed regarding potential changes in its underlying components such as the sales tax rate.

Second, ITEP (2004) makes no mention of reducing taxpayers' consumption of items specified as non-taxable under the **FairTax**. Examples of these non-taxable items include any used goods, mortgage interest, and tuition for educational institutions.

Last, the average tax burdens for taxpayers within various percentiles for each of the fifty states are reported in ITEP (2004); however, they do not utilize global progressivity indices to assess the distributional impacts of replacing the current federal tax system with the **FairTax**. Global indices allow for inferences to be drawn regarding the overall impact of tax systems rather than subjective tradeoff decisions concerning effects upon taxpayers at different income percentiles.

Kotlikoff and Rapson (2006). In contrast to ITEP (2004), Kotlikoff and Rapson (2006) find the **FairTax** to be more progressive than the current tax system. They conclude at the end of their paper the following: "compared with our existing federal tax system, the **FairTax**, as proposed in H.R.25/S.25, would significantly reduce marginal taxes on work, dramatically reduce marginal taxes on saving, and substantially lower the overall tax burdens on current and future workers. Moreover, it would do this without limiting tax progressivity. Indeed, the **FairTax** would make our tax system more progressive." While claiming the **FairTax** to be more progressive, Kotlikoff and Rapson (2006) use average and marginal tax rates, instead of global overall progressivity indices, for 14 stylized households.

There are two attributes of Kotlikoff and Rapson (2006) that differentiates it from ITEP (2004). First, Kotlikoff and Rapson (2006) perform simulations of lifetime income analysis with various combinations of stylized households. The stylized households consist of seven single individuals and seven married couples. Even though the income and expense items vary in amount, the representativeness of these 14 households for different income levels is doubtful. For example, each household is assumed to have a home with a mortgage expense and each household is assumed to have two children. Second, Kotlikoff and Rapson (2006) employ the 30% tax-exclusive tax rate as specified due to their assumption that this rate is revenue-neutral.

Other Related Literature on FairTax

Gale. Gale (2005) examines the required tax rate in a NRST. It shows that the specified 23% tax-inclusive rate in H.R. 25 can not maintain the real levels of government revenues and the real size of government spending programs while repealing the existing personal income, corporate income, payroll, and estate and gift taxes.

The required tax rate in a NRST is estimated using data from the National Income and Product Accountants (NIPA) and from the Congressional Budget Office (CBO). Equations for the required tax rate are developed holding the real (inflation-adjusted) size of government programs constant and maintains the real level of revenues. The equations are functions of taxes to be replaced, the tax base, avoidance, evasion, and so on.

The required tax rate for a NRST over the years 2006-2015 would be 31% tax-inclusive (44% tax-exclusive) assuming full taxpayer compliance. If the tax rate were set at 23% tax-inclusive, the revenue loss would exceed $7 trillion over 2006-2015 relative to current law. Gale (2005) also concludes that if the private consumption tax base in H.R.

25 were eroded by 10% due to tax evasion, tax avoidance, and/or legislative adjustments, the average rate would be 34% tax-inclusive (53% tax-exclusive) for the 10 year period. If 20% of the tax base were eroded, then the 10-year revenue-neutral **FairTax** rate would be 39% tax-inclusive (65% tax-exclusive).

Bachman et al. Bachman et al. (2006) defend the 23% tax-inclusive (30% tax-exclusive) rate that is specified in H.R. 25. Specifically, the authors conclude that the **FairTax** would be revenue-neutral for the tax year 2007 at a tax-inclusive rate of 23.82% (31.27% tax-exclusive) which is only slightly higher than the 23 percent rate in the **FairTax** legislation. By implementing the **FairTax** at a 23% rate, it would require a modest 2.73% reduction in real non-Social Security federal spending, according to their calculation.

Bachman et al. (2006) also assume full taxpayer compliance with the **FairTax**. While the authors admit that they have not explicitly considered tax evasion, they also claim that they have implicitly incorporated some degree of tax evasion in their calculations simply by using NIPA-based figures that presumably understate total household consumption. They also argue that two other factors could mitigate the revenue loss from tax evasion. First, the **FairTax** can enhance economic growth which would raise the **FairTax** base due to the general equilibrium feedback effects. Second, there would be roughly one trillion dollars in capital gains resulting from a reduction in the real value of nominal U.S. government debt if the consumer prices rise by the full amount of the **FairTax**.

Summary and Contrasting NRST Literature Compared to the Current Study

Prior to the **FairTax** proposals in Congress, researchers at the National Bureau of Economic Research (NBER) assess the distributional impacts of hypothesized future legislative NRST proposals. Feenberg et al. (1997) and Metcalf (1997) examine the distributional effects of replacing the federal income tax with a consumption tax under several hypothetical NRST systems. Both of these studies conclude that the current federal tax system is more progressive than any of the hypothetical national retail sales tax systems.

While studies such as Feenberg et al. (1997) and Metcalf (1997) are valuable exploratory resources for those seeking to design a national consumption tax policy, their underlying assumptions differ from that of actual proposed legislation. That is, the results of distributional analysis in prior research on NRST policies may vary significantly when assessing an actual proposed legislative bill such as the **FairTax**.

Kotlikoff and Rapson (2006) and ITEP (2004) examine the distributional effects of the **FairTax** but find opposite results. Gale (2005) indicates the specified **FairTax** rate is not revenue-neutral while Bachman et al. (2006) defends the rate. The current study investigates these conflicting results by including the following specifications. Initially, analysis is performed under the assumption that the **FairTax** rate of 30% is revenue-neutral. However, sensitivity analysis is conducted under the alternative assumption of higher sales tax rates as derived in Gale (2005), 44%, 53%, and 65% respectively. Also, actual annual household data from the CES is utilized rather than simulated stylized households.

Consequently, the current study makes the following contributions. First, prior studies address general forms of NRST systems using parameters (i.e., tax rates, tax exempt items, etc.) which are delineated by the researchers. In contrast, the current study focuses on the specific components in the legislative proposal entitled the **FairTax**.

Second, several previous studies (e.g., Feenberg et al. 1997; ITEP 2004; Kotlikoff and Rapson 2006), when analyzing sales tax systems, use local or pointwise measures of progressivity that report the level of progressivity at different points along their income scale. However, an inherent limitation in using pointwise measures of progressivity is their inability to make a comprehensive inference regarding the degree of progressivity over the entire tax system. To address this limitation, the current study adopts the common methodological approach of employing global tax progressivity measures (i.e., Kakwani 1977; Suits 1977; Pfähler 1983; and Reynolds-Smolensky 1977) that take into account a tax system's overall progressivity.

Third, previous studies indicate that whether we rank people by annual income or lifetime income it makes a significant difference when measuring the progressivity of a tax system (e.g. Fullerton and Rogers 1993; Caspersen and Metcalf 1994; Metcalf 1997 and 1999). Some economists have consistently argued that lifetime income is a better measure of a household's relative economic welfare than annual income because it is more closely associated with consumption streams that generate utility (Fitzgerald 1990). However, as indicated by Creedy (1999), "there is no obvious answer to the question of how income should be measured for tax purposes, and this has given rise to considerable debate." Therefore, the current study applies both annual income and lifetime income distribution methods and contrasts the results.

CHAPTER 3

RESEARCH METHODOLOGY

In this chapter, a detailed discussion of the research design and methodology is provided. First, the research questions are restated. Second, the databases used in this study are described. Third, both annual income and lifetime income distribution methods are detailed. Fourth, the methods for distribution of tax liabilities are illustrated. Last, measures of tax progressivity are discussed.

Research Questions

As discussed in Chapter 1, the following research questions are assessed to gauge the potential distributional impacts of adopting the **FairTax**.

1. How will the **FairTax Plan** change the distribution of tax burdens for different income groups?
2. Is the **FairTax** regressive or progressive under the annual income approach?
3. What is the progressivity level of the **FairTax** compared to that of the current federal tax system it may replace under the annual income approach?
4. Is the **FairTax** regressive or progressive under the lifetime income approach?
5. What is the progressivity level of the **FairTax** compared to that of the current federal tax system it may replace under the lifetime income approach?
6. How effectively will the **FairTax** reduce inequalities in the distribution of before-tax income compared with the current federal tax system it may replace?

To address research question 1, tax liabilities are generated for each household both under the **FairTax Plan** and the current tax system. Households are grouped into deciles and average tax rates are computed. To answer research questions 2-6, several global indices are calculated.

Data Sources

Consumer Expenditure Survey

The primary data source for this study is the 2005 Consumer Expenditure Survey (CES) Interview Survey Microfile, the most recent CES Microfile, which contains information from households interviewed during all four quarters of 2005 as well as the first quarter of 2006.[6] The CES Microfile is administered by the Bureau of Labor Statistics, an agency of the U.S. Department of Labor.

The CES micro-data file is utilized in the current study for several reasons. First, it is recognized as providing the most extensive coverage of expenditures among the leading U.S. micro data sets (e.g., Souleles 1999), which allows us to reasonably approximate the amount of taxable consumption, as defined under the *Fair Tax Act of 2007* (H. R. 25 / S. 1025), for each household. Second, compared with tax return data, CES data capture information for both filers and non-filers and hence strengthens the validity of the distributional analysis. Next, Branch (1994) finds that, with the exception of property income, CES income figures are consistent with other income reports.

As addressed by Feenberg et al. (1997) and Metcalf (1997), the CES records only out-of-pocket medical spending. All third-party payments made by insurance companies,

[6] Due to the sample redesign in 2005, January interview data is unavailable on the first quarter (q051) files of the 2005 CD. Therefore, the aggregate estimate for the first quarter will be inflated by factors of 3/2 as suggested by 2005 CES Interview Survey Microdata Documentation. The sampling frame in 2005 is generated from the 2000 Population Census 100-percent-detail file.

Medicare, and Medicaid are not included in the CES data. Since these expenditures are taxable under the **FairTax Plan**, the current study will use the Medical Expenditure Panel Survey (MEPS) to predict the total medical spending for a household.[7] The MEPS is a set of large-scale surveys of families and individuals, their medical providers, and employers across the United States conducted by the National Center for Health Statistics. The survey provides nationally representative estimates of health care use, expenditures, sources of payment, and health insurance coverage for the U.S. civilian non-institutionalized population. The MEPS Household Component (MEPS-HC) also provides estimates of respondents' demographic and socio-economic characteristics. Estimates can be produced for individuals and families. The most recent MEPS-HC 2005 Consolidated Data File is used in the current study.

Panel Study of Income Dynamics

Panel Study of Income Dynamics (PSID) data for the years 1968-2005 are used to estimate the lifetime income of CES households. The PSID is a longitudinal survey of a representative sample of U.S. individuals and their families (Hill 1991). The first sample was collected in 1968 and consisted of a national sample of 4,802 U.S. households. These households were re-interviewed in subsequent years, and from these interviews panel data have been compiled. The panel has been self-regenerating. Even though no specific replacements for those families who dropped out of the panel have been made, the split-offs of a family have been tracked and treated as new family units whenever family members move out of a household. All newly formed family units were included in the panel study thereafter. As a result of the diligent following up of these split-off families,

[7] Feenberg et al. (1997) and Metcalf (1997) use the National Medical Expenditure Survey (NMES) to predict total medical spending for CES households. But the most recent NMES was conducted in 1987.

the sample size increased towards the end of the panel period. The survey was conducted annually until 1997 and biennially thereafter. A sample of 441 immigrant families was added in 1997 and by 2005 the sample included 8,002 households. From year 1968 to 2005, there are records for 25,117 households in total.

Each yearly round of interviewing, re-interviewing, and recording of data on the panel is known as a wave. This information is then merged with all the relevant data from preceding waves. Therefore, for those families that are still in the panel at the time of a given wave, a virtually complete history is available up to that interview year. For example, among the 8,002 households in the 2005 survey, 776 households have been in the survey since 1968. The main sample for the current study includes only those households tracked over 1968-2005. Alternative tests are also conducted based on larger samples but covering fewer years (e.g. 20, 25, and 30 years) of information for each household.

Annual Income and Lifetime Income Distribution

Distributional studies need to divide people into groups according to their ability to pay, or economic well-being. The existing distributional studies fall into two general categories in this respect. One approach ranks households based on some measure of their annual income, which is the approach taken by many scholars and all government agencies that measure the distributional effects of taxes. The other approach utilizes estimates of lifetime income as a measure of economic well-being.

Annual Income

Annual income is commonly used by tax progressivity researchers (e.g., Pechman 1985; Ricketts 1990; Feenberg et al. 1997; and ITEP 2004) as an index of ability to pay

taxes, but there is a lack of agreement concerning how to measure the income. The current study adopts the measure of Total Income as defined within the CES data file.[8]

It should be noted that CES income data is questioned for underreporting at the low end and top coding at the high end. The lowest income levels in the CES sample tend to report very high consumption to income ratios. Some of these households are probably in transitory low levels and may be borrowing or using up assets. Some of these households are elderly people living on savings and college students being supported by their parents. Another important reason could just be under-reporting of income by the low-income households in the CES sample. If the consumption to income ratio is overstated because the denominator, income, is under-reported, then the consumption tax as a share of income is also going to be overstated (Mazerov 2002). In other words, under-reporting of income at the low end of the income distribution can exaggerate the regressivity of consumption taxes. Meanwhile, the income variables in the CES are subject to top coding, a process conducted to protect the identity of survey participants. Specifically, if a household reports data for a variable that exceeds a prescribed critical value, CES replaces that data with the subset mean of all outlying observations. Income top coding at the high end, on the other hand, could overstate the average tax rate for high income people and thereby underestimate the regressivity of a consumption tax. A reasonable validity check of the CES income data is to investigate whether it closely approximates another noted income distribution. Therefore, the income distributions of 2005 CES data are compared with that of the 2005 (SOI) Individual Income Tax Returns

[8]The measure of Total Income accounts for the following items: wages, salary, non-farm business, partnership or professional practice, farming activities, supplemental social security, unemployment compensation, workers compensation, veterans' benefits, public assistance, welfare, job training grants,

file. As indicated in Figure 3.1, while the income distributions for CES and SOI are relatively similar, the comparison does suggest the existence of both income under-reporting at the low end and income top coding at the high end for the CES income distribution. Nevertheless, the effect of income top coding is more significant than that of the income underreporting. Thus, analysis using annual income data from the CES is more likely to underestimate the regressivity of a consumption tax.

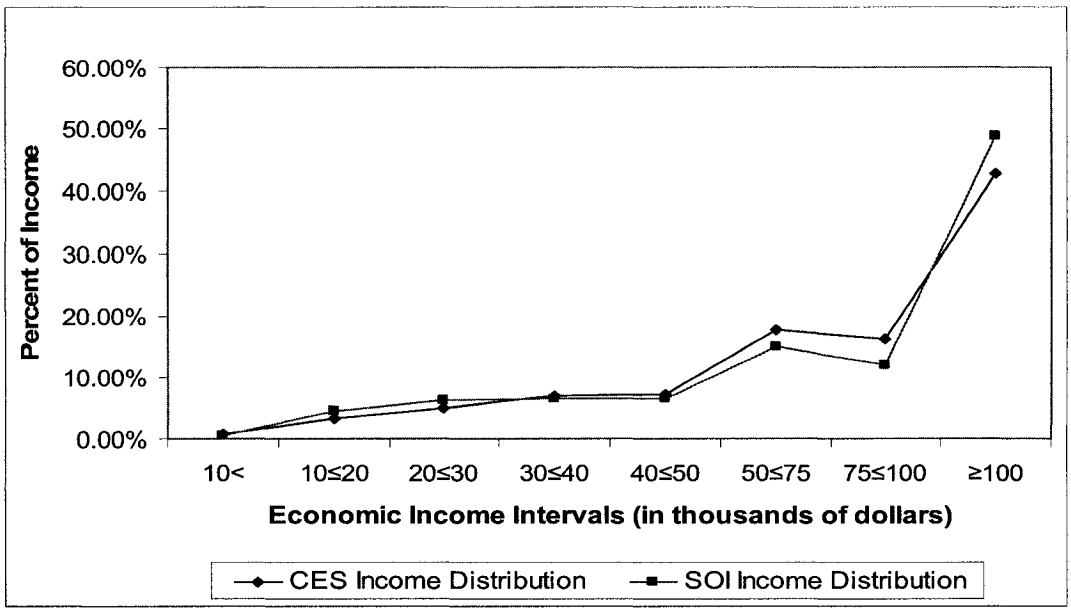

Figure 3.1 Comparison of CES and SOI Income Distributions

Lifetime Income

Since people tend to earn the highest incomes in their life around middle age (i.e., prime working years) and the lowest incomes in their youth and old age, there is usually a pronounced hump-shaped pattern of income over the course of a person's lifecycle (Harding 1993, 4). Friedman's Permanent Income hypothesis suggests that the

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interest income, dividends, royalties, estates, trusts, pensions, annuities, rental units, alimony, child support, scholarships, and food stamps.

distribution of well-being is better measured by the distribution of permanent income, rather than the distribution of income at a single point in time because the latter is affected by both transitory income fluctuations and lifecycle effects (Harding 1993, 5). Compared to annual income, lifetime income is more difficult to measure. It requires panel data that necessitates re-interviewing the same people regularly throughout their lives rather than cross-sectional data (Harding 1993, 6).

Fullerton and Rogers (1993) is the first study to use panel data, rather than annual survey or actual but static data, in the distributional analysis literature. The major sample of their study is 484 heads from the PSID with an average of 15 years of wage data for each head. They also use another sample of 334 spouses with an average of 11 years of wage data for each spouse. Wage rates are regressed on time, the age of each individual, the age squared, the age cubed, and various demographic variables. Consumption data are directly from the PSID, which are less accurate than those in the CES.

Caspersen and Metcalf (1994), Metcalf (1997), and Metcalf (1999) use the same PSID data to estimate lifetime income. Income age profiles in the PSID are constructed and from these the present discounted value of earned income and gifts for a household are computed. The estimated coefficients obtained from PSID data are then applied to households in the CES to calculate an estimate of lifetime income. They use both OLS and fixed-effects regression models to estimate income in the PSID panel. Their approach has the following shortcomings. First, there is no perfect way to attribute the individual (fixed) effects obtained from the PSID panel to the CES cross-sectional data. While it is the desire for unbiased estimates that suggests a fixed-effect model in the first place, their use of CES current consumption as a proxy for the individual fixed effect from the PSID

sample to a different CES sample likely introduces bias to the estimates (Maxell 2003). Second, by using a fixed-effects model, all time invariant information such as race, gender, and education is lost because the model differences out the means. Third, the PSID data used in these studies for lifetime income estimation are from years before 1988. All households, including those spanning very short lifecycles of a head, are used for lifetime income estimation,[9] which could also lead to biased coefficients in the model.

Maxwell (2003) uses a PSID panel of 705 households tracked over 1970-1993 to estimate household lifetime income profiles which are then used to predict lifetime income for the 1995 CES sample of 638 households. Household income is assumed to be a function of economic and demographic variables. An exact maximum likelihood estimator was used to remove an AR (1) process. As addressed by the author, the estimates from this model could include bias if individual effects are significant (different intercepts). But it can include both time variant and time invariant information and make it possible to use the estimated parameters in the PSID regression to predict for a different CES sample. Meanwhile, the data is autoregressive of order one and the AR (1) exact maximum likelihood corrects for autocorrelated errors.

Therefore, the current study follows the method used in Maxwell (2003) to estimate lifetime income based on the PSID data for the years 1968-2005. With more recent PSID data that cover 38 years of life for each household's head, this study should be able to more accurately capture the income lifecycle effects.

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[9] These studies do not actually specify which years of the PSID data are used, or what are the sample selection criteria. But since Caspersen and Metcalf (1994) use CES 1988 for the primary analysis, it is logical to assume their PSID data are from years before 1988. Also, the number of observations in the PSID regression model are 134,217 in Caspersen and Metcalf (1994, p738) and households with short time-period information seem to have not been deleted.

