AN ANALYSIS OF THE IMPACT OF TAX SYSTEMS ON INCOME DISTRIBUTION, POVERTY, AND HUMAN WELL-BEING: EVIDENCE FROM CROSS-COUNTRY COMPARISONS

by

SONJA ENGELI PIPPIN, M.S., M.S.

A DISSERTATION

IN

BUSINESS ADMINISTRATION (ACCOUNTING)

Submitted to the Graduate Faculty
of Texas Tech University in
Partial Fulfillment of
the Requirements for
the Degree of

DOCTOR OF PHILOSOPHY

Approved

John J. Masselli
Chairperson of the Committee

David Malone

Robert C. Ricketts

Bradley T. Ewing

Accepted

John Borrelli
Dean of the Graduate School

August, 2006

ACKNOWLEDGEMENTS

I would like to acknowledge the numerous people who helped me during my time as a student at Texas Tech University. First of all, I would like to thank my dissertation chair, John Masselli. He was not only my advisor assisting and guiding me through my doctoral research but has been a mentor, role model, and friend during my entire time in the Master's and in the Ph.D. program. I further want to thank my dissertation committee members, David Malone, Robert Ricketts, and Bradley Ewing, who provided helpful guidance with their probing questions and insightful comments. Thanks also to the entire Texas Tech accounting faculty, current and past, who have supported me while I was a Masters and a Ph.D. student. I have thoroughly enjoyed my time working with them. Many thanks in particular to everyone in the Area of Accounting for their understanding and support when our first and our second daughter were born in spring 2002 and 2004 respectively. I want to especially mention the help of Robert Ricketts and Michele Crosby. Without their assistance I would not have been able to complete my studies in those semesters.

I also am grateful for the generous financial support that I received through the Jerry S. Rawls scholarship fund.

Further, I want to mention my fellow Ph.D. travelers, past and present, who have made this journey a little bit easier and certainly more enjoyable. I especially want to thank Carie Ford for being a good friend and colleague during the last five years.

These acknowledgements would not be complete without my deepest thanks to my cousin and friend, Simone Hanesch. As a fellow Ph.D. student (albeit in a different field and at a different school) her support and encouragement went far beyond the many rounds of proof reading she agreed to and completed for me.

Finally, I want to extend special thanks my immediate family, in particular, my parents who have been my long-distance support system for the past seven years, helping us financially and emotionally and my husband who has been at my side through all the frustrations and joys of my Ph.D. journey. I hope that finishing my degree will make them proud.

I dedicate this dissertation to my children who are my greatest source of inspiration and motivation.

CONTENTS

ABSTRACT

The question "what is a good tax?" has been addressed many times in the past. While much optimal taxation research focuses on economic effects of taxation, the purpose of this study is to add a new dimension by investigating the relationship between tax system variables and certain aspects of social welfare other than traditional economic variables. To that end, relationships between four dimensions of a country's tax and transfer system – (i) progressivity, (ii) overall tax burden, (iii) income tax reliance (i.e., the proportion of total tax revenues from income taxes), and (iv) residual tax burden (i.e., overall tax burden net of income taxes) – and three dependent variables – (i) income inequality, (ii) poverty, and (iii) collective happiness – are examined. These correlations are tested using data from North America, Europe, and Australia. Previous studies have shown that, on average, Americans feel less negatively about inequality and poverty than Europeans. If these beliefs affect the design of the respective tax and transfer systems, differences in effects of tax system variables on income inequality, poverty, and collective happiness are probable. Specifically, tax system progressivity and overall tax burden are expected to impact income inequality, poverty, and collective happiness less in the United States than in Europe. Consequently, this study also examines the differences in the impact of tax system variables on income inequality, poverty, and collective happiness across tax and transfer systems in the United States and in Europe.

The results show that progressivity and overall tax burden appear to be negatively correlated with income inequality and with poverty. Furthermore, the redistributive and

poverty-reducing effect of transfer progressivity – defined as the reduction of income inequality due to transfers – appears to be much more important than the effect of tax progressivity – defined as the redistribution of income due to taxes –, suggesting that, for tax policy decisions, it is essential to take the entire tax and transfer system, i.e., government revenues *and* expenditures, into consideration. These findings may be of importance to tax policy makers if reducing inequality and poverty/redistribution of income is a goal of tax policy. Moreover, this study provides evidence that some tax system variables (i.e., overall tax incidence and income tax reliance) are positively associated with collective happiness indicating that a high tax burden does not necessarily impact human well-being in a negative way.