First, income age profiles in the PSID are constructed. Household income is assumed to be a function of economic and demographic explanatory variables. Total family money income is regressed on age, age squared, age cubed, and various demographic variables. The dependent and explanatory variables used in the income regressions are selected to correspond to information that is also available in the CES. For instance, income in both the PSID and CES samples is defined as household labor income plus transfers. Income used for analysis is real income. Income values for years 1968-2003 are inflated to 2004 dollar using GNP deflators. [10] Note that the CES sample, unlike PSID, does not identify a household head, only a reference person. I assume the reference person is the head unless it is a married household and the reference person is female; in this case, information on the male spouse is used to be consistent with the PSID which always assumes that the male is the head of the household for a married couple. Table 3.1 lists the detailed description of the dependent and independent variables used in this model.

Second, the estimated coefficients from these regressions are applied to households in the CES to calculate an estimate of lifetime income. Lifetime income is defined as the present value of total family income over the adult life of the household head and depends only on the demographic variables associated with each family. A household is assumed to be an income-generating entity from the time the head is 18 years old until the time the head is 90 years old. Workers are continually employed until age 65 at which point they retire. Following Maxwell's (2003) approach, a two-part age-income profile is generated for each household. (1) Profile 1 is an age-income profile

[10] The reported income value in both CES and PSID are values for the previous year. For example, the latest 2005 CES and PSID income data correspond to the 2004 calendar year.

Table 3.1 Variables for Lifetime Income Estimation

Variable	Category	Symbol	Definition
Dependent	Income	INC	real total family income, which include taxable income, transfer income, and social security income for the head, wife, and other family members. Income values from the 1968-2003 waves are inflated to 2004 dollar using the GNP deflator.
Independent	Age of head	AGE	age of the family head
		AGESQ	age of the family head squared
		AGECUB	age of the family head cubed
	Gender of head	FMHD	If the head of a household is female, FMHD=1, otherwise FMHD=0
	Race of head	NWHD	If the head of a household is not white, NWHD=1, otherwise NWHD=0
	Employment status of head	UNEMP	If the household head is unemployed, UNEMP=1, otherwise UNEMP=0
	Region and Location[1]	NE-URB	If a family resides in the northeast urban area, NE-URB=1, otherwise NE-URB=0
		MW-URB	If a family resides in the midwest urban area, MW-URB=1, otherwise MW-URB=0
		S-URB	If a family resides in the south urban area, S-URB=1, otherwise S-URB=0
		W-URB	If a family resides in the west urban area, W-URB=1, otherwise W-URB=0
	Education of head[2]	SH	If the head of a household's education level is 9-11 grades, SH=1, otherwise SH=0
		HG	If the head of a household's education level is 12 grades (completed high school, HG=1, otherwise HG=0
		SC	If the head of a household attends college without a degree, SC=1, otherwise SC=0
		CG	If the head of a household has a bachelor degree, CG=1, otherwise CG=0
		PG	If the head of a household has a graduate degree, PG=1, otherwise PG=0
	Spouse dummy	COUPLE	COUPLE=1 if there is a spouse, otherwise COUPLE=0
	Time trend	TREND	indicator for the year, 1 for 1968, 2 for 1969,? 38 for 2005.

Notes: 1. The base for each dummy is the rural area in that region.
2. The base education level is one that is lower than 9 grades.

from the 2005 age of the household head to age 90; and (2) Profile 2 is an age-income profile from age 18 to the 2005 age of the household head. Profile 2 is brought forward to 2005 as a future value, while profile 1 is brought to 2005 as a present value. Consistent with previous studies (Fullerton and Rogers 1993; Caspersen and Metcalf 1994; Maxwell 2003), the discount rate is assumed to remain constant at 4% over time. This discount rate is intended to approximate the marginal social rate of time preference (MSRTP) at which individuals are willing to trade off current for future consumption and is equal to the real after-tax savings rate (Maxwell 2003). Since most estimates of the MSRTP range from 0% to 4%, sensitivity tests based on different discount rates such as 1%, 2%, and 3% are also conducted in this study

Third, lifetime income estimates are converted to annuity equivalents assuming a 4% real rate of interest. An annuity equivalent for profile 1 is calculated according to the annuity formula for present value, and the annuity equivalent for profile 2 is calculated using the annuity formula for future value. [11] For every household, a lifetime equivalent income is calculated as the weighted average of the two annuities and 2005 predicted real income.

Distribution of Tax Liabilities

Two types of tax liabilities are generated for each household in the sample. One is computed according to the current tax system, i.e., the four major current taxes that the **FairTax** plans to replace, while the other is stipulated under the **FairTax Plan**. These two sets of tax liabilities are used to test for differences in the distributional effects under each of the respective tax systems. The federal personal income, corporate income, estate

[11] The discount factor is $[1-(1+r)^{-t}]/r$ for annuity of present value and $[(1+r)^{t}-1]/r$ for annuity of future value, where r is the interest rate and t is the length of discount period.

and gift, and payroll taxes are distributed to each CES household. The **FairTax** tax liabilities are simulated for each CES household according to its taxable consumption, as defined under the *Fair Tax Act of 2007* (H. R. 25 / S. 1025).

Personal Income and Payroll Taxes

Federal personal income and payroll taxes are reported by each CES household. Both employee and employer portions of payroll taxes are distributed to each household assuming an inelastic labor supply. But the assumption of elastic labor supply, which means consumers bear only the employee portion of payroll tax, is also applied as an alternative analysis. As a validity check of the self-reported tax data, the income tax liability distribution of 2005 CES data is compared with that of the 2005 (SOI) Individual Income Tax Returns file. As indicated in Figure 3.2, the income tax distributions of the CES and SOI files are relatively similar. The comparison does suggest difference at the high end due to the top coding process.

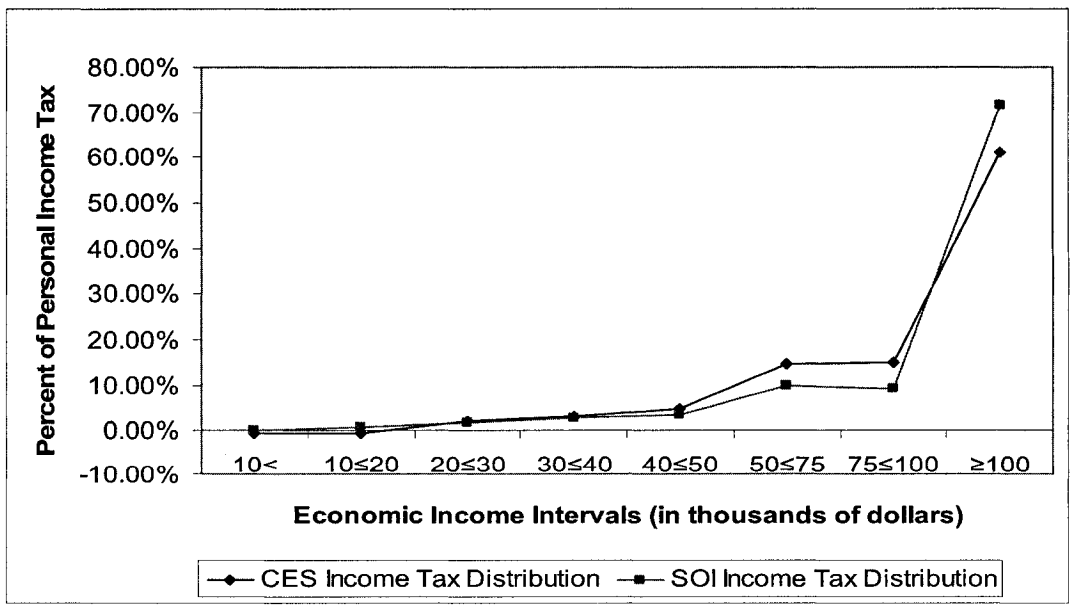

Figure 3.2 Comparison of CES and SOI Personal Income Tax Distributions

Corporate Income Tax

Corporate income tax is first distributed according to the Feldstein's (1988) approach which assumes that the corporate income tax is born by all those who hold any type of capital assets, not just those who own claims on corporate capital. This methodology has been used by Feenberg et al (1997), Metcalf (1997), and Metcalf (1999). The procedures of this approach are as follows:

(1) Calculate total capital income (K) which is defined as the sum of corporate profits (C), net interest received by households (I), and rental income (R).

$K=C+I+R$

where: C = NIPA corporate profits + decrease in corporate debt value resulting from inflation[12] + real interest earned by pension funds[13];

I = real interest received by households – real personal interest expense[14];

R = rental income from NIPA tables.

(2) Calculate the average tax rate on capital income (γ_1):

$\gamma_1 = T / K$

where: T is NIPA corporate tax collections and K is the total capital income.

(3) Calculate the profits to dividends ratio (γ_2):

$\gamma_2 = C / D$

where: C is the corporate profits as defined in (1) and D denotes NIPA dividends.

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[12] This equals to credit market instrument liabilities of corporate sector (Flow of Funds) times inflation rate (CPI).

[13] Nominal interest rates (ρ) are weighted based on holdings of pension funds and converted to real interest rate (r) using CPI as inflation rate (π): $r=(1+\rho)/(1+\pi)-1$

[14] Similarly, nominal interest rates are weighted based on holdings of households in Flow of Funds and converted to real interest rate using CPI as inflation rate.

(4) Calculate the corporate income tax for each CES household:

$CORP_i = \gamma_1 * \gamma_2 DIV_i + \gamma_1 * INT_i + \gamma_1 * RENT_i$

where: $CORP_i$ denotes corporate income tax attributed to household i;

DIV_i denotes dividends for household i;

INT_i denotes interest income for household i;

$RENT_i$ denotes rental income for household i.

Corporate income tax is also distributed based on a recent Congressional Budget Office (CBO) report (Randolph 2006). This report estimates that for the corporate income tax in an open economy, like the United States, workers could bear as high as 70 percent of the tax burden while owners of capital would bear around 30 percent. The procedure for this approach first allocates 70% of the corporate tax to salary income and the remaining 30% is distributed according to Feldstein's (1988) method as discussed earlier.

Estate and Gift Tax

Estate and gift tax is distributed following the methodology used in Feenberg et al. (1997). Feenberg et al. (1997) allocates the burden of estate and gift taxes in proportion to each household's share of capital income valued in excess of $30,000 and limits the imputation to households with someone over the age of 65. [15] To generate the $30,000 cutoff capital income, a household needs to have held approximately $370,000 in 30-year Treasury Bonds which have a nominal interest rate of 8.14% in 1991. A household with this level of financial assets is assumed to have a taxable estate that approaches the $600,000 estate tax exemption amount in 1991.

[15] As admitted by Feenberg et al. (1997, p27), this algorithm may underestimate estate tax liabilities for some households with substantial owner-occupied real estate holdings but no other assets that generate taxable capital income.

The current study modifies the methodology used in Feenberg et al. (1997) as explained below:

First, Capital income (CAP) is defined as the sum of dividends, interest income, and rental income received by a household based on available information in the CES data, which is the same definition used for corporate income tax distribution.[16]

Second, the capital income threshold is set as $50,000 due to the increase of the estate tax exemption amount (estate tax exemption amount in 2005 is $1,500,000) and the decrease of the nominal interest rates of long-term Treasury Bonds. To illustrate, a household would have to have held approximately $1,020,000 in 20-year Treasury Bonds with a nominal interest rate of 4.9% in 2005 to generate this $50,000 flow of capital income.[17] Since most households with this level of financial assets are also homeowners, their taxable estate would be greater than the financial asset holdings and hence, approach the $1,500,000 estate tax exemption.

Third, since the sample size of CES households is much smaller than the one used in Feenberg et. al (1997), the aggregate amount of federal estate and gift taxes will be deflated using the ratio below:

θ_1 = CESCAP / total capital income (K)

where CESCAP denotes the sum of capital income for all the CES households. K is the same total capital income used for corporate income tax distribution, which are calculated using aggregate data from NIPA tables and Flow of Funds, etc.

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[16] Feenberg et al. (1997) define capital income as the sum of dividends, taxable interest, capital gains, tax-exempt bond interest, income from trusts, partnerships, Subchapter S corporations, rents, and royalties because they use SOI tax returns data. The definition of capital income in the current study is consistent with Metcalf (1997) and the U.S. Congress Joint Committee on Taxation (1993).

[17] 30-year Treasury Bonds was discontinued in 2002 and reintroduced in 2006.

Last, without age information in the tax returns, Feenberg et al. (1997) use the arbitrary cutoff age of 65 which assumes that the mortality risk is zero for those under age 65 and positive but equal for all households with someone over age 65. The current study uses the age-specific mortality rates from the National Center for Health Statistics (see Table 3.2) to project the probability of death, but limits the estate and gift tax imputation to households with someone over age 55, when the death rate is above the national average.

Table 3.2 U.S. Death Rates per 100,000 Population by Age Groups, 2004

Age Groups (j)		Death Rates (d_j)
1	Under 1 year	685.2
2	1-4 years	29.9
3	5-14 years	16.8
4	15-24 years	80.1
5	25-34 years	102.1
6	35-44 years	193.5
7	45-54 years	427
8	55-64 years	910.3
9	65-74 years	2164.6
10	75-84 years	5275.1
11	85 years and over	13823.5
All Ages Average		816.5

Source: CDC/NCHS, National Vital Statistics System, Mortality. Rates are based on populations estimated as of July 1, 2004.

Specifically, two new variables are constructed for each CES household.

CAP50K = 0 if CAP < $50,000

= CAP - $50,000 if CAP > $50,000

DRATE = 0 if both the household head and his/her spouse are under age 55

= d_j if the age of a household head or his/her spouse, whoever is older, falls into age group j (j>=8)

This approach assumes that: first, the burden of estate and gift taxes falls on the decedent; second, taxes on accumulated wealth are taxes on the stock of capital held by the taxpayers and therefore can be allocated according to capital income; third, expected estate and gift tax payments for a household can be approximated based on age, age-specific death rates, and capital income.[18]

Therefore, the estate and gift taxes burden for the CES households is imputed using the following equation:

$$EGTAX_i = \frac{DRATE_i * CAP50K_i}{\sum DRATE_i * CAP50K_i} * \theta_1 * FEDEGTAX$$

where $EGTAX_i$ denotes the estate and gift tax distributed for household i; FEDEGTAX is the NIPA federal receipts from estate and gift taxes; As defined previously, $DRATE_i$ is adjusted death rate for household i; $CAP50K_i$ is the amount of capital income in excess of $50,000 for household i; and θ_1 is the deflator.

The FairTax

The **FairTax** liability for each household, as shown in Table 3.3, is computed by multiplying their total taxable consumption by the proposed sales tax rate of 30%. Under

[18] This approach was discussed in Feenburg et al. (1997, p28) and the U.S. Congress Joint Committee on Taxation (1993, p70) but was not applied by them due to lack of information.

the **FairTax** Plan, not all goods and services are taxable. To more accurately gauge the actual taxable expenditures, the total expenditure figure is reduced for each household by items, listed in Table 3.3 panel (A), that are defined as non-taxable under the **FairTax** Plan. These non-taxable items mainly consist of mortgage interest, property taxes, tuition for educational institutions, interest on lines of credit, expenditures for used vehicles, and charitable contributions.

Table 3.3 Calculation of Tax Liabilities

Panel A: FairTax Taxable Expenditure Calculation
Total Expenditure in CES interview survey main summary level expenditure data
Less: nontaxable Items in main summary level data
Cash contributions
Retirement, pensions, Social Security
Mortgage interest[1]
Property tax[1]
Interest on home equity loan[1]
Interest on line of credit home equity loan[1]
Used Vehicles (net outflow)[2]
Tuitions[3]
Add: taxable items in CES expenditure outlays summary data
Predicted mortgage principal for new housing sales [4,5]
Predicted taxable portion of home equity loan [4,6]
Predicted taxable portion of line of credit home equity loan [4,6]
Panel B: Current Federal Taxes (CFT) and the FairTax (FT)
CFT=Federal income tax + Payroll tax + Corporate income tax + Estate and gift tax
FT = Taxable Expenditure*0.3 - Poverty Tax Credit

Source: 2005 Consumer Expenditure Survey (CES)

1 *Including owned home, owned vacation home, and other properties;*

2 *Including used cars, trucks, vans, motorcycles, and motor scooters or mopeds;*

3 *Including college tuition, elementary and high school tuition, and other schools tuition; and*

4 *Including owned home, vacation home, and other property.*

5 *The FairTax would be assessed on new home sales but not on existing home sales. Therefore, the percentage of new home sales to total home sales obtained from National Association of Realtors (15%) is used to predict taxable portion of new housing payments.*

6 *50% of home equity loan and line of credit home equity loan are predicted to be used for taxable purpose such as home improvements.*

Because the CES main level summary file does not include principal payments on mortgage payments or home equity loans, these payments are classified as expenditure outlays in a separate file. Unfortunately, there is no information provided as to whether these principal payments are for new housing or if the equity loans are used to purchase new goods or services. As a result, 15% of the mortgage principal payments are assumed for new housing since the National Association of Realtors estimated that new home sales comprise 15% of total home sales (Molony and Salvant 2005). In regard to principal payments on home equity loans, the 2004 Survey of Consumer Finances estimates that the major purposes of extracted equity are for "home improvements" (45%) and "debt consolidation" (31%) (Bucks et al.2006). Other uses of extracted equity are not reported. Therefore, 50% of the home equity loans and consequently, the principal repayments are assumed for new goods and services. Although these adjustments provide a consumption figure that is closer to that which would be taxable under the **FairTax** Plan, it still may be overstated due to including purchases of used goods or possibly understated due to under-reporting of actual consumption.

Implicit in the computation is that consumers bear the entire burden of the consumption tax, i.e., none of the tax will be borne by firm owners. Extant literature (Phares 1980; Metcalf 1994) notes that forward shifting of consumption taxes has become a widely accepted assumption. Moreover, Poterba (1996) provides empirical evidence that retail prices rise by approximately the amount of sales tax.

Measures of Tax Progressivity

Pointwise Measures versus Global Indices

There is a wide range of measures to assess the overall progressivity of tax systems. Local or "pointwise" measures of progressivity are the most computationally simplistic methods available. For example, the ratio of the total tax burden of the highest quintile in an income distribution to that of the lowest quintile is one index of progressivity. But, as noted by Chernick (2005), this method has the disadvantage of not taking into account the tax burdens in the second, third, or fourth quintiles. In fact, pointwise measures of progressivity are often criticized for their inability to assess the "progressivity of the whole tax schedule" (Smith 2001). Global indices, on the other hand, are capable of measuring the overall progressivity of a tax system. As a result, global tax progressivity indices are the most common methodology used by tax policy researchers.

Fundamental Concepts for Global Indices

Various global indices of tax progressivity have been developed in the economics literature (e.g. Musgrave-Thin 1948; Kakwani 1977; Reynolds and Smolensky 1977; Suits 1977; Pfähler 1983; and Braum 1987), among which Gini-based indices are most widely used. Gini-based indices are developed basing on Lorenz and concentration curves. Therefore, the fundamental economic concepts that are used in the definition and calculation of these indices will be discussed before the introduction of four major Gini-based tax progressivity indices.

Lorenz Curves. A fundamental concept in the analysis of a tax system is the Lorenz curve. It is a graph that captures all of the quantile share information for a given

income distribution. Because the tax system is such that pre-tax income is transformed into post-tax income, Lorenz curves include a Lorenz curve of pre-tax income (L_x) and a Lorenz curve of post-tax income (L_y). To obtain L_x, individuals must first be ranked in ascending order by their pre-tax incomes. Then the cumulative percent of total family pre-tax income is calculated and plotted on the vertical axis against the cumulative percent of families on the horizontal axis.

As indicated in Figure 3.3, the diagonal line represents the line of perfect income equality. Along this line, the income distribution is perfectly proportionate to the population. Since income distributions are typically not proportional, L_x usually sags below the line of perfect equality.[19] The farther below the line of perfect equality the Lorenz Curve sags, the less equitable is the income distribution (Anderson et al. 2003, p82). L_y can be produced in the same manner except that individuals are ranked in ascending order according to post-tax income values. In view of the assumed inequality-reducing nature of the tax structure, L_y usually lies inside of L_x, that is, L_y is closer to the diagonal line of equality (Creedy 1999, p413).

[19] L_x will usually sag below the diagonal line because individuals are ranked in ascending order according to their pre-tax incomes. For example, while there is income inequity, the first quintile of the population earns less than 20 percent of the income while the top quintile of the population earns much more than 20 percent.

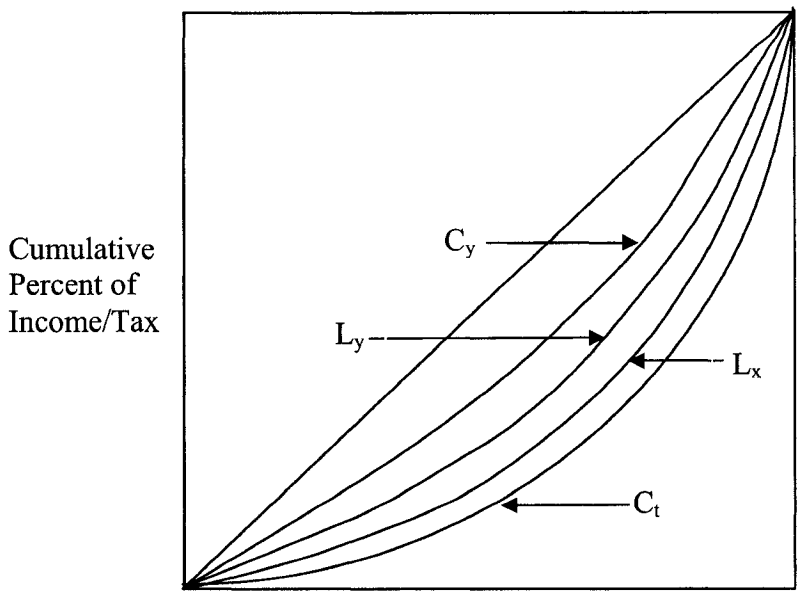

Figure 3.3 Lorenz curves and concentration Curves

The Gini Coefficient. The Gini coefficient is computed as the ratio of the area from the Lorenz Curve sag to the diagonal line to the total area under the diagonal line. If the area between the diagonal line and the Lorenz curve is A, and the area under the Lorenz curve is B, then the Gini coefficient is A/(A+B). Since A+B equals the area of the triangle under the diagonal line that has base and altitude of 1, A+B = 0.5. Therefore, the Gini coefficient, G = A / (0.5) = 2A = 1-2B. The Gini coefficient ranges from zero for no income inequality to one for the most extreme inequality in which all income is concentrated in a single family.[20]

[20] If there is no income inequality, the Lorenz Curve overlaps with the diagonal line and the Gini coefficient equals zero. At the other extreme, if there is extreme inequality with one household holding all the income, the Lorenz Curve sags all the way down to the axes and the Gini coefficient approaches one.

Mathematically, Gini coefficients of the distribution of pre-tax income and post-tax income can be calculated by integrating their relevant Lorenz curves. The Gini coefficient of pre-tax income (G_x), for example, can be written as:

$$G_x = 1 - 2B = 1 - 2\int_0^1 L_x dx$$

where x denotes the pre-tax income and L_x is the Lorenz curve of pre-tax income as defined before.

In some cases, however, there is an explicit formula that can be used to calculate the Gini coefficients (Creedy 1999, p413).

$$G_x = 1 + \frac{1}{N} - \frac{2}{N^2}\sum_{i=1}^{N}(N+1-i)(\frac{x_i}{\bar{x}})$$

where x denotes the pre-tax income, $\bar{x}$ denotes the arithmetic mean, and N denotes the number of families.

The Gini coefficient of post-tax income (G_y) is, of course, obtained using the same equation with post-tax incomes substituted for pre-tax incomes.

Concentration Curves and Concentration Indices. The after-tax income concentration curve (C_y) and the tax concentration curve (C_t) are also widely used in tax analysis. As indicated by Figure 3.3, the x-axis and y-axis of concentration curves are the same as those of the Lorenz curves. The difference is that households are always ranked in ascending order of pre-tax income when calculating concentration curves. C_y is constructed by arranging after-tax incomes in order of ascending pre-tax income while C_t orders taxes by pre-tax income. In a manner similar to the calculation of the Gini

coefficients from the Lorenz curves, concentration indices can be obtained from the concentration curves.

As described before, a Lorenz curve of post-tax income (L_y) is calculated by ranking individuals in ascending order according to post-tax income values. Therefore, if the tax system does not lead to a re-ranking of individuals when moving from the pre-tax to the post-tax distribution, L_y and C_y are coincident. If there is a tax-induced re-ranking, the two curves differ. The extent of re-ranking can be measured using the difference between the Gini coefficient of post-tax income (G_y) and the concentration index of post-tax income (C_y), which is called the Atkinson-Plotnick (AP) re-ranking index.

$$AP = G_y - C_y$$

Global Indices of Tax Progressivity

Formby et al. (1990) categorize global indexes into one of two groups. The first group, consisting of the Kakwani (1977) and Suits (1977) indices, analyzes the progressivity of tax systems by comparing "the before-tax income and tax distributions."

The second group of global tax progressivity indices compares "the before- and after-tax income distributions." Variations of indices in this group include but are not limited to the Pfähler (1983) index and the Reynolds-Smolensky (1977) index. Researchers frequently report an index from this second group in conjunction with one or more of the indices from the first group (e.g., Scott and Triest 1993; Decoster and Camp 2001).

The Kakwani's Index (K). Kakwani (1977) proposes a progressivity index which examines the difference between the tax concentration index (C_t) and the Gini

measure of pre-tax income (G_x). A formal definition of Kakwani's index (K) is given by (Creedy 1999, 415; Lambert 2001, 201):

$$K = C_t - G_x$$

where C_t is the concentration index of tax and G_x is the Gini coefficient of pre-tax income.

If a tax system is proportional, the concentration curve of taxation and the Lorenz curve of pre-tax income coincide, and therefore $C_t = G_x$, and K=0. The maximum and minimum values of K are +1 and -2, respectively. Positive values of K indicate progressivity and negative values indicate regressivity (Iyer et al. 1996, 91-92).

An often overlooked but useful property of the Kakwani index is that, by utilizing the appropriate equations in Kakwani (1977), it is also capable of measuring the income inequality reducing the effects of tax systems (Seetharaman and Iyer 1995, 54). Specifically:

$$C_y = G_x - \frac{t}{1-t}K$$

where C_y is the concentration index of post-tax income and G_x is the Gini coefficient of pre-tax income. Consequently, this property is employed as a robustness check of the Reynolds and Smolensky results.

The Reynolds-Smolensky Index (RS). The redistributive effect of a tax structure can be summarized by the extent of the reduction in the Gini coefficient when moving from pre-tax to post-tax incomes, that is, the difference between G_x and G_y (Creedy 1999, 413-414). The index that measures this difference is named after Reynolds and Smolensky's (1977) application to the US tax system.

$$RS = G_x - G_y$$

There is a relationship between the Kakwani's index, the Reynolds-Smolensky index, and the Atkinson-Plotnick (AP) reranking index as follows (Creedy 1999, 416):

$$RS = K(\frac{t}{1-t}) - AP$$

where t denotes the overall effective average tax rate.

This equation can be rearranged as follows:

$$1 = \frac{K}{RS}(\frac{t}{1-t}) - \frac{AP}{RS}$$

Hence, the redistribute effect is decomposed into two components: the first depends on both t and the progressivity measure while the second term depends on the re-ranking effect, which has a negative effect on redistribution.

If there is no tax-induced income re-ranking, there is a simple relationship between the K and the RS.

$$RS = K(\frac{t}{1-t})$$

The Suits Index (S). Suits (1977) proposes a tax progressivity index independently of Kakwani, but around the same time. The Suits index is based on a variant of the Lorenz curve which plots the cumulative percent of tax burden on the vertical axis against the cumulative percent of income on the horizontal axis.

As illustrated by Figure 3.4, a proportional tax would yield the 45 degree diagonal line OB. Curve OCB represents a progressive tax in which the tax rate increases with income while curve ODB represents a regressive tax in which the reverse is true.

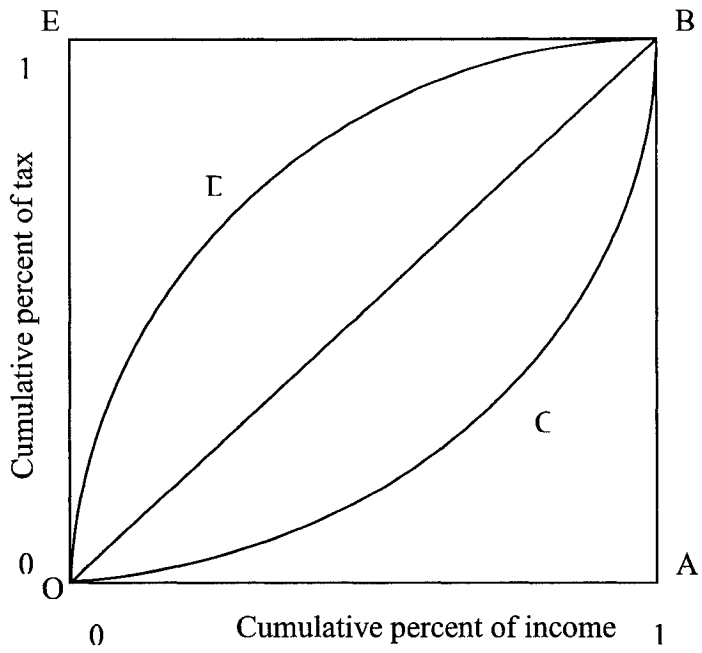

Figure 3.4 The Suits Index

The Suits index (S) is defined by the ratio of the area between the diagonal and the tax curve to the total area under the diagonal. The Suits index may be represented as:

$S= (K-L)/K=1-L/K$

where K = the total area below the diagonal line; L = the total area under the Lorenz curve. For a proportional tax, where L=K, the value of the Suits index will equal zero. For a progressive tax as indicated by curve OCB, where L<K, the value of the Suits index will be positive. For a regressive tax as indicated by curve ODB, where L>K, the value of the Suits index will be negative.

Therefore, the range of the index is from -1 to +1, with -1 indicating extreme regressivity, +1 indicating extreme progressivity, and 0 indicating proportionality (Rickets 1990). As discussed by Suits (1977) and Iyer (1996), the maximum value of S occurs when all taxes are paid by the highest income and the tax curve hence overlaps

OAB (L=0). Similarly, S equals to -1 when all taxes are paid by the individual with no income and the tax curve overlaps OEB (L=1; K=0.5).

Since the triangle under the diagonal line has base and altitude of 1, K always equals to 0.5. Mathematically, the Suits Index can be written as (Suits 1977, 750; Anderson et al. 2003, 84):

$$S = 1 - 2\int_0^1 T(Y)dY$$

where Y denotes cumulative percentage of income and T(Y) is the tax curve.

Researchers typically compute the Suits Index by dividing taxpayers into quartiles, quintiles, or deciles, and consequently only four, five, or ten observations are used to calculate the Suit Index (Anderson et al. 2003, 84). The current study, however, considers the cumulative share of total income received by all CES households. A close approximation of the Suits index is given by the following expression (Suits 1977, 750):

$$S = 1 - \sum_{i=1}^{n} [T(Y_i) + T(Y_{i-1})](Y_i - Y_{i-1})$$

where Y and T(Y) denote the cumulative percentage of income and tax, n is the total number of households in the sample.

The Suits index is particularly attractive because the progressivity of a group of taxes may be expressed as the weighted average of the individual taxes, where the weights are given by the respective effective tax rates. Thus, if S_1 and S_2 are the Suits indices for two taxes, say the federal income tax and the payroll tax, and the respective tax rates are T_I and T_P, the index for progressivity of the two tax systems combined (S_{comb}) is given by (Iyer 1994, 37):

$$S_{comb} = (T_I * S_1 + T_P * S_2)/(T_I + T_P)$$

As noted by Seetharaman and Iyer (1995, 54-55), the principal difference between Kakawani's index (K) and Suits index (S) is that K integrates the difference between income and tax with respect to income recipients while S integrates tax with respect to income. Kakwani (1987, 433) expresses this difference by observing that his measure (K) concentrates on the "number of people who are richer," but S focuses on the aggregate incomes of the richer rather than their number.

Actually, K and S are identical except that S includes a weighting factor which is the slope of the Lorenz curve of income (Formby et al. 1981; Greene and Balkan 1987). But, because of this difference, S and K could result in conflicting conclusions (Formby et al. 1984).

The Pfähler Index (P). An index of the redistributive effect as proposed by Pfähler (1983) differs from the Reynolds-Smolensky index in the same way that the Suits index differs from the Kakwani index (Lambert 1993, 207-208).

Therefore, if there is no tax-induced income re-ranking, there is a simple relationship between the Pfähler index (P) and the Suits index (S):

$$P = S(\frac{t}{1-t})$$

where t denotes the overall effective average tax rate.

If there is tax-induced income re-ranking, then the relation between P and S includes an additional term measuring a re-ranking correction as discussed for the relationship between K and RS.

The Pfähler index ranges from -1 for a tax that redistributes all income to the person with the most pre-tax income to +1 for a tax that redistributes all income to the person with the least pre-tax income.

Most importantly, the standard tax progressivity measures, such as Suits and Kakwani, suffer from the "tax scale invariance" problem, which means that a proportional scaling of the tax system will not affect the value of the index. The Pfähler index is not tax scale invariant, and therefore, it can capture the effect of reduced revenues on the income distribution. Since some previous studies (e.g., Gale 2005) claim that **FairTax** reform is not revenue neutral, the Pfähler index can do a better job than other measures in this case.

Use of Multiple Indices

Prior research, Greene and Balkan (1987) and Lambert and Pfähler (1988), suggests that none of the global indices are theoretically superior to the others. Consequently, the results of the current study are reported via multiple global indices to increase the robustness of the findings. Specifically, this inquiry utilizes two global indices to measure the progressivity of the current federal tax system and the **FairTax**, the Suits index (Suits 1977) and Kakwani's index (Kakwani 1977). Although there are other indices that could have been chosen, these two indices are used in the current study because they appear to be the ones most regularly employed by current researchers (e.g., Iyer et al. 1996; Decoster and Camp 2001; Anderson et al. 2003; Leigh 2005).

While both the Suits and Kakwani indices provide valuable information regarding tax burdens' relative positions to being proportionally distributed, they do not assess the before and after income redistribution effects of taxes (Formby et al. 1990). That is,

neither the Suits nor the Kakwani indices provide insights as to how much a tax system reduces income inequality. To address this critical component of tax policy evaluation, the current study employs the Reynolds-Smolensky (Reynolds and Smolensky 1977) and Pfähler (Pfähler 1983) redistribution indices. In addition, the robustness of redistribution effects is expanded by following the Kakwani (1977) methodology of expressing the after-tax income inequality as a function of the Kakwani index.

CHAPTER 4

ANALYSIS OF RESULTS

Previous chapters contain: (1) a discussion of the **FairTax** proposal and the need for further research, (2) a review of the pertinent distributional effects and national retail sales tax research literature that has a direct influence upon the current research, and (3) development of the research methodology used in the current study. This chapter presents the results of the empirical analysis. Data selection procedures and summary statistics are presented first, followed by a discussion of the results pertaining to each of the research questions presented in Chapter 3.

Data Selection and Imputation

The primary data source for the analysis is the 2005 Consumer Expenditure Survey (CES). Several adjustments are made to improve the consumption and tax information in the CES. First, the medical related expenditures for the CES households are replaced with the forecasted total medical spending using 2005 Medical Expenditure Panel Survey (MEPS) data. Second, a representative quarter is selected based on taxable consumption and the **FairTax** burden is then calculated for every household. Third, corporate income tax as well as estate and gift taxes are imputed to every CES household to approximate the current federal tax burden. Fourth, lifetime income is estimated for

every CES household using data from the 1968-2005 Panel Study of Income Dynamics (PSID).

Estimating Total Family Medical Expenditure

As addressed in Chapter 3, total medical expenditure is taxable under the **FairTax Plan**. But the CES only records out-of-pocket spending and does not provide information for third-party payments made by insurance companies, Medicare, and Medicaid. Moreover, this out-of-pocket health care spending can often be negative if the household has received a refund from an insurance company for medical spending in the current survey period. The Medical Expenditure Panel Survey (MEPS) provides detailed information about personal and family level health care spending where the total medical expenditure variable includes both out-of-pocket spending and third-party payments. Therefore, MEPS Household Component (MEPS-HC) 2005 Consolidated Data File is used to predict the total medical spending for the 2005 CES households in the current study. After deleting the observations with inapplicable values for several variables such as age and family size, the sample size for MEPS-HC 2005 is 33,641 individuals from 12,886 households. Following the methodology used by Metcalf (1997) and Feenberg et al (1997), total family health care expenditure is regressed on family size, family income, number of family members who are over the age of 64 (or an indicator for the presence of elderly family members), and number of children under the age of 2 (or an indicator for the presence of children under 2).[1] Tables 4.1 and 4.2 present the descriptive statistics of

[1] These demographic variables are selected to correspond to information that is also available in CES 2005. Metcalf (1997) uses an indicator for the presence of children under age 18 rather than one for children under 2. The number of children under age 18 (or an indicator for the presence of children under 18) is highly correlated with the family size variable. In the current study, the family size variable would have an insignificant negative coefficient if using the number of children under age 18 (or an indicator for the

the variables and the estimated coefficients for total family medical expenditure using MEPS-HC 2005 data. All the coefficients are highly significant ($p<0.0001$) with expected signs.

Table 4.1 Descriptive Statistics for MEPS-HC 2005 Data

Variables	N	Mean	Stand Deviation
Family Total Health Care Expenditure	12,886	7,752	15,429
Family Out-of-Pocket Health Care Expenditure	12,886	1,381	2,633
Family Size	12,886	2.61	1.58
Family Total Income	12,886	48,405	44,535
Number of family members over 64	12,886	0.28	0.57
Number of family members under 2	12,886	0.08	0.29
Indicator for the presence of members over 64	12,886	0.22	0.41
Indicator for the presence of children under 2	12,886	0.08	0.26

Table 4.2 Total Family Health Care Expenditure Forecast Models

Variables	Model 1	Model 2
Intercept	4,378	4,202
Family Size	387	444
Family Total Income	0.014	0.015
Number of family members over 64	5,338	
Number of family members under 2	2,653	
Indicator for the presence of members over 64		6,720
Indicator for the presence of children under 2		2,644

Note: Statistics are for the 12,886 observations in the MEPS-HC 2005 data set.
The dependent variable is the family total medical spending.

The estimated coefficients of Model 1 in Table 4.2 are then used to forecast total family medical spending in the CES, which only reports out-of-pocket medical spending.[2] The medical related spending for CES households are replaced with the

presence of children under 18), which indicates a multicollinearity problem. Therefore, the current study chooses to use the number of children under 2 (or an indicator for the presence of children under 2) as an independent variable.