Contrary to expectations, only few differences in effects between United States tax system variables and European tax system variables were found. This is surprising since the United States and European tax and transfer systems differ significantly from each other in every dimension addressed in this study.

TABLES

FIGURES

CHAPTER I

INTRODUCTION

Overview

"What is a good tax?" has been asked many times in different contexts in the academic literature. In the past, much attention of academic research has been on the economic effects of taxation. The purpose of this study is to extend past research by concentrating on the relationship between tax and transfer systems and certain elements of social welfare other than traditional economic aspects. Specifically, the focus of this study is to examine the impact of various tax system variables on income inequality, poverty, and collective happiness. These variables are analyzed in an international context by comparing the impact of tax and transfer systems in different countries.

In addition to non-traditional dependent variables, this study also uses non-traditional data from the Luxembourg Income Study (LIS), the Euro-Barometer Survey, and the U.S. General Social Survey. The LIS database contains, for selected countries, household level data concerning different types of income, taxes, and transfers since the 1980s (Table A.3). Stated differently, it provides internationally comparable information pertaining to poverty levels and pre- and post-tax-transfer income inequality. The Euro-barometer Survey in the European Union and the U.S. General Social Survey in the United States have been asking citizens questions about their happiness/satisfaction with their lives since the 1970s. Similar to relatively recent happiness studies, such as Alesina

et al. (2004) and Di Tella et al. (2003), data from these two surveys are used here to measure collective happiness.

Motivation

Recently, United States tax policy has focused extensively on the reduction of taxation on capital, personal income, and wealth transfers. The underlying motivation behind such tax policy is based largely on the need for economic stimulation based on the assumption that taxes impede growth.[1] Whereas opinions on the overall effectiveness of supply-side economic policies vary, little is understood about the impact of taxation on overall human well-being, a discussion regarding definition, and measurement of which can be found on page 24 and on page 30 of this dissertation. Most would agree that while taxes impact individual taxpayers' economic situations, a fair and properly developed tax system is necessary to support government's operations. Opinions vary significantly, however, on what constitutes a good tax system.

Adam Smith (1776: 825–828) defines a good tax system as one that allows the government to raise sufficient revenues while taking the taxpayer's ability to pay into consideration without being too complex and without distorting economic behavior. Since Smith's seminal work, many scholars have examined tax policies and their effects on social welfare. In particular, the need of a fair tax system with minimal disincentive

[1] See for example The Whitehouse (2001). The President's Agenda for Tax Relief. Report 3065, February 15, 2001. [URL = http://www.whitehouse.gov/news/reports/taxplan.html]; and Stephen Moore (2003). Testimony on President Bush's Economic Growth Tax Cut before the Subcommittee on Oversight and Investigation, United States House of Representatives Committee on Financial Services. March 18, 2003. [URL = http://www.cato.org/testimony/ct-sm03182003.html].

effects has been discussed extensively (Musgrave, 1959: 61–115, Heady, 1993). While Smith (1776) argues that a fair tax is one that is levied in proportion to income, Heady (1993) implies that many researchers now believe a fair tax should reduce inequality of utility. Rawls (1971: 277–283) argues similarly and introduces the max-min social welfare function (Rawls, 1971: 150–161), suggesting that the only factor determining social welfare is the income of the poorest person in society.

Economic and public policy research also addresses the problem of disincentive effects. Ideally, taxes should not distort economic behavior and have no effect on economic growth. However, it is impossible to raise revenues without affecting behavior. Thus, optimal taxation research focuses on quantifying and/or minimizing disincentive effects (Mirrlees, 1971, Atkinson, 1973, Heady, 1993).

The two criteria of a good tax, fairness and economic efficiency, compete with each other. As Heady (1993) points out, a poll tax (lump sum payment) would have fewer disincentive effects than a tax based on income. Yet, most would agree that an income tax is fairer. Optimal taxation research therefore often combines the two criteria into one, assigning relative weights to each. In practice, these weights change based on changes in taxpayer preferences over time (Steinmo, 2003).