[2] Additional analysis using model 2 coefficients are also conducted but not reported since there are no significant differences in the results.

forecasted total medical spending amount. The average reported medical related spending for the CES households is $2,563 and the forecasted average family medical spending is $8,019. The Pearson correlation coefficient for the CES reported medical spending and the estimated medical spending is 0.25 and significant ($p<0.001$), which indicates total family medical spending is reasonably estimated and highly correlated with the original reported out-of-pocket spending.

Data Selection Based on Taxable Expenditure

Data from each household within the CES interview survey is collected for five consecutive quarters with 20% of the households being replaced with new households each quarter. This "rolling sample" methodology reduces the pressure on the CES to find a sufficiently large sample of households to begin the survey at the same point in time. Meanwhile, the rolling sample approach also limits the number of households for which 12 months of consumption is actually reported in any five quarter data set. To explain, given that the data consists of five consecutive quarters with 20% of the households being replaced each quarter, the maximum amount of households that report 12 months of consumption is 40% within each individual quarter.

For that reason, a graph of the taxable consumption for each of the four quarters 0f 2005 is used to determine which quarter is the best representation of an "average consumption" quarter. Taxable consumption under the **FairTax Plan** for every quarter is calculated according to the methodology addressed in Chapter 3 (See Table 3.3 for more details).

As shown in Figure 4.1, the consumption information collected during the fourth quarter of 2005 is closest to the average consumption per quarter. It should be noted that

this is the information about consumption collected during the fourth quarter of 2005, and, therefore, not necessarily consumption that occurred during the fourth quarter of 2005. To clarify, regardless of when interviewed, households report their consumption over the previous three months. Accordingly, depending upon when the household was interviewed during the fourth quarter of 2005, a portion of the consumption they report is from the fourth quarter of that year and the remaining from the third quarter.

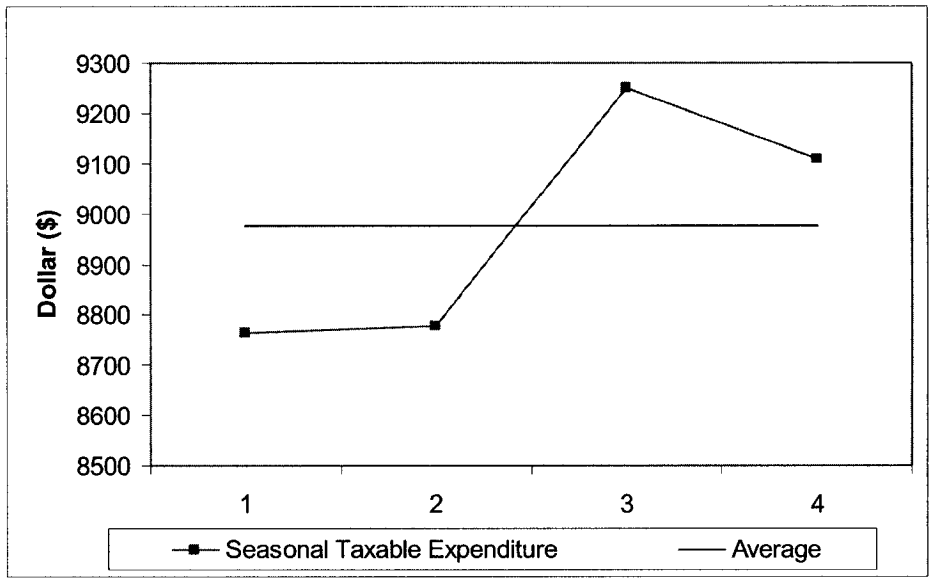

Figure 4.1 Expenditure Seasonal Analysis

The initial size of the sample for the fourth quarter of 2005 is 7,585 households. Only those headed by persons aged 18 to 90 and for which there are no missing data are selected[3]. Regarding the issue of omitted data, the CES codes it as either reasonably (i.e., valid reason for a response of zero) or unreasonably (i.e., invalid responses such as "don't know" or refusals) missing. The observations with blank responses coded by the CES as

[3] The age range is selected to be in consistent with that of the Panel Study of Income Dynamics (PSID) data.

being the result of invalid responses are eliminated. The above selection process resulted in a final sample of 7,373 households.

After selecting the fourth quarter of 2005 as the representative quarter, it is then mulitiplied by four to compute an estimated amount of annual taxable consumption for each of the households. The **FairTax** burden is also calculated for every CES household based on its annual taxable consumption and family rebate (refer to Table 3.3 for the calculation). The mean annual taxable consumption is $36,444 and the mean **FairTax** burden is $7,087.

Imputing Corporate Income Tax to CES Households

Methodology of Feldstein (1988). Corporate income tax is first distributed according to the Feldstein's (1988) approach which assumes that the tax is born by all capital income, an approach which has been widely used by economists (e.g., Feenberg et al 1997; Metcalf 1997; Metcalf 1999). This methodology is shown as follows:

First, calculate total capital income (K) which is defined as the sum of corporate profits (C), net interest received by households (I), and rental income (R). Table 4.3 presents the procedure and results for this calculation. The total capital income amounts to $1,284.33 billion. The calculation procedures for three real interest adjustors are further detailed in Tables 4.4, 4.5, and 4.6. The data used is for the year 2005 and is collected from the National Income and Product Accounts (NIPA), Flow of Funds, and Federal Reserve Bank.

Table 4.3 Calculation of Total Capital Income (K)

Unit: billion dollars

NIPA corporate profits (1)	1,154.60		
Federal Reserve Bank (FRB) profits (2)	(26.60)		
NIPA corporate profits excluding FRB profits (3)=(1)-(2)		1,128.00	
Corporate sector credit market instrument liablities (4)	5,289.20		
2005 inflation rate based on the CPI (5)	3.40%		
Decrease in corporate debt value resulting from inflation (6)=(4)*(5)		179.83	
Interest income received by pension funds (7)	118.20		
Pension funds real interest adjuster (8)	26.57%		
Real interest earned by pension funds (9)=(7)*(8)		31.41	
Total pretax corporate profits (C): (3)+(6)+(9)			**1,339.24**
Interest received by households from NIPA (10)	996.4		
Household interest income real interest adjuster (11)	4.90%		
Real interest income received by households (12)=(10)*(11)		48.77	
Personal interest expenses (excluding mortgage interest) from NIPA (13)	217.7		
Personal interest expenses real interest adjuster (14)	67.33%		
Real personal interest expenses (15) = (13) *(14)		(146.58)	
Net real interest income received by households (I): (12)-(15)			**(97.81)**
Rental income (R)			**42.90**
Total capital income (K = C + I + R)			**1,284.33**

Source: National Income Product Accounts (http://www.bea.gov)
and Flow of Funds (http://fraser.stlouisfed.org)

Table 4.4 Pension funds nominal interest rate (ρ) and real interest rate (r) calculation

Holding	Amount [a]	Percentage	Interest Rate [b]	Interest Rate Category
Time Deposits, etc.	101	12.5%	3.0%	Assumed based on various rates
Money Funds	86.7	10.7%	3.7%	6-month CDs
Governmental Bonds	344.2	42.6%	4.3%	10-year Treasury Constant Maturitiess
Corporate Bonds	276.1	34.2%	6.1%	Corporate Baa Bonds
Nominal Interest Rate Weighted by Holdings (ρ)			4.7%	
Inflation Rate (π)			3.4%	
Real Interest Rate: r=(1+ρ)/(1+π)-1			1.2%	
Adjuster to convert nominal interest into real interest (r / ρ)			26.6%	

Source: a. Flow of Funds (http://fraser.stlouisfed.org)
b. Federal Reserve Bank (http://www.federalreserve.gov/releases/h15/)

Table 4.5 Household nominal interest rate (ρ) and real interest rate (r) calculation

Holding	Amount [a]	Percentage	Interest Rate [b]	Interest Rate Category
Time Deposits, etc.	5144.9	64.4%	3.0%	Assumed based on various rates
Money Funds	949.2	11.9%	3.7%	6-month CDs
Governmental Bonds	1057.2	13.2%	4.3%	10-year Treasury Constant Maturitiess
Corporate Bonds	840.9	10.5%	6.1%	Corporate Baa Bonds
Nominal Interest Rate Weighted by Holdings (ρ)			3.6%	
Inflation Rate (π)			3.4%	
Real Interest Rate: r=(1+ρ)/(1+π)-1			0.2%	
Adjuster to convert nominal interest into real interest (r / ρ)			4.9%	

Source: a. Flow of Funds (http://fraser.stlouisfed.org)
b. Federal Reserve Bank (http://www.federalreserve.gov/releases/h15/)

Table 4.6 Personal interest expenses nominal interest rate (ρ) and real interest rate (r) calculation

Holding	Amount [a]	Percentage	Interest Rate [b]	Interest Rate Category
Consumer credit	2313.9	69.6%	12.5%	Credit card rates in FRB
Misc. Debt	1011.2	30.4%	8.2%	Prime Rate +2%
Nominal Interest Rate Weighted by Holdings (ρ)			11.2%	
Inflation Rate (π)			3.4%	
Real Interest Rate: r=(1+ρ)/(1+π)-1			7.5%	
Adjuster to convert nominal interest into real interest (r / ρ)			67.3%	

Source: a. Flow of Funds (http://fraser.stlouisfed.org)
b. Federal Reserve Bank (http://www.federalreserve.gov/releases/h15/)

Table 4.7 Average tax rate on capital income (γ_1) and profits to dividends ratio (γ_2): Feldstein Approach

NIPA corporate income taxes (T)	319.80
Total capital income (K)	1,284.33
Average tax rate on capital income (γ_1 = T / K)	0.25
Total pretax corporate profits (C)	1,339.24
Personal dividends (D)	574.70
Profits to dividends ratio (γ_2 =C / D)	2.33

Second, calculate the average tax rate on capital income (γ_1) and profits to the dividends ratio (γ_2). NIPA corporate income tax collections (T) are $319.8 billion in 2005. Personal dividends (D) calculated from the NIPA tables are $574.7 billion. As indicated in Table 4.7, the average tax rate on capital income (γ_1) is the ratio of corporate tax collections to capital income and equals 0.25. The profits to dividends ratio (γ_2) equals 2.33. As a result, the corporate tax liability per dollar of dividends distributed equals $\gamma_1 * \gamma_2 = 0.58$. The formula for attributing corporate tax liability is

$$CORP_i = 0.58*DIV_i + 0.25*INT_i + 0.25 * RENT_i \quad (4.1)$$

As discussed in Feldstein (1988), what matters for the purpose of tax distribution is not the interest and dividends that individuals report but the actual amount of interest and dividends that they receive. According to estimates by the Bureau of Economic Analysis (Ledbetter 2007), individuals include in their 2005 adjusted gross income only about 70% of the nominal interest income that they receive and about 66% of the dividends that they receive.[4] Therefore, the current study uses these estimates as adjusters for underreporting. Thus the formula for attributing corporate tax liability evolves as

$$CORP_i = 0.58*DIV_i / 0.66 + 0.25*INT_i / 0.7 + 0.25 * RENT_i$$

$$= 0.88*DIV_i + 0.36*INT_i + 0.25 * RENT_i \quad (4.2)$$

The mean corporate income tax attributed to the 2005 CES households equals $776 using formula 4.2.[5]

[4] Metcalf (1997) uses the same adjusters for underreporting that Feldstein (1988) uses for dividends (0.71) and interest income (0.82), which are estimates for year 1983 published by Department of Commerce. These adjusters are also tested in the current study and the results are not significantly different.

[5] Additional analyses using no adjusters or Feldstein (1988) adjusters are also conducted. These approaches distribute less corporate income taxes to the sample households while leaving the main results and conclusions of the study unchanged.

Methodology of 2006 Congressional Budget Office (CBO) Report. A recent CBO report (Randolph 2006) estimates that workers could bear as high as 70 percent of the corporate income tax burden while owners of capital would bear around 30 percent. The procedure for this approach is as follows: First, calculate the average corporate income tax rate on salary income (γ_3). NIPA wage and salary disbursements for private industries equals $4,686.9 billion in 2005. Assuming 70 percent of the $319.8 billion, i.e., $223.86 billion, corporate income taxes are born by all the salary income, the average corporate income tax rate on salary (γ_3) is 0.05. Second, the remaining 30 percent of the corporate income taxes are then distributed using the Feldstein (1988) methodology. As indicated in Table 4.8, the average tax rate on capital income (γ_1) equals 0.07. The profits to dividends ratio (γ_2) equals 2.33. Thus, the corporate tax liability per dollar of dividends distributed equals $\gamma_1 * \gamma_2 = 0.17$.

Table 4.8 Average tax rate on capital income (γ1), profits to dividends ratio (γ2), and average tax rate on salary income (γ3) : CBO Approach

30% of NIPA corporate income taxes (T_1)	95.94
Total capitalincome (K)	1,284.33
Average tax rate on capital income ($\gamma_1 = T_1 / K$)	0.07
Total pretax corporate profits (C)	1,339.24
Personal dividends (D)	574.70
Profits to dividends ratio ($\gamma_2 = C / D$)	2.33
70% of NIPA corporate income taxes (T_2)	223.86
NIPA wage and salary disbursements for private industries (S)	4,686.90
Average tax rate on salary income ($\gamma_3 = T_2 / S$)	0.05

Therefore, the formula for attributing corporate tax liability according to the 2006 CBO report is

$$CORP_i = 0.17*DIV_i + 0.07*INT_i + 0.07 * RENT_i + 0.05*SAL_i \quad (4.3)$$

After adjusting for underreporting, the formula for attributing the corporate tax liability is

$$CORP_i = 0.26*DIV_i + 0.1*INT_i + 0.07 * RENT_i + 0.05*SAL_i \quad (4.4)$$

The mean corporate income tax attributed to the 2005 CES households equals to $2,488 using formula 4.4.[6]

Imputing Estate and Gift Taxes to CES Households

As discussed in Chapter 3, the estate and gift tax burden for the CES households is imputed using the following equation:

$$EGTAX_i = \frac{DRATE_i * CAP50K_i}{\sum DRATE_i * CAP50K_i} * \theta_1 * FEDEGTAX \quad (4.5)$$

where $EGTAX_i$ denotes the estate and gift tax distributed for household i; FEDEGTAX is the NIPA federal receipts from estate and gift taxes; θ_1 is the deflator; $DRATE_i$ is adjusted death rate for household i; and $CAP50K_i$ is the amount of capital income in excess of $50,000 for household i.

The sum of capital income reported by the 2005 CES households equals to $9,418,008. To address the potential underreporting problem, two inflators used in the preceding section for interest income (0.7) and dividend income (0.66) are also adopted. The adjusted sum of capital income for the CES households would be $13,546,420. As calculated in the corporate income tax distribution section, the nation-wide aggregate total capital income (K) is $1,284.33 billion and there were $25 billion in NIPA federal

[6] Additional analyses assuming 70% are born by all households and the remaining are born by capital income, as well as those assuming no adjusters, are also conducted. These approaches will distribute less corporate income taxes to the sample households while leaving the main results and conclusions of the study unchanged.

receipts from estate and gift taxes in 2005. Therefore, $263,687 of estate and gift taxes will be allocated to the CES households resulting in less than 1 percent in the sample bearing the estate and gift tax burdens. Not surprisingly, the imputation procedure assigns most of the estate and gift tax burden to high income households. Households with incomes below $50,000 per year are assigned essentially no estate and gift tax and less than 9% of the estate and gift tax burden is allocated to households with incomes lower than $100,000.

Measuring Lifetime Income

This study uses 1968-2005 longitudinal income data from a sample of 563 households from PSID to perform income regressions and then estimate lifetime income profiles for the CES sample households based on PSID regression results.

First, an age-income profile is generated for the 563 households tracked over 1968-2005. PSID households are selected only if they meet the following three criteria: (1) participated in all annual surveys from 1968-2005; [7](2) headed by individuals aged 18 to 90 years;[8] and (3) there was no missing data.[9]

The Maxwell (2003) income estimation model is used in the current study.

$$INC_{it}=C+AGE_{it}+AGEit^2+AGE_{it}^3+Z_{it}+T_{it}+U_{it} \quad (4.6)$$

where INC_{it} is real total family income of the household i at time period t, AGE_{it} is age of the ith household head at time period t, Z_{it} is a vector of dummy variables, T_{it} is a time trend, i=1,2,…,n households, and t=1,2,…,k years.

[7] The survey went through 38 years (1968-2005) but has only 34 years of records since it is conducted every two years since 1997.
[8] In effect, a cohort of households headed by individuals aged 18 to 53 years of age in 1968 is followed over 38 years (with 34 years of records since PSID was conducted annually until 1997 and biennially thereafter). In 2005, ages of these household heads range from 55 to 90.
[9] Missing information for demographic variables such as race, gender, and education are imputed if there is consistent information in the year before and after.

The data is autoregressive of order one. The Durbin-Watson statistic equals 0.7085, and the test for positive autocorrelation of the errors is highly significant ($p<0.0001$). Thus, an exact maximum likelihood estimator is used to remove the AR (1) process.[10] After the correction, the Durbin-Watson statistic equals 2.18. Estimates of Equation 4.6 are presented below in Table 4.9.

Table 4.9 AR(1) Exact Maximum Likelihood Estimates of PSID Regression

Parameter	Estimate	Standard Error	t statistic	p value
C	-165,143.00	27,252.0	-6.06	<.0001
AGE	8,165.00	1,635.0	4.99	<.0001
AGESQ	-109.55	32.3	-3.39	.0007
AGECUB	.37	.2	1.83	.0678
UNEMP	-7,580.00	1,606.0	-4.72	<.0001
COUPLE	21,375.00	2,358.0	9.07	<.0001
FMHD	-13,031.00	4,337.0	-3.00	.0027
NWHD	-9,467.00	3,191.0	-2.97	.0030
NE-URB	18,609.00	6,190.0	3.01	.0026
MW-URB	11,292.00	6,024.0	1.87	.0609
S-URB	9,927.00	6,014.0	1.65	.0988
W-URB	18,849.00	6,271.0	3.01	.0027
SH	4,039.00	3,861.0	1.05	.2955
HG	12,488.00	3,619.0	3.45	.0006
SC	28,126.00	4,017.0	7.00	<.0001
CG	47,303.00	4,094.0	11.55	<.0001
PG	49,762.00	4,372.0	11.38	<.0001
TREND	797.43	140.0	5.70	<.0001
RHO	.65	.005	118.57	<.0001

Note: dependent variable is the real total family income.
Number of observations: 19,142
n=563 households k=34 years
R-squared = .5156 Durbin-Watson = 2.1800
Rho (autocorrelation coefficient) = .6517

[10] Ordinary least squares, fixed- and random-effects models are also estimated. Both F test and Hausman T test are in favor of a fixed-effects model. Following the Caspersen and Metcalf (1994) approach, a fixed-effects model is estimated for the PSID data. An instrumental variable regression is used to proxy for the individual effects in the CES data. But due to the limitations addressed in Chapter 3, the fixed-effects model does not forecast well for the CES sample.

All the estimates have the expected signs. Income initially rises with age and then falls in later years. Nonwhite or female-headed households earn less than white or male-headed households. Household income decreases significantly when the household head is unemployed. Household income for a married couple is higher than the income of a single-headed household. Residents of urban areas have higher incomes with particularly higher levels in the west and northeast. Income rises with the increase of education level, with a particularly large increase for the completion of a college degree. All the coefficients, except the education dummy for some high school, are significant at the 0.05 level with the exception of age cubed, the Midwest-urban, and the South-urban dummies which are significant at the 0.1 level.

The mean predicted income and actual real income for the PSID sample are presented in Table 4.10. Two kinds of predicted means can be produced from the AR (1) Exact Maximum Likelihood regression model. One (PRED1) includes both the structural part of the model (Equation 4.6) and the predicted values of the autoregressive error process (the coefficient for RHO listed in Table 4.9). The other (PRED2) is obtained from only the structural part of the model. As can be seen from Table 4.10, both mean predicted annual real income values are very close to the actual mean annual income. But both predicted values have much smaller standard deviations, especially for PRED2. Actual and predicted age-real income profiles for the PSID sample are shown in Figure 4.2. Real income appears to peak around age 60. The income predictions track actual income closely. Thus, the AR (1) Exact Maximum Likelihood process has successfully corrected for autocorrelation and the estimators from the structural part of the model can be further used to forecast income for the CES sample.

Table 4.10 Actual and Predicted Annual Real Income (PSID)

	NOB	Mean	Std. Deviation
Actual Annual Real Income	19,142	67, 584.71	78295.86
Predicted Annual Real Income (PRED1)	19,142	67, 584.87	55798.25
Predicted Annual Real Income (PRED2)	19,142	67, 585.05	29466.05

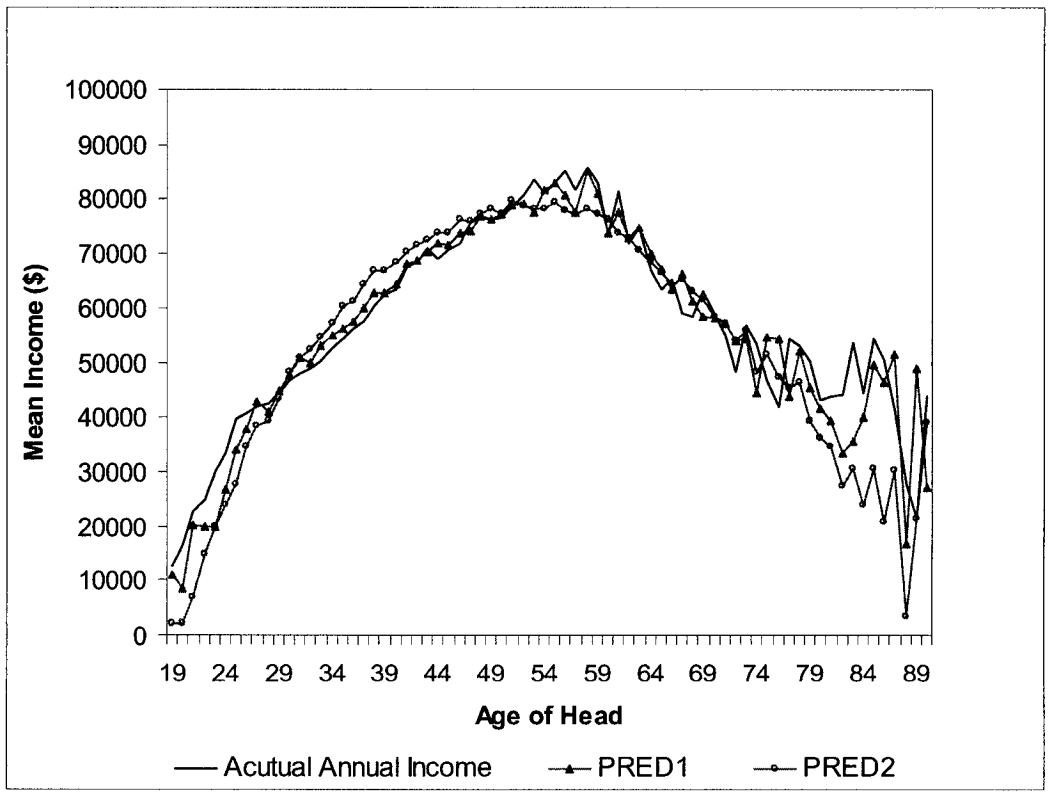

Figure 4.2 Actual and Predicted Age-Income Profile (PSID)

Next, the regression estimates from Equation 4.6 are used to predict lifetime income in the 2005 CES sample and compute the annualized lifetime equivalent income, which is a weighted average annuity as defined in Maxell (2003). [11]

Table 4.11 presents the 2005 actual annual real income, the 2005 predicted annual real income, and the estimated lifetime equivalent income. As can be seen from Table 4.11, while the mean of predicted annual income is higher than that of actual annual income in the CES, lifetime equivalent income is close to the actual annual income. Lifetime income measures exhibit less volatility (smaller standard deviation) when compared to annual income, which includes transitory gains and losses that cancel out over a lifetime.

Table 4.11 Actual Annual Real Income and Lifetime Equivalent Income (CES)

	N	Mean	Std. Deviation
Actual Annual Real Income	7,373	59,339.60	59,371.13
Lifetime Equivalent Income	7,373	61,247.07	27,651.11

Figure 4.3 shows the actual, predicted, and lifetime age-real income profiles for the CES sample. Annual income fluctuates and has a hump-shaped age-income profile

[11] Note that there is a general problem while calculating lifetime incomes for a cross-section of households: the status of the household head in the cross-section needs to be assumed to continually hold throughout its lifetime. This problem will have an ignorable impact on time-invariant variables but more of an effect on time-variant variables such as employment and marital status. In this study, the head is assumed to work from 18 until 64 and retire at age 65.

because of the lifecycle and transitory effects. The lifetime equivalent income flattens out and exhibits less volatility across all age categories, which is consistent with the permanent income theory.

Lifetime equivalent income is also more equally distributed over the CES sample population than actual annual real income. Gini coefficients were estimated for both income measures. A Gini coefficient of 1 indicates complete inequality of income with the highest income household having all income. A coefficient of 0 implies complete equality. Gini coefficients of .465 for annual income and .259 for lifetime income show lifetime income to be more equally distributed.

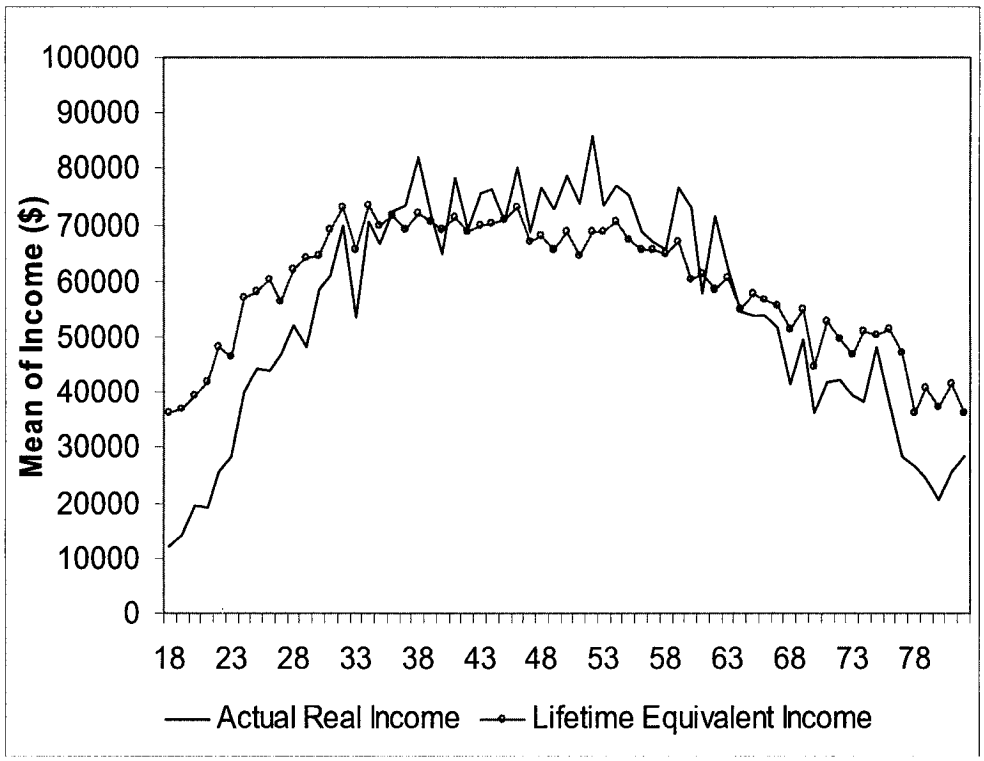

Figure 4.3 Actual and Lifetime Age-Income Profile (CES)

While mean incomes are comparable between the annual income and lifetime income measures, the placement of households within the income distributions can vary substantially in moving from an annual to a lifetime measure. Table 4.12 presents a cross-tabulation of annual and lifetime income quintiles, which shows that there is considerable variation among the quintiles based on annual and lifetime income. About 50% of households in the highest or lowest lifetime income quintile are also in the same annual income quintile. However, only 27.5% of those in the middle lifetime income quintile are middle income using annual income quintiles. More strikingly, nearly 10% of the households in the highest annual income quintile have lifetime income in the lowest 40% of the distribution while 10% of the households in the lowest annual income quintile are in the highest 40% of the distribution of lifetime income. The correlation between annual and lifetime income in the sample is 0.5. Based on the cross tabulation table, some difference between distributional results of the annual income approach and the lifetime income approach are expected.

Table 4.12 Cross Tabulation of Annual and Lifetime Equivalent Income

	Lifetime Equivalent Income Quintiles				
Annual Income Quintiles	1	2	2	4	5
1	**50.1**	27.2	12.8	7.6	2.3
2	28.9	**29.7**	20.2	15.4	5.8
3	13.6	24.0	**27.5**	22.4	12.5
4	5.6	11.3	25.2	**30.3**	27.6
5	1.9	7.8	14.3	24.5	**51.5**

Results for Research Question One: Average Tax Rates

Distributional Analysis under Annual Income Approach

The distributional impacts of the current federal tax system (CFT) and the **FairTax** (FT) under the annual income approach are reported in Tables 4.13 and 4.14. Table 4.13 presents the average tax burden and Table 4.14 presents the average tax rates. The current federal tax system includes personal income and payroll taxes, imputed estate and gift taxes, and imputed corporate income tax. The first imputed corporate income tax burden (CIT1) is based on the Feldstein (1988) approach which assumes the tax is born by capital income. The second imputed corporate income tax burden (CIT2) is based on the 2006 CBO report which finds that workers bear 70% of the corporate income tax while capital income bears only 30%. The two sets of total current federal taxes (CFT1 and CFT2) differ only in the corporate income tax.

As shown in the tables, the average tax burden and tax rates under the current federal tax system generally increase as household income increases, while the average tax rates under the **FairTax** decrease as income increases. The first four income deciles of households realize an increase in their average taxes under the FT.[12] In terms of dollars, if the **FairTax Plan** is adopted, the average tax rate will increase (decrease) for taxpayers with incomes less (greater) than $34,100.

[12] Initially, it may seem counter intuitive to have taxes borne by the first decile group of taxpayers, given that the Family Consumption Allowance should essentially cancel out the consumption tax paid by the lowest-level income earners. At the same time, however, it is important to remember that certain taxpayers may have high levels of expenditures despite having limited income, e.g., retired individuals who are drawing upon previously accumulated wealth. The average taxes as a percentage of taxable expenditure, however, increase with each of the deciles.

Table 4.13 Distributional Analysis: Average Tax Burden for Annual Income Deciles

Decile	Income Range $ '000	Average Income	PIT	PPT	EGT	CIT1	CIT2	CFT1	CFT2	FT	Average Taxable Expenditure
1	<10.4	5,664	(102)	353	-	59	120	309	370	2,892	18,634
2	10.4 -17.8	13,857	(131)	841	-	114	268	824	978	3,917	22,925
3	17.8 - 25.8	21,904	443	2,009	-	177	632	2,629	3,084	4,844	27,696
4	25.8 - 34.1	29,999	126	3,306	-	254	1,020	3,686	4,452	5,238	29,202
5	34.1 - 43.1	38,331	669	4,887	-	269	1,450	5,825	7,006	5,593	31,347
6	43.1 - 54.6	48,551	1,082	6,422	0.13	344	1,956	7,848	9,460	6,345	34,475
7	54.6 - 69	61,121	1,363	8,764	10	384	2,565	10,521	12,702	7,159	37,797
8	69 - 88	77,703	2,297	11,159	3	539	3,332	13,998	16,791	8,178	42,155
9	88 - 119	101,512	3,132	14,521	65	1,160	4,474	18,878	22,193	10,050	48,860
10	119 - 602	194,205	8,512	20,952	278	4,454	9,032	34,196	38,775	16,617	71,212
SAMPLE MEAN		59,340	1,742	7,327	36	777	2,488	9,881	11,592	7,087	36,385

Notes: PIT: Federal Personal Income Tax
PPT: Payroll Tax (both employer and employee portion)
EGT: Imputed Estate and Gift Taxes
CIT1: Imputed Corporate Income Tax (Feldstein Approach)
CIT2: Imputed Corporate Income Tax (CBO Approach)
CFT1: Total Current Federal Taxes (CFT1=PIT+PPT+EGT+CIT1)
CFT2: Total Current Federal Taxes (CFT2=PIT+PPT+EGT+CIT2)
FT: Net FairTax Liabilities after deducting prebates

Table 4.14 Distributional Analysis: Average Tax Rates for Annual Income Deciles

Decile	Income Range $ '000	Average Income	PIT	PPT	EGT	CIT1	CIT2	CFT1	CFT2	FT	Average FT as a Percentage of Taxable Expenditure
1	<10.4	5,664	-1.80%	6.22%	0.00%	1.04%	2.12%	5.46%	6.54%	51.05%	15.52%
2	10.4 -17.8	13,857	-0.94%	6.07%	0.00%	0.82%	1.93%	5.94%	7.05%	28.27%	17.09%
3	17.8 - 25.8	21,904	2.02%	9.17%	0.00%	0.81%	2.88%	12.00%	14.08%	22.11%	17.49%
4	25.8 - 34.1	29,999	0.42%	11.02%	0.00%	0.85%	3.40%	12.29%	14.84%	17.46%	17.94%
5	34.1 - 43.1	38,331	1.74%	12.75%	0.00%	0.70%	3.78%	15.20%	18.28%	14.59%	17.84%
6	43.1 - 54.6	48,551	2.23%	13.23%	0.00%	0.71%	4.03%	16.17%	19.49%	16.55%	18.40%
7	54.6 - 69	61,121	2.23%	14.34%	0.02%	0.63%	4.20%	17.21%	20.78%	11.71%	18.94%
8	69 - 88	77,703	2.96%	14.36%	0.00%	0.69%	4.29%	18.01%	21.61%	10.52%	19.40%
9	88 - 119	101,512	3.09%	14.30%	0.06%	1.14%	4.41%	18.60%	21.86%	9.90%	20.57%
10	119 - 602	194,205	4.38%	10.79%	0.14%	2.29%	4.65%	17.61%	19.97%	8.56%	23.33%
SAMPLE MEAN		59,340	2.94%	12.35%	0.06%	1.31%	4.19%	16.65%	19.54%	11.94%	19.48%

Notes:
PIT: Federal Personal Income Tax
PPT: Payroll Tax (both employer and employee portion)
EGT: Imputed Estate and Gift Taxes
CIT1: Imputed Corporate Income Tax (Feldstein Approach)
CIT2: Imputed Corporate Income Tax (CBO Approach)
CFT1: Total Current Federal Taxes (CFT1=PIT+PPT+EGT+CIT1)
CFT2: Total Current Federal Taxes (CFT2=PIT+PPT+EGT+CIT2)
FT: Net FairTax Liabilities after deducting prebates

Note that these results are based on the legislative **FairTax** rate (30% tax-exclusive and 23% tax-inclusive) which is questioned for its revenue neutrality. The **FairTax** is not revenue neutral based on the analysis of the present study using the 2005 CES sample. The average FT is $7,087 while the average CFT1 is $9,881 and the average CFT2 is $11,592. Since the overall **FairTax** burden is lower than that of the current federal tax burden, one should be cautious when analyzing the average tax rates. That is, the regressivity level of the **FairTax** is expected to be even stronger under higher revenue-neutral rates. Pseudo revenue-neutral analysis using the 2005 CES sample suggests that the **FairTax** rate should be at least 40% tax-exclusive (28.6% tax-inclusive) to collect the same amount as CFT1 and 45% tax-exclusive (31% tax-inclusive) to collect the same amount as CFT2. [13] Opposition to the **FairTax Plan** may use this as evidence that the tax rate is not high enough to create a revenue-neutral shift in tax policies. Conversely, supporters of the **FairTax Plan** could respond that the drop in tax revenue collections will be made up for by the increased number of individuals paying into the tax system, e.g., illegal immigrants, tourists, or current tax evaders. Nevertheless, sensitivity analyses using these pseudo revenue-neutral rates and other revenue-neutral rates suggested by prior literature is presented later.

Evidence regarding the progressivity of each of these systems is also apparent in Figures 4.4 and 4.5. Figure 4.4 presents the average tax rate trend for each specific current federal tax except the estate and gift tax because of very small numbers. The federal personal income tax (PIT) is progressive with an exception at the 4th decile. The payroll tax rates (PPT) increase at the middle income deciles then flatten out at both low

[13] This procedure is named as pseudo revenue-neutral analysis because macro-level data is needed for the calculation of a revenue-neutral rate while these two rates are obtained based on the 2005 CES sample.

and high ends and even decrease dramatically from decile 9 to 10, corresponding to the social security tax ceiling. The corporate income tax (CIT1 and CIT2), however, seems to be relatively proportional.

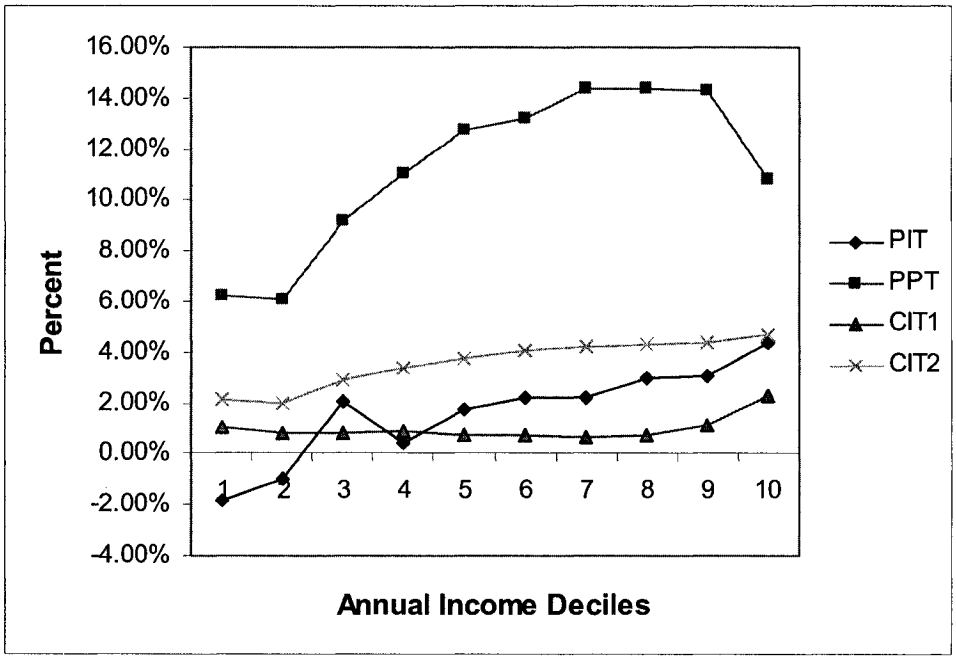

Figure 4.4 Average Tax Rates for the Current Federal Taxes: Annual Income

Figure 4.5 provides a graphical representation of the contrast of increasing and decreasing average tax rates between the current federal tax and the **FairTax**, respectively. Overall, the current federal tax system seems to be progressive while the **FairTax** appears to be regressive.