The literature on optimal taxation examines the criteria of a good tax with respect to maximizing social welfare, which is defined as the sum of the individuals' utilities (Heady, 1993). However, in practice, social welfare cannot be measured empirically because there is no agreement on what one's utility encompasses. The economic aspect of utility/social welfare, i.e., total or average income or income growth, is addressed by

many studies that examine the effect of taxation on economic growth (e.g., Rebelo, 1991, Alesina and Rodrik, 1994, Persson and Tabellini, 1994, and Engen and Skinner, 1996). Based on Rawls (1971), Sen (1997), Wolff (2002), and Griffith (2004), income inequality, poverty, and collective happiness are used in this dissertation to measure other aspects of utility/social welfare. Stated differently, this study investigates how tax policy factors impact social welfare by analyzing international tax data using three dependent variables: a country's income distribution, poverty level, and taxpayer happiness. Independent variables used to assess each country's tax and transfer system include: (i) progressivity, (ii) overall tax burden, (iii) income tax reliance, and (iv) residual tax burden (Widmalm 2001).

This study compares and contrasts multiple international tax systems from North America, Europe, and Australia. A motivating factor for this cross-country analysis is attributed to the findings of Alesina et al. (2004) that Americans are far less concerned about economic inequality and poverty than other modern developed cultures, suggesting a need for further comparative analysis. To that end, this study analyzes the extent to which the American tax and transfer system differs from various European tax and transfer systems with regard to tax and transfer progressivity, tax burden, and tax mix. In addition, differences in effects of tax and transfer systems on certain aspects of social welfare, specifically income inequality, poverty, and collective happiness, are examined.

Contribution

Results of this study provide information about potential impacts of tax policy on certain aspects of social welfare including the impacts of various tax system variables on income inequality, poverty, and collective happiness. They lend support to the notion that a relationship between tax and transfer systems and income inequality, poverty, and collective happiness exists. In summary, the findings suggest that progressivity and the overall tax burden of a country's tax and transfer system are negatively correlated with income inequality and poverty while some tax system variables (i.e., overall tax burden and income tax reliance) are positively associated with collective happiness. These results may be of importance to tax policy makers if reducing income inequality and poverty/redistribution of income is a goal of tax policy. Furthermore, the data indicates that transfer progressivity, defined as the redistribution of income through transfers, is more significant in reducing income inequality and poverty than tax progressivity, defined as the redistribution of income through taxes. This finding supports the notion that one cannot assess a tax system's effectiveness without addressing both collection *and* distribution of government revenues.

Organization

This study is organized in six chapters. In this chapter, purpose, motivation and importance of the research have been presented. Chapter II provides a review of existing literature including a comparison of United States and international tax policy for the years 1965–2002. The research questions and hypotheses follow in Chapter III. In

Chapter IV, data sources, research model, and statistical methodology are presented. The main empirical results as well as several sensitivity tests are listed in Chapter V. The last chapter contains summary and conclusions of the research.

CHAPTER II

LITERATURE REVIEW

In his seminal work, Adam Smith (1776: 825–828) outlined four maxims of a good tax system: 1) equality (fair to taxpayers),[2] 2) certainty (sufficient to fund the government), 3) convenience (easy to collect/easy to pay), and 4) economic efficiency (taxes should not be expensive to collect nor should they discourage business). Unfortunately, these maxims often have competing objectives. For example, a convenient tax system (i.e., one with minimal administrative cost) competes with taxpayer equity because, in order to achieve a horizontally and vertically equitable tax structure, more tax provisions are necessary to correct the perceived inequities in taxpayers' relative abilities to pay the tax. Assessment of the relative importance of these maxims is subjective at best. Some argue that simplicity and sufficiency of the tax system far outweighs distributional equity while others favor a tax system that promotes greater emphasis on a taxpayer's ability to pay. Though individual taxpayer utility functions and policy preferences are difficult to measure directly, research methods, such as elasticity analysis, etc., are often used to assess the extent to which one principle or preference is significantly chosen over another and how taxpayers' preferences change over time (Musgrave, 1959: 61–115, Atkinson, 1973).

Steinmo (2003) describes how the standards of a good tax shifted during the 20th century. He suggests that tax reforms often spread from the United States to other countries once their effectiveness has been demonstrated. In fact, in 1913, subsequent to

[2] Note that Smith was thinking of a proportional, not a progressive tax system.

the ratification of the sixteenth amendment of the United States constitution that legalized a Federal income tax, social values in many western countries shifted to a mindset where taxing the profits and income of the industrialists (the "rich people") was seen as a policy solution that would fairly generate sufficient government revenues. As the century progressed, however, many countries – including the United States – migrated from a "class tax" to a "mass tax" (Steinmo, 2003: 211) thus capturing middle and lower income taxpayers into the snare of its tax system. Governments further modified the tax system to serve as an instrument of public policy and social control (i.e., to achieve equity while influencing the economy) (Steinmo, 2003).