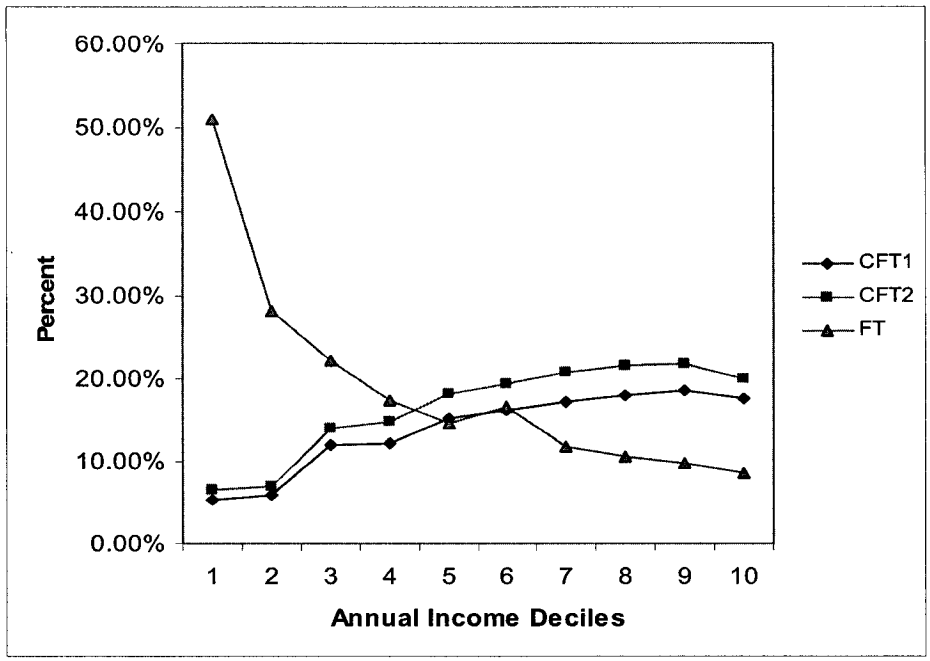

Figure 4.5 Average Taxes as a Percent of Annual Income: Current Federal Tax System (CFT) VS FairTax (FT)

Distributional Analysis under Lifetime Income Approach

The distributional impacts of the current federal tax system (CFT) and the **FairTax** (FT) under the lifetime income approach are reported in Tables 4.15 and 4.16. As can be seen, lifetime income appears to be more equally distributed across the income scales and thereby flattens out the distribution of tax liabilities. The **FairTax** average tax rate decreases from 33.78% at decile 1 to 16.44% at decile 2 but remains relatively stable around 10-11% for the next 8 deciles. The first two income deciles of households realize an increase in their average taxes under the FT. In terms of dollars, if the **FairTax Plan** is adopted, the average tax rate will increase (decrease) for taxpayers with lifetime incomes less (greater) than $35,700.

Table 4.15 Distributional Analysis: Average Tax Burden for Lifetime Income Deciles

Decile	Income Range $ '000	Average Income	PIT	PPT	EGT	CIT1	CIT2	CFT1	CFT2	FT	Average Taxable Expenditure
1	<22.2	12,720	42	1,766	9	169	566	1,987	2,383	4,297	22,860
2	22.2 -35.7	29,686	281	3,209	1	198	967	3,690	4,459	4,880	25,320
3	35.7 - 45.8	41,087	578	4,067	25	377	1,248	5,047	5,918	4,907	26,731
4	45.8 -54.2	50,699	862	4,931	16	509	1,481	6,318	7,291	6,005	32,005
5	54.2 - 61.8	57,870	1,085	6,427	9	432	1,929	7,952	9,450	6,052	33,406
6	61.8 - 68.6	64,686	2,033	8,067	7	457	2,512	10,564	12,619	6,718	35,780
7	68.6 -77.8	73,046	1,187	8,114	90	727	2,580	10,118	11,971	7,694	38,594
8	77.8 - 88.8	83,136	2,935	10,077	71	1,576	3,518	14,659	16,601	8,193	41,604
9	88.8 - 99.5	94,977	3,662	11,529	71	1,566	4,328	16,828	19,589	10,115	50,181
10	119 -111.2	104,387	4,741	15,051	58	1,753	5,734	21,603	25,583	11,989	57,876
SAMPLE MEAN		61,247	1,742	7,327	36	777	2,488	9,881	11,592	7,087	36,385

Notes: PIT: Federal Personal Income Tax
PPT: Payroll Tax (both employer and employee portion)
EGT: Imputed Estate and Gift Taxes
CIT1: Imputed Corporate Income Tax (Feldstein Approach)
CIT2: Imputed Corporate Income Tax (CBO Approach)
CFT1: Total Current Federal Taxes (CFT1=PIT+PPT+EGT+CIT1)
CFT2: Total Current Federal Taxes (CFT2=PIT+PPT+EGT+CIT2)
FT: Net FairTax Liabilities after deducting prebates

Table 4.16 Distributional Analysis: Average Tax Rates for Lifetime Income Deciles

Decile	Income Range $ '000	Average Income	PIT	PPT	EGT	CIT1	CIT2	CFT1	CFT2	FT	Average FT as a Percentage of Taxable Expenditure
1	<22.2	12,720	0.33%	13.89%	0.07%	1.33%	4.45%	15.62%	18.73%	33.78%	18.80%
2	22.2 -35.7	29,686	0.95%	10.81%	0.00%	0.67%	3.26%	12.43%	15.02%	16.44%	19.27%
3	35.7 - 45.8	41,087	1.41%	9.90%	0.06%	0.92%	3.04%	12.28%	14.40%	11.94%	18.36%
4	45.8 -54.2	50,699	1.70%	9.73%	0.03%	1.00%	2.92%	12.46%	14.38%	11.84%	18.76%
5	54.2 - 61.8	57,870	1.87%	11.11%	0.02%	0.75%	3.33%	13.74%	16.33%	10.46%	18.12%
6	61.8 - 68.6	64,686	3.14%	12.47%	0.01%	0.71%	3.88%	16.33%	19.51%	11.61%	18.78%
7	68.6 -77.8	73,046	1.62%	11.11%	0.12%	0.99%	3.53%	13.85%	16.39%	10.53%	19.94%
8	77.8 - 88.8	83,136	3.53%	12.12%	0.08%	1.90%	4.23%	17.63%	19.97%	9.86%	19.69%
9	88.8 - 99.5	94,977	3.86%	12.14%	0.07%	1.65%	4.56%	17.72%	20.63%	10.65%	20.16%
10	119 -111.2	104,387	4.54%	14.42%	0.06%	1.68%	5.49%	20.69%	24.51%	11.49%	20.71%
SAMPLE MEAN		61,247	2.84%	11.96%	0.06%	1.27%	4.06%	16.13%	18.93%	11.57%	19.48%

Notes: PIT: Federal Personal Income Tax
PPT: Payroll Tax (both employer and employee portion)
EGT: Imputed Estate and Gift Taxes
CIT1: Imputed Corporate Income Tax (Feldstein Approach)
CIT2: Imputed Corporate Income Tax (CBO Approach)
CFT1: Total Current Federal Taxes (CFT1=PIT+PPT+EGT+CIT1)
CFT2: Total Current Federal Taxes (CFT2=PIT+PPT+EGT+CIT2)
FT: Net FairTax Liabilities after deducting prebates

A graphic presentation of the average tax rates is shown in Figures 4.6 and 4.7. Even though most of the tax distributions under lifetime income appear to be flatter than those under annual income, the changes in the distribution of payroll tax (PPT) and **FairTax** (FT) are more obvious. The distributions of the total current federal tax (CFT1 and CFT2) are significantly affected by the payroll tax (PPT). Overall, the current federal tax system seems to be progressive under both the annual income and the lifetime income approaches, while the **FairTax** appears to be less regressive under the lifetime income approach than the annual income approach but still more regressive than the current federal tax system.

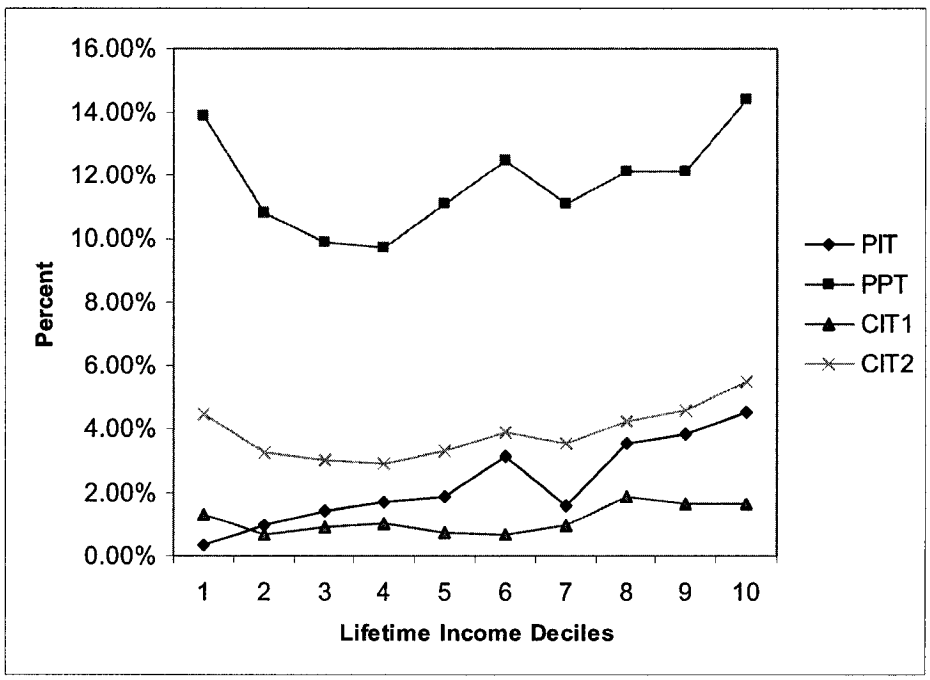

Figure 4.6 Average Tax Rates for the Current Federal Taxes: Lifetime Income

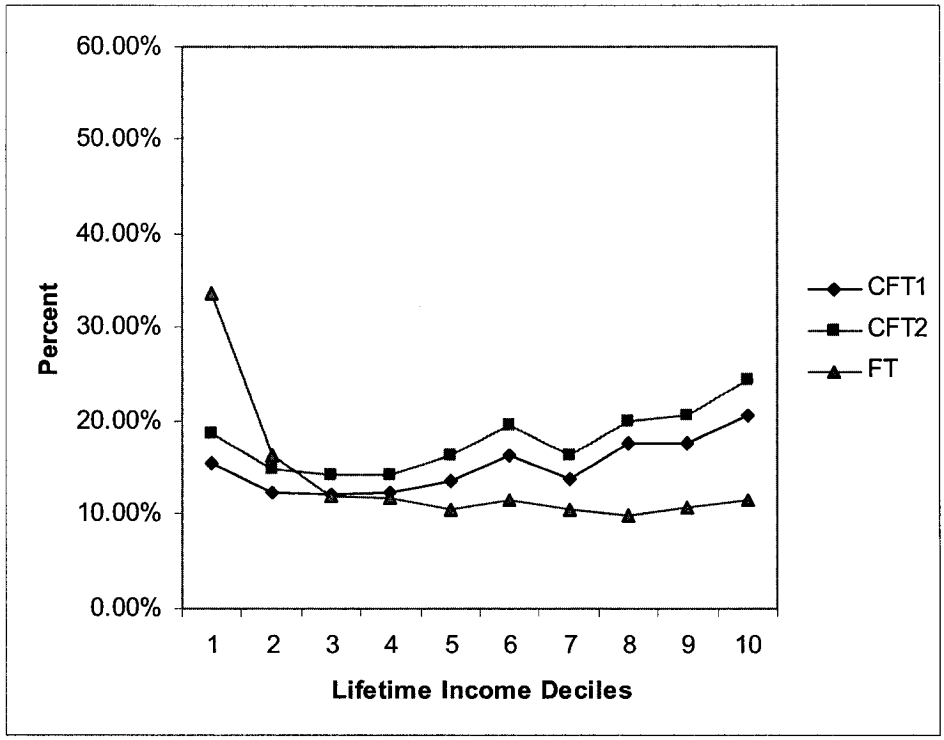

Figure 4.7 Average Taxes as a Percentage of Lifetime Income:
Current Federal Tax System (CFT) VS FairTax (FT)

Again, these results are based on the legislative **FairTax** rate and sensitivity analyses using pseudo revenue-neutral rates from the CES sample and other revenue-neutral rates suggested by the prior literature will be presented later. The regressivity level of the **FairTax**, however, is expected to be even stronger under higher revenue-neutral rates.

Results for Research Questions Two to Five: Overall Progressivity

Although the information acquired by analyzing the average tax rate is valuable in assessing the distributional effects of adopting the **FairTax**, nonetheless, global measures of progressivity are necessary to measure overall systems. Accordingly, the present study employs the Suits and Kakwani indices. As provided in Iyer et al. (1996), the first step

when employing the Suits or Kakwani indices is to graph the respective indices "because if the income and tax curves intersect each other, interpretation of the overall values of the indexes is not straightforward."

Assessing Overall Progressivity Based on Suits Index

Annual Income Approach. The Suits curves for the CFT1, CFT2, and FT under the annual income approach are illustrated in Figure 4.8. A progressive (regressive) tax system results in a tax curve that lies below (above) the diagonal. The relative progressivity of two tax systems can only be achieved by examining their respective tax curves before and after any points of intersection.

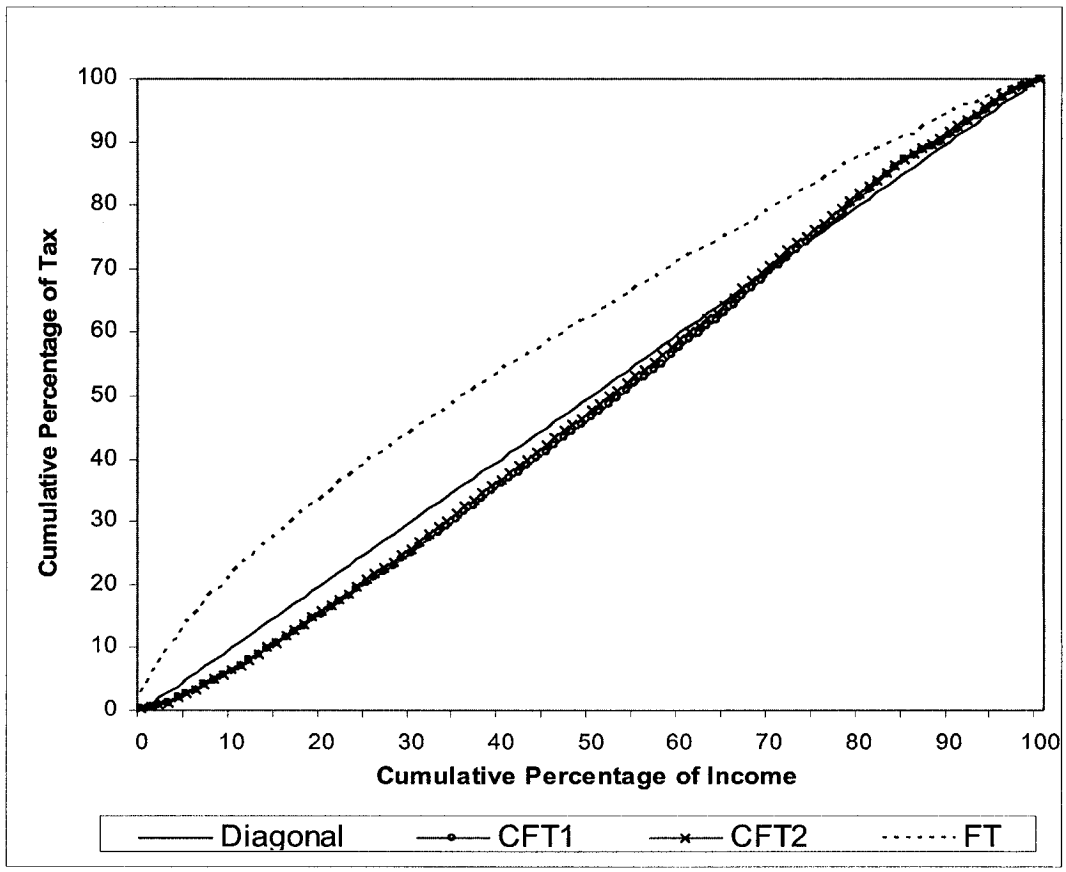

Figure 4.8 Suits Curves of 2005 CFT and FT: Annual Income

For the tax curves in Figure 4.8, the curve for FT is above the diagonal line, indicating regressivity of the **FairTax** system. The curves for CFT1 and CFT2 almost overlap each other, suggesting the use of different corporate income tax distribution methodology doesn't have a significant effect on the overall progressivity level of the current federal tax (CFT) system. The only point of intersection occurs at the 74th cumulative percentage of income, indicating that CFT is regressive after the 74th cumulative percentage of income. This finding is contrary to prior research that the current federal tax system is progressive (e.g., Pechman 1985).

To understand the reason for this intersection, the Suits curves for the four components of the current federal taxes, i.e. personal income tax (PIT), payroll tax (PPT), estate and gift tax (EGT), and corporate income tax (CIT1 or CIT2) are further analyzed. As indicated in Figure 4.9, PIT, EGT, CIT1, or CIT2 are all progressive while PPT is regressive after the 38th cumulative percentage of income. Thus, the reason for this unusual finding is mainly due to the payroll tax, which prior researchers find to be regressive in nature, e.g., Ricketts (1990). Furthermore, the extent and accuracy of information (i.e., topcoding) in regards to households at the upper income levels could be insufficiently represented in the CES data. For example, the largest income for a household in the CES file is approximately $602,000 while in the SOI file it exceeds $10,000,000. This could also affect the results at the upper income levels.

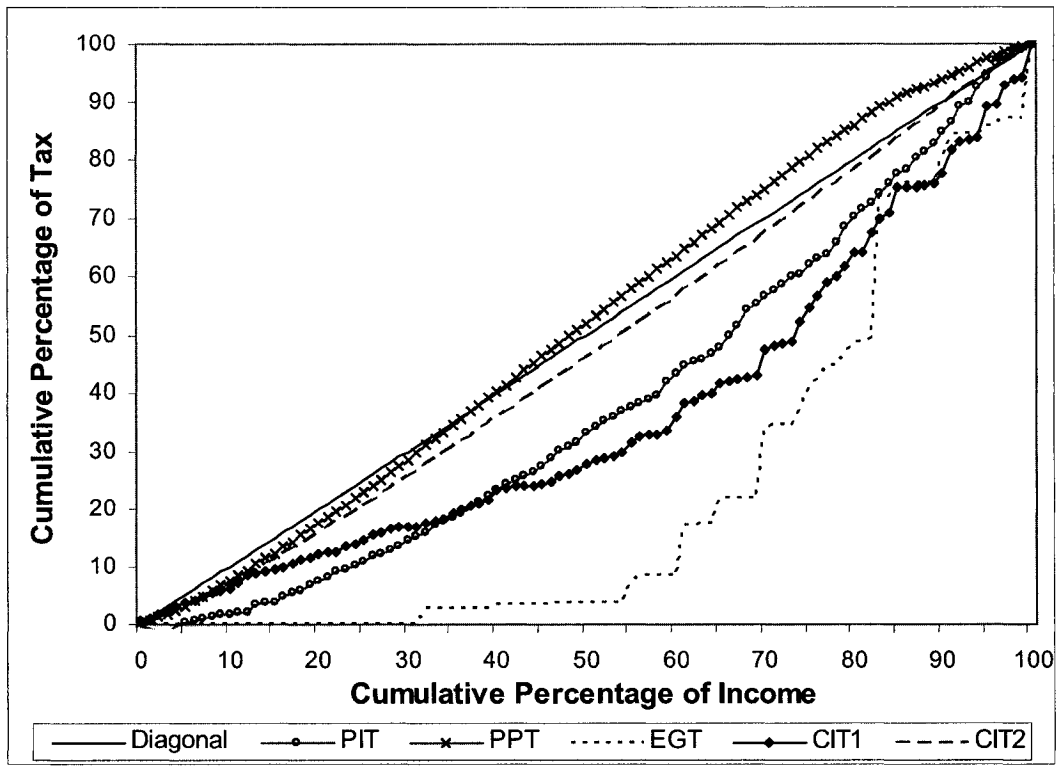

Figure 4.9 Suits Curves of 2005 Current Federal Taxes: Annual Income

Lifetime Income Approach. The Suits curves for the CFT1, CFT2, and FT under the lifetime income approach are illustrated in Figure 4.10. The tax curve for FT is above the diagonal line, indicating that the **FairTax** system is still regressive under the lifetime income approach. Compared to the FT curve under the annual income approach, the lifetime income FT curve is closer to the diagonal line and hence suggests that the **FairTax** appears to be less regressive under the lifetime income approach. This finding is consistent with prior literature with regard to the regressivity of a consumption-based tax (e.g., Fullerton and Rogers 1993; Caspersen and Metcalf 1994; Metcalf 1997; Maxwell 2003). The tax curves for CFT1 and CFT2 still nearly overlap each other suggesting different corporate income tax distribution methodology doesn't have a significant effect on the overall progressivity level of the current federal tax (CFT) system even under the

lifetime income approach. The curves for both CFT1 and CFT2, however, lie beyond the diagonal line and have no intersections suggesting that the current federal tax system is even more progressive under the lifetime income approach.