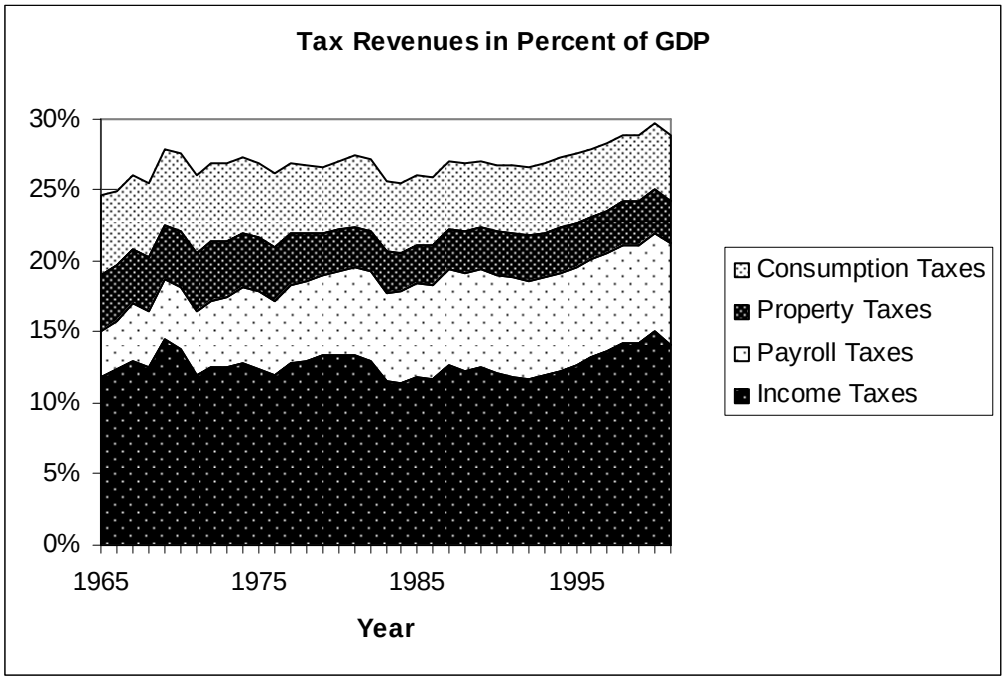
Using taxes as "social control" measures (Steinmo, 2003: 214) introduced additional complexity into the tax law. As a result, taxpayers with higher incomes used loopholes to avoid taxes. Consequently, many people perceived the tax system to be unfair. In the mid-1980s, tax policy in the United States shifted to a supply side economic perspective. This ideological shift led to significant reduction in marginal tax rates, in particular for higher income taxpayers, based on the argument that the extra disposable income accompanying the rate reductions would stimulate a proportionately greater percentage increase in the tax base, resulting in an overall increase in tax revenues. Concurrent with such policy changes, the general perception of what constituted a "good tax system" also seemed to shift focus from maximizing horizontal and vertical equity to minimizing economic distortions (Steinmo, 2003).

Tax Systems in the United States and in Other Countries

Steinmo (2003) presents evidence that "good" tax policy is a subjective concept and that consensus on the subject matter what constitutes a good tax is lacking. In addition, main objectives of tax policy change over time. The figures that follow below illustrate changes in United States and international tax policy over the past decades.

Figure 2.1 presents the tax revenues in the United States between 1965 and 2001. Despite many modifications to the United States tax law during that time frame, tax revenues, as a proportion of GDP, remained relatively constant, as did revenues from payroll, property, consumption, and other taxes.[3] The only tax that appears to vary more than others is the income tax. The figure suggests that if there are changes in the progressivity of a tax system, they tend to be enacted as part of income tax legislation.

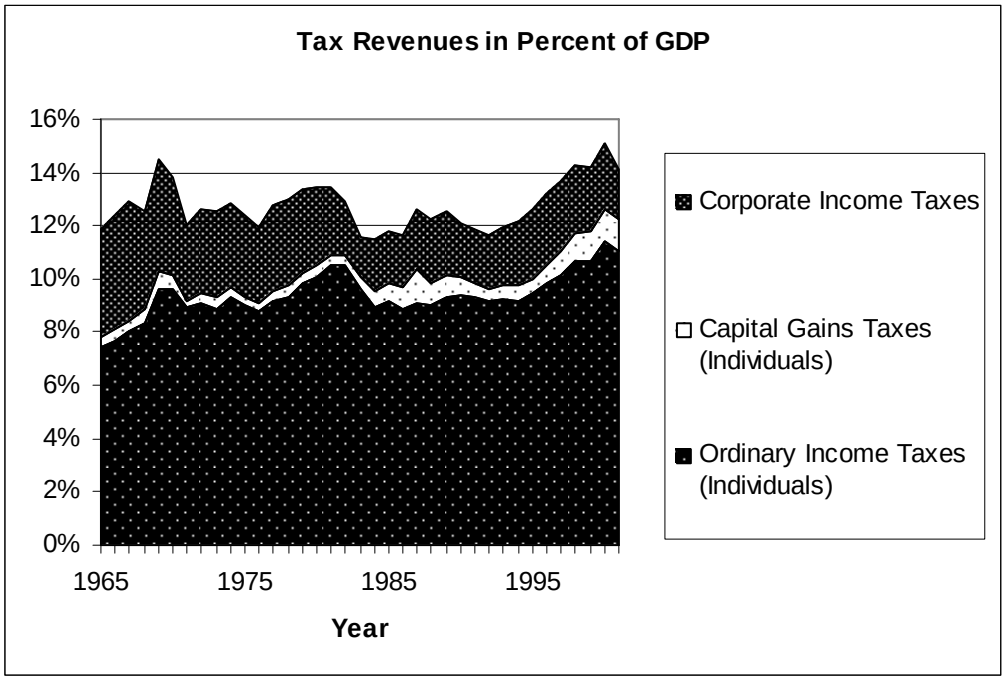
[3] Note that the 2001 tax cuts are not reflected in this graph.



Source: OECD (2002).

Figure 2.1 United States tax revenues in percent of GDP for the years 1965–2001

Figure 2.2 presents income tax revenues categorized as: 1) taxes on ordinary income for individuals, 2) taxes on capital gain revenue for individuals, and 3) corporate income taxes. The figure indicates that the majority of income tax revenues generated were derived from taxes on ordinary income of individual taxpayers. These numbers increased between 1965 and 2001 from 7.4 percent of GDP to 11 percent of GDP. The tax revenues from corporations decreased slightly over this time period. Capital gains taxes were responsible for government revenues of less than one percent of GDP in 1965 and a little over one percent of GDP in 2001.

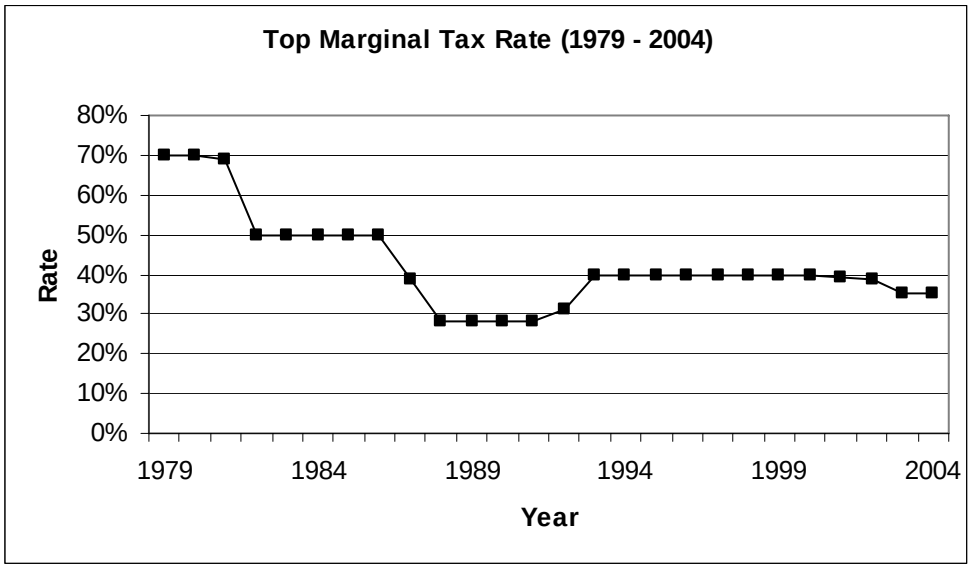


Source: OECD (2002).