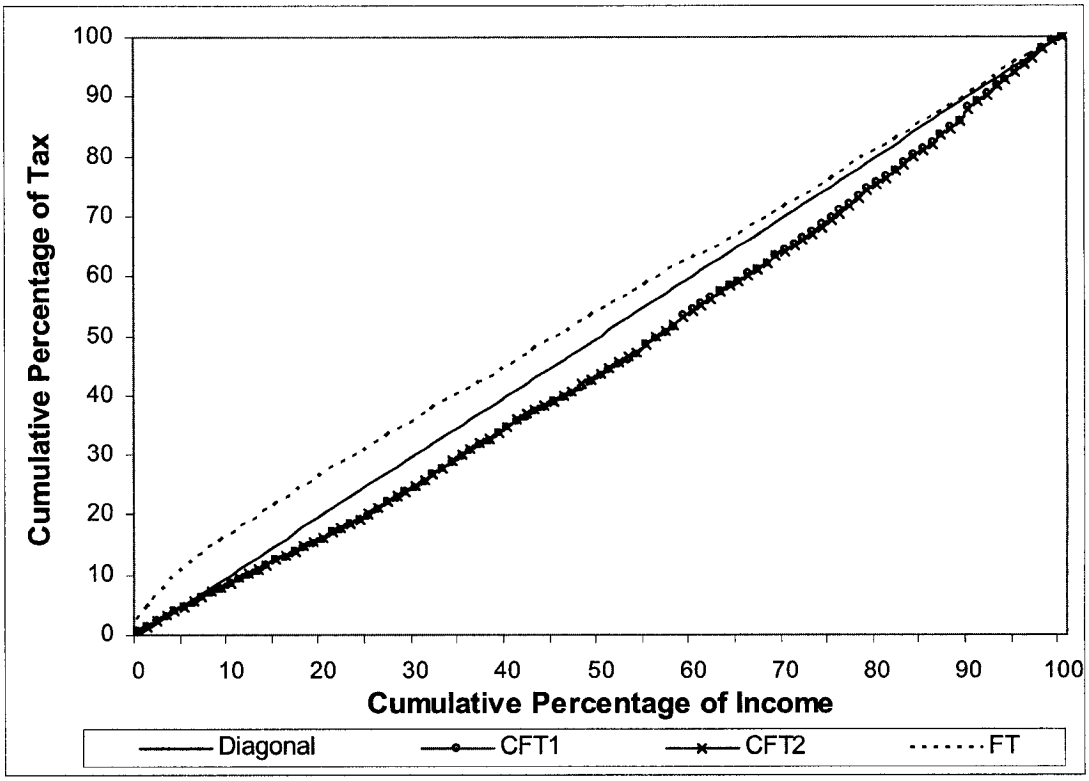

Figure 4.10 Suits Curves of 2005 CFT and FT: Lifetime Income

Because prior literature generally suggests that the individual income tax is less progressive under the lifetime income approach (e.g., Fullerton and Rogers 1993; Metcalf 1997), the Suits curves for the four components of the current federal taxes, i.e. personal income tax (PIT), payroll tax (PPT), estate and gift tax (EGT), and corporate income tax (CIT1 or CIT2) are further analyzed using the lifetime income approach. The results are presented in Figure 4.11. Compared to the curves using the annual income approach as shown in Figure 4.9, one notable change is that the PPT curve lies totally beyond the

diagonal line and has no intersection with the diagonal line in Figure 4.11. In other words, the PPT appears to be very progressive under the lifetime income approach while it is regressive at the middle and high level income levels using the annual income approach. Therefore, one major reason for the improvement in the progressivity level of the current federal tax system under the lifetime income approach is the change of the progressivity level of the payroll taxes.

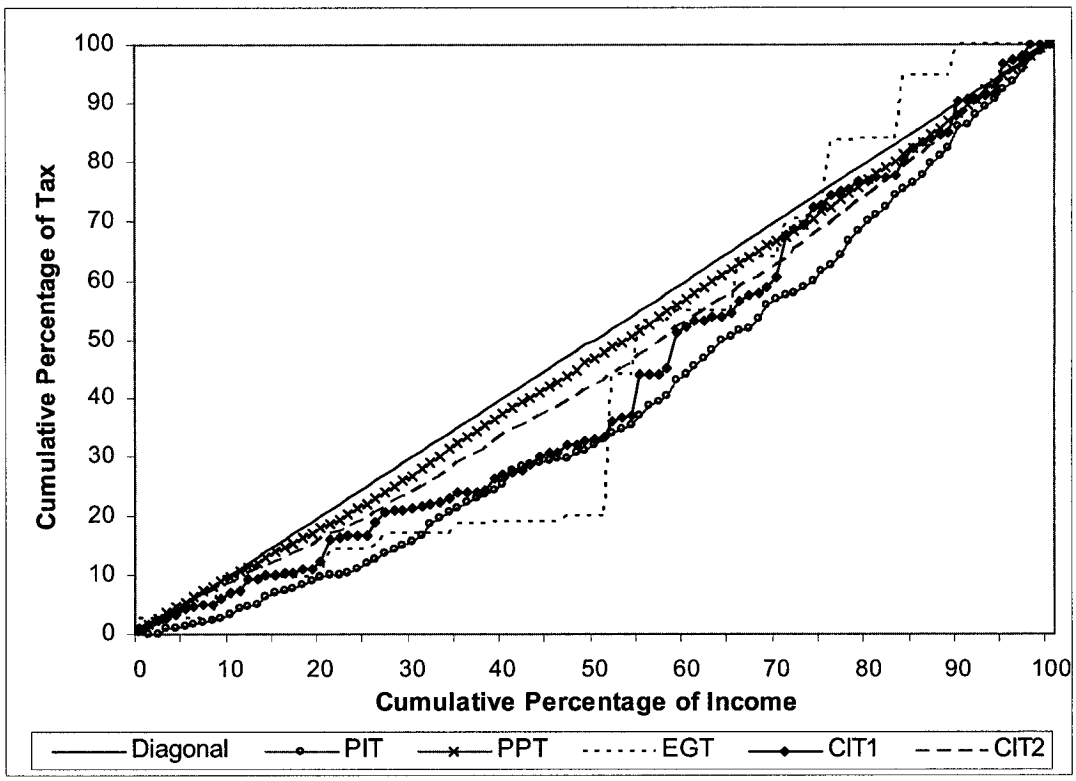

Figure 4.11 Suits Curves of 2005 Current Federal Taxes: Lifetime Income

Another notable change is seen in the EGT tax curve, which is highly progressive under the annual income approach but shows some degree of regressivity at high lifetime income levels as shown in Figure 4.11. One possible explanation for this unusual finding is the lifecycle effects on lifetime income. In other words, elderly people tend to have

lower lifetime income while higher lifetime income individuals are more likely to be younger and theoretically bear less estate and gift taxes. Nevertheless, the estate and gift tax remains highly progressive overall as suggested by the values of Suits indices in Table 4.17 under both the annual income approach (0.553) and the lifetime income approach (0.229).

Table 4.17 Comparison of Suits Index

Tax System	Annual Income	Lifetime Income
PIT	0.247	0.231
PPT	-0.021	0.054
EGT	0.553	0.229
CIT1	0.291	0.146
CIT2	0.066	0.106
CFT1	0.053	0.093
CFT2	0.04	0.092
FT	-0.196	-0.066

PIT: Federal Personal Income Tax
PPT: Payroll Tax (both employer and employee portion)
EGT: Imputed Estate and Gift Taxes
CIT1: Imputed Corporate Income Tax (Feldstein Approach)
CIT2: Imputed Corporate Income Tax (CBO Approach)
CFT1: Total Current Federal Taxes (CFT1=PIT+PPT+EGT+CIT1)
CFT2: Total Current Federal Taxes (CFT2=PIT+PPT+EGT+CIT2)
FT: Net FairTax Liabilities after deducting prebates

Comparison of the Suits Indices. Table 4.17 presents the overall values of the Suits indices for the current federal tax system and the **FairTax**. Both Suits values for FT under annual income (-0.196) and lifetime income (-0.066) suggest that the **FairTax** is regressive. The **FairTax** does appear to be less regressive, however, under the lifetime income approach. As measured by Suits values, the ranking of the households by lifetime income instead of annual income would reduce the level of regressivity by 66.3%. This finding is not only consistent with prior literature, but also corresponds to the economic

theory that suggests lifetime income to be an important determinant of consumption and annual income measures generally overstate the regressivity level of a consumption tax (Caspersen and Metcalf 1994; Maxwell 2003).

Under both income approaches, the Suits values for CFT1 and CFT2 indicate a progressive current federal tax system. Note that these values for annual income are obtained without decomposing the Suits index into pre- and post-intersection point computations. As the result of higher income individuals being under represented in the CES database and the curves seeming to be nearly overlapping after the intersection, it does not appear worthwhile to decompose the subsequent Suits index analysis into pre- and post-interception point computations. The potential limitations of this approach, however, do not have a significant impact on the findings because the Suits indices for FT, pursuant to both income approaches, strongly indicate that the **FairTax Plan** is regressive.

All the current federal taxes, including payroll taxes, appear to be progressive under the lifetime income approach. PIT, EGT, and CIT1 appear to be less progressive while CIT2 appears to be more progressive under the lifetime income approach. PPT, however, switches from being regressive under annual income to being progressive using lifetime income. Hence, the current federal tax system (CFT1 and CFT2), which the **FairTax Plan** intends to replace, appears to be even more progressive under the lifetime income approach.

Assessing Overall Progressivity Based on Kakwani Index

Annual Income Approach. Figure 4.12 presents the Kakwani curves of CFT1, CFT2, and FT under the annual income approach. The FT curve always lies above the

Lorenz curve of income, which indicates a regressive tax system. The overall Kakwani index for the FT system under the annual income approach, as presented in Table 4.18, supports this conclusion with a negative value of (-0.192).

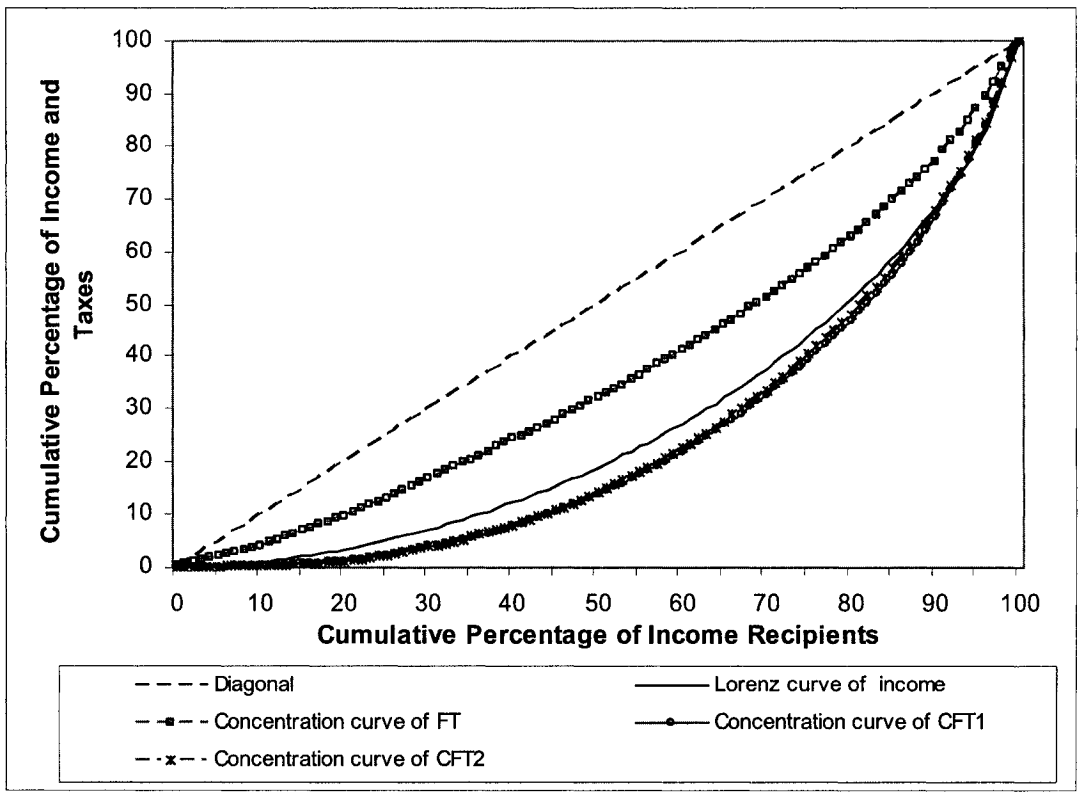

Figure 4.12 Kakwani Curves of 2005 CFT and FT: Annual Income

Comparatively, the CFT1 curve lies below the Lorenz curve of income until it crosses over at the 94th (92th for CFT2) cumulative percentile of income recipients. Again, the CFT1 and CFT2 curves do not differ significantly. As a result, the current federal tax system appears to be progressive in the majority of our sample households, which is consistent with positive Kakwani indices (0.062 for CFT1 and 0.053 for CFT2) as reported in Table 4.18.

Table 4.18 Comparison of Kakwani Index

Tax System	Annual Income	Lifetime Income
Current Federal Tax System (CFT1)	0.062	0.079
Current Federal Tax System (CFT2)	0.053	0.077
FairTax (FT)	-0.192	-0.076

Lifetime Income Approach. Figure 4.13 presents the Kakwani curves of CFT1, CFT2, and FT under the lifetime income approach. The lifetime income FT curve still lies above the Lorenz curve of income, which indicates a regressive tax system. It is, however, much closer to the Lorenz curve of income than the annual income FT curve. Therefore, the FairTax appears to be less regressive under the lifetime income approach. The overall Kakwani index for the FT system under the lifetime income approach, as presented in Table 4.18, supports this conclusion with a smaller negative value of (-0.076). Compared to the Kakwani index under the annual income approach (-0.192), ranking households by lifetime income would reduce its regressivity level by 60.4%. The CFT1 and CFT2 curves which almost overlap each other, however, always lie below the Lorenz curve of income. Consistent with the finding that uses the Suits Index, the current federal tax system appears to be even more progressive under the lifetime income approach, supported by the larger positive Kakwani indices (0.079 for CFT1 and 0.077 for CFT2) as reported in Table 4.18.

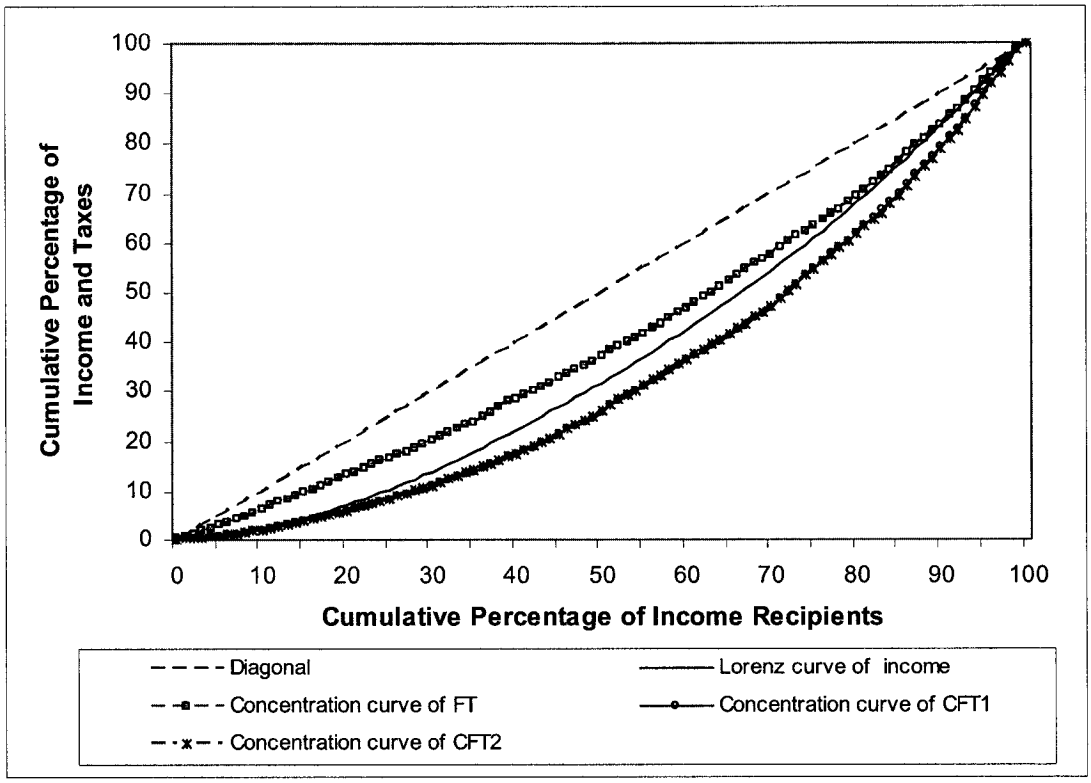

Figure 4.13 Kakwani Curves of 2005 CFT and FT: Lifetime Income

Results for Research Question Six: Implications on Income Inequality

The final objective of the present study is to examine the redistributive effect, that is, the ability to reduce income inequality when moving from pre-tax to post-tax incomes, of the current federal tax system and the **FairTax**. As discussed in Formby et al. (1990), the concepts of a tax being progressive and having a redistributive effect are two inter-related yet separate concepts. To explain, the redistributive effect concept incorporates horizontal equity (i.e., re-ranking effect) in addition to progressivity. The ability of the CFT and FT systems to decrease the before-tax income inequality is reported by two separate measures: the Reynolds-Smolensky index and the Pfähler index.

A positive value for the Reynolds-Smolensky (RS) index indicates a tax system that reduces income inequality. On the other hand, a negative value denotes increasing inequality. The RS indices are reported in Table 4.19. Under the annual income approach, the positive values for the current federal tax system (0.006 for CFT1 and 0.007 for CFT2) signifies a reduction in income inequality while the negative value (-0.031) for FT denotes that income inequality increases under the **FairTax Plan**. Under the lifetime income approach, surprisingly, both the current federal tax system (either CFT1 or CFT2) and the **FairTax** system have negative values for the RS index. In fact, lifetime income inequality increases to a similar extent under both systems as suggested by the RS values (-0.022).