Figure 2.2 United States tax revenues (income taxes only) in percent of GDP for the years 1965–2001

Lack of change in overall tax revenues as a percentage of GDP does not necessarily translate to immaterial changes in the relative allocation of the overall tax burden. Kasten et al. (in Slemrod, 1994: 9–50) examine the effect of the five major tax bills during the 1980s and 1990s on the distribution of the tax burden among income groups. They find that the total effective tax rate (ETR) for all families was approximately the same in 1993 as in 1980. However, among different income groups ETRs changed. Specifically, ETRs were higher for low-income families, and lower for medium income and for most high-income families. Furthermore, both ETRs and

progressivity decreased between 1980 and 1985, and increased again after that. Petska and Strudler (2000), using tax return data from 1979 through 1996, analyze the changes in marginal and average tax rates for that period. Consistent with the results of Kasten et al., they find that although top marginal tax rates decreased significantly between 1979 and 1989, average tax rates changed very little. Steuerle (2004) comes to a similar conclusion. Figure 2.3 presents the change in the top marginal tax rates in the United States.



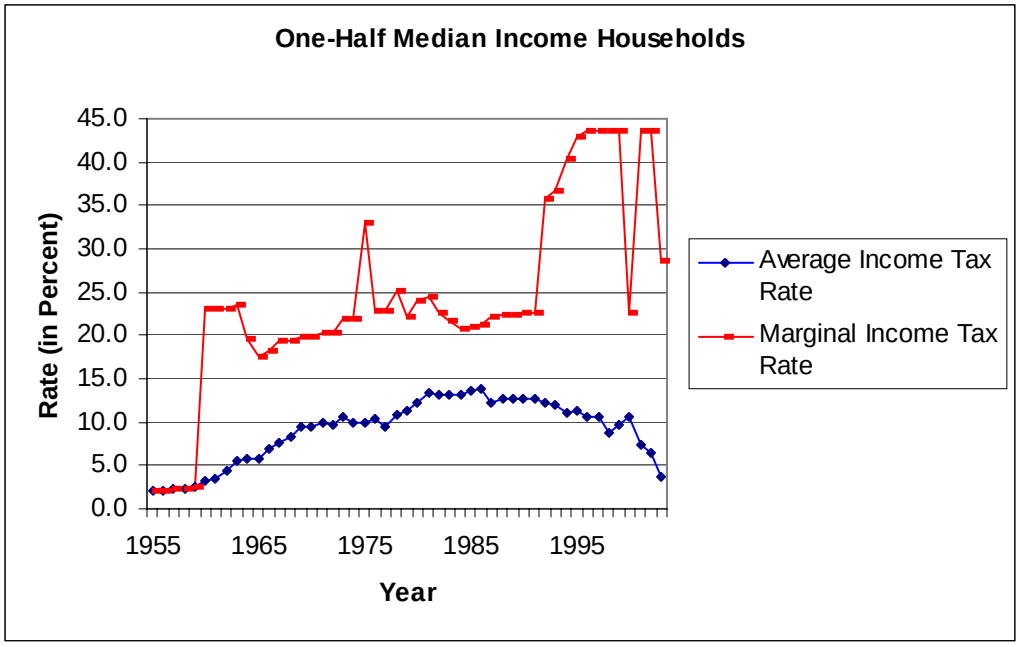
Source: Steuerle (2004).

Figure 2.3 Top marginal tax rates in the United States between 1979 and 2004

Petska and Strudler (2000) further analyze tax burden by income group. They show that for the years 1979-1996 income tax incidence increased for the top 10 percent income group while decreasing for the bottom 90 percent of taxpayers. Average tax rates

by income-size class demonstrate that, in general, tax burdens increased with income-size classes for the entire time period in question (1979–1996). This data supports the overall progressivity of the income tax. Burman et al. (1998) also analyze changes in marginal income tax rates between 1980 and 1995 using panel data. They decompose marginal tax rate changes into two parts: (i) changes due to tax law changes and (ii) changes due to life-cycle changes. The authors find that between 1980 and 1990 statutory marginal tax rates declined significantly for most households and that, in most cases, changes in tax law were the reason for the decline.

Steuerle (2001) examines the effect of the Economic Growth and Tax Relief Reconciliation Act of 2001 on tax revenues as a percentage of GDP. He posits that although the tax act significantly cut marginal tax rates, estimated future federal tax revenues as percentage of GDP are still likely to fall within the narrow range that has existed since World War II (between 14 and 22 percent of GDP). However, Steuerle (2004) demonstrates that some 2001 tax law changes were significant nonetheless – at least for certain income groups. Figure 2.4 shows how average and marginal tax rates changed over the last five decades for three different levels of income.