Table 4.19 Indices for Redistributive Effects

	Annual Income			Lifetime Income		
Indices/Tax System	CFT1	CFT2	FT	CFT1	CFT2	FT
Reynolds-Smolensky (RS) Index	0.006	0.007	-0.031	-0.022	-0.022	-0.022
Pf鋒ler (P) Index	0.005	0.004	-0.032	-0.018	-0.018	-0.021
Atkinson-Plotnick (AP) Index	0.006	0.006	0.005	0.037	0.040	0.012

As addressed before, the redistributive effect incorporates the income re-ranking effect in addition to progressivity. The re-ranking effect has a negative outcome on redistribution. Whenever non-income characteristics are taken into account in determining tax liabilities, reversals in the ranking of incomes are likely to occur in the transition from pre-tax to post-tax. As discussed in Chapter 3, the concentration curve for post-tax income differs from the post-tax Lorenz curve when income re-ranking exists. The Atkinson-Plotnick (AP) index measures this difference for the income re-ranking effect.

Atkinson-Plotnick (AP) re-ranking indices are also reported in Table 4.19. The re-ranking effects on annual income are relatively small for both the current federal tax system (0.006 for CFT1 and CFT2) and the **FairTax** system (0.005 for FT). The tax-induced re-ranking effects on lifetime income, however, are larger than the re-ranking effects on annual income. As shown in Table 4.19, the current federal tax system also causes lifetime income re-ranking but to a larger extent (0.037 for CFT1 and 0.040 for CFT2) than the **FairTax** (0.012 for FT). Because of the negative effect of re-ranking on redistribution, the current federal tax system has a negative RS index value while being progressive under the lifetime income approach.

AP indices suggest that both the current federal income tax and the **FairTax** induce income re-ranking and hence horizontal inequity, which are even stronger when using a lifetime income measure. The extent of this horizontal inequity for the current federal tax system also appears to be stronger than the horizontal inequity for the **FairTax** system. One possible explanation for this finding could be that many non-income characteristics are taken into account in determining tax liabilities, especially for the current federal tax system.

A second measure of the redistributive effect is the Pfähler index. Similar to those findings using the RS index, the current federal tax system is found to reduce annual income inequity but increases lifetime income inequity, while the **FairTax** increases the inequality of both annual income and lifetime income.

Sensitivity Analysis

Sensitivity analyses are performed to test the robustness of the results and conclusions of this study when its underlying assumptions or estimates are varied. Issues addressed in this section include the following:

First, the preceding computations rely upon the assumption that employees pay both the employees' and employers' portion of payroll taxes under the current system. However, another reasonable assumption is that employees only pay their portion of payroll taxes. This condition holds where the labor market is fairly elastic. Where this assumption is true, the level of progressivity for the current federal tax system would be deflated. Consequently, analysis of the current tax system is replicated with the employer portion of payroll taxes being excluded from the CFT1 and CFT2 variables. The Suit index values for modified CFT1 and CFT2, under both the annual income approach and the lifetime income approach, are presented in Table 4.20. Not surprisingly, these modified CFT distributions are found to be even more progressive than under the original assumptions. Therefore, the current federal tax system is more progressive than the **FairTax Plan** regardless of the actual incidence of employer payroll taxes.

Table 4.20 Suit Index for Current Federal Tax System with Employer Portion of Payroll Taxes Excluded

Tax System	Annual Income	Lifetime Income
Modified CFT1 [a]	0.096	0.116
Modified CFT2 [b]	0.068	0.110

Notes: (a) CFT1-employer portion of payroll taxes
(b) CFT2-employer portion of payroll taxes

Second, the initial analysis in the present study is based on the proposed **FairTax Plan**'s 30% "tax-exclusive" sales tax rate. While prior literature presents mixed results for the revenue neutrality of the **FairTax Plan**, it is found not to be revenue-neutral for the 2005 CES sample. A pseudo revenue-neutral rate would need to be at least 40% tax-exclusive to have the same tax collection as CFT1 and 45% tax-exclusive to cover CFT2. Meanwhile, Gale (2005) has reported three revenue neutral tax-exclusive rates: 44%, 53%, and 65%. Therefore, sensitivity analyses assuming these five revenue-neutral rates are performed. As can be seen from Table 4.21, these higher sales tax rate assumptions, however, only amplify prior results. That is, the **FairTax Plan** becomes even more regressive.

Table 4.21 Suits Index for the FairTax Assuming Different Revenue-neutral Rates

Revnue-neutral Rates	Annual Income	Lifetime Income
40%	-0.203	-0.068
45%	-0.206	-0.069
53%	-0.21	-0.071

Third, the present study assumes a 4% discount rate while estimating lifetime income for the CES sample, which is consistent with prior literature (Fullerton and Rogers 1993; Caspersen and Metcalf 1994; Maxwell 2003). Since most estimates of the marginal social rate of time preference range from 0% to 4%, sensitivity tests based on different discount rates such as 1%, 2%, and 3% are performed in the current study. As can be seen from Table 4.22, the **FairTax** appears to be less regressive while the current federal tax appears to be more progressive if lower discount rates are used to calculate

lifetime income measures. Therefore, the conclusion that the current federal tax system is more progressive than the **FairTax Plan** still holds.

Table 4.22 Suits Index under Lifetime Income Estimated Using Different Discount Rates

Discount Rates	FT	CFT1	CFT2
1%	-0.042	0.103	0.098
2%	-0.049	0.100	0.096
3%	-0.057	0.097	0.094
4%	-0.066	0.093	0.092

Fourth, the age range for the household head selected for lifetime income estimation in both the PSID and the CES is from age 18 to age 90. Using different age range selections such as 20-80 and18-85, however, has only a very slight impact on the annuity equivalent and regressivity estimates, leaving the overall results and conclusion in the present study unchanged. The Suit index values for both the current federal tax system and the **FairTax** under lifetime income estimated using different age ranges are presented in Table 4.23.

Table 4.23 Suits Index under Lifetime Income Estimated Using Different Age Ranges

Age Range	FT	CFT1	CFT2
18-85	-0.063	0.084	0.081
20-80	-0.068	0.071	0.068

Last, the current research uses 563 households from PSID that participated in all annual surveys from 1968-2005 to estimate lifetime income. As these households could be homogeneous, sensitivity tests are also conducted based on larger samples but

covering fewer years (20, 25, and 30 years) of information for each household. As can be seen from Table 4.24, the PSID regression models based on larger sample size are highly significant as expected.

Table 4.24 AR(1) Exact Maximum Likelihood Estimates of PSID Income Equations

	PSID20		PSID25		PSID30	
Parameter	Estimate	p value	Estimate	p value	Estimate	p value
C	-75,830.00	<.0001	-91,027.00	<.0001	-127,910.00	<.0001
AGE	4,050.00	<.0001	4,967.00	<.0001	6,897.00	<.0001
AGESQ	-53.26	<.0001	-69.08	<.0001	-97.57	<.0001
AGECUB	.17	.0004	.25	<.0001	.38	<.0001
UNEMP	-7,592.00	<.0001	-7,046.00	<.0001	-7,619.00	<.0001
COUPLE	18,856.00	<.0001	19,553.00	<.0001	19,596.00	<.0001
FMHD	-8,347.00	<.0001	-8,007.00	<.0001	-10,499.00	<.0001
NWHD	-8,992.00	<.0001	-7,355.00	<.0001	-8,396.00	<.0001
NE-URB	12,760.00	<.0001	12,973.00	<.0001	13,955.00	<.0001
MW-URB	8,539.00	<.0001	9,086.00	<.0001	6,895.00	.0134
S-URB	7,358.00	<.0001	6,237.00	.0016	6,594.00	.0179
W-URB	13,041.00	<.0001	13,297.00	<.0001	16,760.00	<.0001
SH	3,615.00	<.0001	3,615.00	.0011	3,199.00	.0927
HG	10,190.00	<.0001	10,287.00	<.0001	10,759.00	<.0001
SC	19,931.00	<.0001	19,168.00	<.0001	22,658.00	<.0001
CG	36,658.00	<.0001	36,302.00	<.0001	39,656.00	<.0001
PG	49,407.00	<.0001	47,530.00	<.0001	43,861.00	<.0001
TREND	792.73	<.0001	758.37	<.0001	721.98	<.0001
RHO	.57	<.0001	.63	<.0001	.65	<.0001
Observations	111,074		78,742		40,224	
Households	4,122		2,647		1,234	
R-squared	0.49		0.55		0.53	
Durbin-Watson	2.25		2.26		2.22	

Notes: dependent variable is the real total family income.
PSID20 is the PSID sample with households been in the survey for at least 20 years; PSID25 is the PSID sample with households been in the survey for at least 25 years; PSID30 is the PSID sample with households been in the survey for at least 30 years;

The Suits index values using larger samples, as shown in Table 4.25, indicate that the FairTax appears to be less regressive while the current system appears to be even more progressive than under the main analysis. Therefore, the current federal tax system appears to be more progressive than the **FairTax Plan** regardless of the sample selection criteria for PSID data.

Table 4.25 Suits Index under Lifetime Income Estimated Using Larger PSID Samples

PSID	FT	CFT1	CFT2
20 [a]	-0.013	0.141	0.137
25 [b]	-0.016	0.138	0.135
30 [c]	-0.028	0.127	0.125

Notes: (a) the PSID sample with households been in the survey for at least 20 years;
(b) the PSID sample with households been in the survey for at least 25 years;
(c) the PSID sample with households been in the survey for at least 30 years;

CHAPTER 5

SUMMARY AND CONCLUSIONS

In this chapter, a summary of the previous chapters is outlined. Research findings on the distributional impacts of the **FairTax Plan** are presented, followed by policy implications, limitations of the study, future research recommendations, and conclusions.

Summary of Previous Chapters

As discussed in Chapter 1, dissatisfaction with the current federal tax system is fostering serious interest in a national retail sales tax. Specifically, the **FairTax Plan**, a proposal that intends to replace most federal taxes with a national retail sales tax, is gaining momentum in Congress and has attracted more cosponsors than any other fundamental tax reform bill. The **FairTax** is promoted as being progressive but there is considerable opposition to this claim. Therefore, an in-depth empirical investigation of the progressivity of both the existing tax system and the **FairTax** proposal is needed.

Chapter 2 includes a review of relevant prior studies. While assumptions and methodologies differ in distributional effects studies, two approaches have been widely used: annual income versus lifetime income measures. Prior literature suggests that using the lifetime income or the annual income approach makes a significant difference when measuring the progressivity of a tax system (e.g. Fullerton and Rogers 1993; Caspersen and Metcalf 1994; Metcalf 1997 and 1999). Distributional studies in the national sales tax

arena offer mixed results, while the general conclusion is that a consumption tax is less regressive under the lifetime income approach than under the annual income approach.

Chapter 3 details the research design and methodology. Both the annual income and lifetime income approaches are adopted in this study. Lifetime income measures are estimated based on the Panel Study of Income Dynamics (PSID) data for the years 1968-2005. Tax liabilities are generated for each household both under the **FairTax Plan** and the current tax system, including imputed corporate income tax and estate and gift taxes. Multiple global progressivity measures (Suits and Kakwani indices) and redistribution indices (Reynolds-Smolensky and Pfähler indices) are used to increase the robustness of the findings.

The research results are presented in Chapter 4. Annual income analysis indicates that the **FairTax** is very regressive while the current federal tax system is progressive. Under the lifetime income approach, the **FairTax** appears to be less regressive while the current federal tax system appears to be more progressive due to the increase in the progressivity level of the payroll taxes. Therefore, the current federal tax system is unarguably more progressive than the **FairTax** under both the annual income and the lifetime income approaches. The following section discusses the summary for each of the study's six research questions.

Summary of Research Findings

The following six research questions are investigated in the current study:

1. How will the **FairTax Plan** change the distribution of tax burdens for different income groups?

2. Is the **FairTax** regressive or progressive under the annual income approach?

3. What is the progressivity level of the **FairTax** compared to that of the current federal tax system it may replace under the annual income approach?

4. Is the **FairTax** regressive or progressive under the lifetime income approach?

5. What is the progressivity level of the **FairTax** compared to that of the current federal tax system it may replace under the lifetime income approach?

6. How effectively will the **FairTax** reduce inequalities in the distribution of before-tax income compared with the current federal tax system it may replace?

The **FairTax Plan** will increase the average tax rate for households making approximately $34,100 (35,700 measured by lifetime income) or less while decreasing the average tax rate for the remaining households. Furthermore, the average tax rates exhibit progressive tendencies under the current federal tax system while exhibiting regressive characteristics pursuant to the **FairTax Plan**.

Under the annual income approach, the Suits index and the Kakwani index, along with their graphic presentations, strongly suggest that the **FairTax** is regressive while the current federal tax system is progressive. The results are robust to different corporate income tax distribution methodologies.

Lifetime income analysis, however, indicates that the **FairTax** is less regressive than it appears to be under the annual income approach. As measured by the Suits index, ranking households by lifetime income instead of annual income would reduce its regressivity level by 66.3% (60.4% measured by Kakwani index). On the other hand, the current federal tax system the **FairTax** intends to replace also appears to be more progressive under the lifetime income approach. Further analysis suggests that the improvement in the progressivity level of the current federal tax system under the

lifetime income approach is a result of the change in the progressivity level of the payroll tax. While being regressive under the annual income approach, payroll tax is progressive under the lifetime income approach.

To sum up, the global measures of progressivity (i.e., Suits and Kakwani indices) consistently find that the current federal tax system is more progressive than the **FairTax Plan** under both the annual and lifetime income approaches.

In addition, annual income analysis suggests that the **FairTax Plan** provides less reduction in before-tax income inequality than does the current federal tax system. Lifetime income analysis, however, presents a striking finding that both the current federal tax system and the **FairTax** lack a redistributive effect as a result of the negative effect of tax-induced lifetime income re-ranking. In other words, there is horizontal inequality with respect to lifetime income under both systems.

The results of the present study are robust as to assumptions regarding who currently pays the employer payroll taxes (employers or employees), revenue-neutral sales tax rate assumptions, discount rates used for lifetime income estimation, age range selection for lifetime income estimation, and sample selection criteria for PSID data.

Policy Implications

The findings of this study have important implications for tax policy makers, tax policy researchers, and taxpayers. Prior literature presents mixed results with respect to the progressivity of the **FairTax Plan**. The general criticism of the sales tax is that it is regressive. In other words, raising revenue from sales taxation places a disproportionate and unfair burden on poor households. Meanwhile, some economists argue that "a national sales tax replacement for the income tax is not inherently regressive." (Metcalf

1997) Reasons for this argument include: first, there is evidence supporting the contention that a universal rebate option can reduce the regressivity of a national retail sales tax (e.g., Feenberg et al. 1997) or even make it as progressive as the current income tax (e.g., Metcalf 1997); second, taxing services that are consumed in larger quantities by high-income households would also reduce regressivity of a sales tax (e.g. Maxwell 2003); third, traditional annual income measures overstate the regressivity of a sales tax and using more appropriate lifetime income measures would make a sales taxes much less regressive (e.g., Fullerton and Rogers 1993; Metcalf 1997; Maxwell 2003). As a national retail sales tax plan that introduces a universal prebate, taxes services, and also replaces most current federal taxes including a presumably regressive payroll tax, the **FairTax Plan** is promoted as being progressive and is supported by some previous studies (e.g., Kotlikoff and Rapson 2006; Tuerck et al. 2006). The current study incorporates both the annual income and lifetime income approaches to analyze the equity effects of the **FairTax Plan** and the current federal tax system it intends to replace. While the **FairTax Plan** is much less regressive under the lifetime income approach, it is still not comparable to the current federal tax system from the aspect of progressivity. Meanwhile, both tax systems are found to induce some degree of horizontal inequity, which negates their redistributive effects.

Policymakers are attracted to the **FairTax Plan** as a federal tax reform proposal because of its simplicity and efficiency, yet the enthusiasm for the **FairTax Plan** on efficiency grounds is usually tempered by concerns over equity. The findings of the present study provide useful information with regard to the equity consideration of the **FairTax Plan**, which may lend some thought to the policymakers and taxpayers while

making their decisions. Nevertheless, an ideal federal tax reform proposal should take efficiency, progressivity, and horizontal equity into consideration.

Limitations of the Study

While the CES micro-data file provides detailed information that helps to increase the accuracy of the findings in this study, it is not without its limitations. First, there is no distinction made as to whether expenditures are for new or used products except for the purchase of vehicles. This limitation is significant, because the **FairTax Plan** specifies that the sales tax applies to only new, not used, products. Although not directly testable, it is conjectured that higher (lower) income households will have a larger portion of their purchases consisting of new (used) goods. Therefore, any potential bias introduced into our results by this limitation would cause the **FairTax Plan** to appear less progressive than in reality. Second, the CES is questioned for income underreporting at the low end and top coding at the high end. The lowest income levels in the CES tend to report very high consumption to income ratios. Some of these households are probably in transitory low levels and may be borrowing or using up assets. Some of these households consist of elderly people living on savings and college students being supported by their parents. Another important reason could just be under-reporting of income by the low-income households in the CES sample. If the consumption to income ratio is overstated because the denominator, income, is under-reported, then the consumption tax as a share of income is also going to be overstated (Mazerov 2002). In other words, under-reporting of income at the low end of the income distribution can exaggerate the regressivity of consumption taxes. Meanwhile, income variables in the CES are also subject to top coding. Income top coding at the high end, on the other hand, could overstate the average

tax rate for high income people and thereby underestimate the regressivity of a consumption tax. Nevertheless, the estimation of lifetime income mitigates these limitations of CES income data. Third, the federal personal income tax and payroll taxes are self reported and of questionable accuracy. In the current study, the income and federal personal income tax distributions are also compared with those of the 2005 Statistics of Income (SOI) data from the Internal Revenue Service (IRS) as a validity check.

Notwithstanding its limitations, the CES remains the best available comprehensive source of information about consumption and how families allocate their incomes between various categories of spending and savings. Most economists and government agencies rely on this data source to analyze the distributional impact of taxes imposed on household consumption.

Adopting the proposed **FairTax Plan** would presumably cause extensive behavioral changes in consumption patterns which could not be reasonably modeled into the present study. For example, how would households of differing income levels respond to the imposition of a sales tax on new but not used products? Also, would the increase in take home pay under the **FairTax Plan** cause an increase in consumption? Or, would this be offset by the "sticker shock" effect of seeing an additional thirty cents of tax added to every dollar spent for services or new products? In addition, would the sticker price of new goods dramatically fall due to producers no longer having to pay federal income tax or the employer portion of payroll tax?

Suggested Future Research

This study exposes several issues which would benefit from further analysis. Specifically, what will be the behavioral response of consumers if their gross income increases when this increase is matched with an increase in the sales price of products because of new sales taxes? Will they view this as an even trade off or will there be increased incentives to purchase used goods or, potentially, goods/services from an "underground" economy? What would be the employer shifting mechanisms response if the **FairTax Plan** replaced the current federal tax system?

Conclusions

Support for replacing the current federal tax system with the **FairTax** has received a substantial amount of patronage. This allegiance is evidenced by a consistent stream of legislative bills in Congress. The most recent proposal, the **FairTax Plan**, incorporates features that are promoted as ensuring the normally regressive consumption tax will be progressive. At the same time, there is still a considerably large amount of opposition to the **FairTax Plan** because of the belief that even if it is progressive it will not be as progressive as the current system. Prior literature presents mixed results but lifetime income studies indicate a reduction in regressivity of a consumption tax. Accordingly, the current research addresses this exigency by examining the distributional impacts of replacing the current federal taxes with the **FairTax Plan** under both the annual income and lifetime income approaches. The global measures of progressivity (i.e., Suits and Kakwani indices) consistently find that the current federal tax system is more progressive than the **FairTax Plan** under both annual and lifetime income approaches.

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