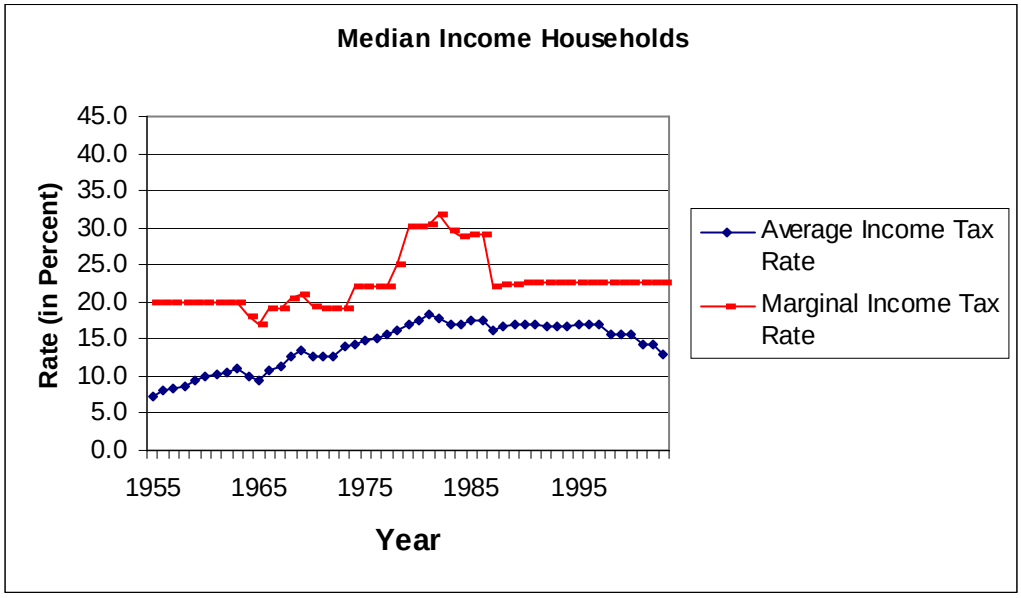
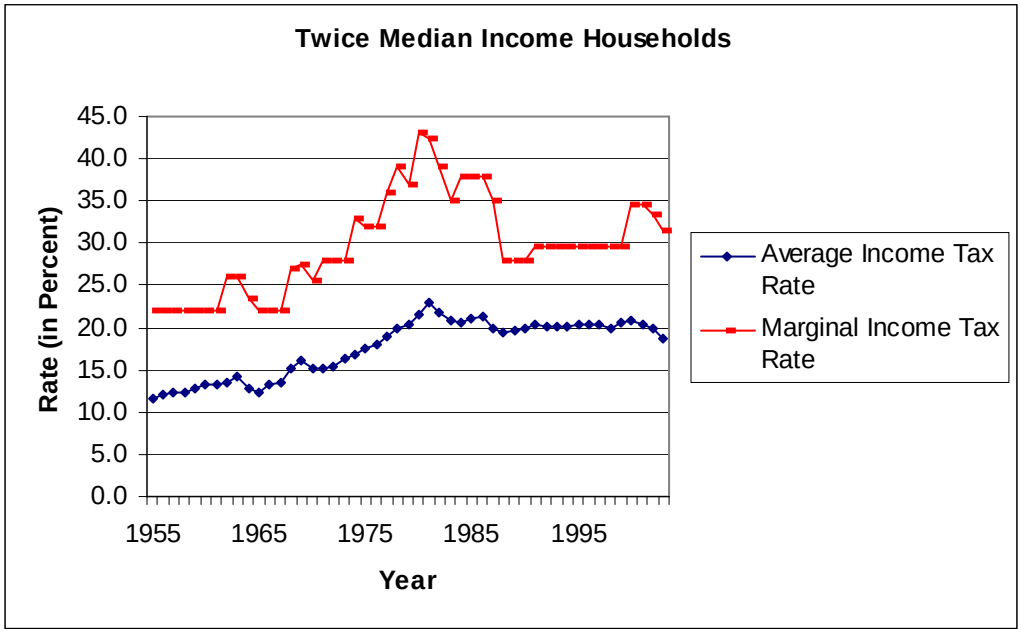


Figure 2.4 Average and marginal combined federal income and FICA tax rates for different income levels (1955–2003)



Notes: (a) Years 1992–2003 include effects of earned income tax credit (assuming two eligible dependents).

(b) Years 2001–2003 include effects of one-year rebate under PL 94-12 and effects of child tax credit expansion under EGTRRA.

(c) Year 2001 includes effects of the $600 rebate given as part of EGTRRA.

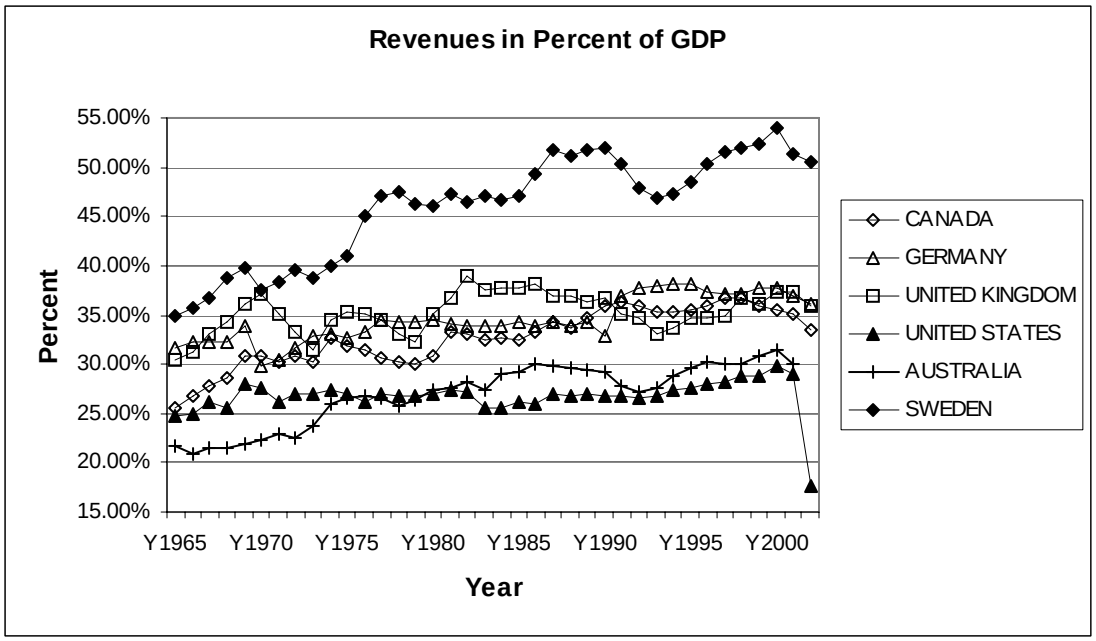
(d) Years 1998–2000 include effects of child tax credit as enacted in Taxpayer Relief Act of 1997.

Source: Steuerle (2004).

Figure 2.4 Continued

More questions arise when comparing the United States tax policy changes to other developed countries' tax and transfer systems. Perry compiled several international tax comparisons (e.g., Perry, 1995, and Perry, 1997). These analyses are based on published annual data from the Organization for Economic Co-operation and Development (OECD). The OECD data enables researchers to compare and contrast the tax systems of each member country of the OECD. Figure 2.5 provides information

comparing the United States and five other OECD countries (i.e., Australia, Canada, Germany, Sweden, and the United Kingdom). Note from Figure 2.5 that while all countries presented seem to have experienced a decrease in tax revenues between 2000 and 2002, the United States' decline is striking. Stated differently, no other country in the analysis experienced such a significant loss in tax revenues during any time between 1965 and 2002.



Source: OECD (2002).

Figure 2.5 Tax revenues in percent of GDP for six OECD countries (1965–2002)

The composition of tax revenues across different countries is also of interest. Figure 2.6 provides a comparison of the same OECD countries. This graph demonstrates that in the United States, relative to the other countries presented, consumption taxes, comprise a smaller component of government revenues (approximately 16–20 percent)

and that the relative importance of consumption taxes declined between 1965 and 2001. Payroll and income taxes together comprise a significant portion of tax revenues for all countries in this sample with an increase in emphasis on these taxes between 1965 and 2001.

Figure 2.7 illustrates the shift in emphasis on different types of income taxes for the same OECD countries. From 1965 to 1986, for most countries (except the United Kingdom), the relative incidence of taxes on ordinary income of individual taxpayers increased at the expense of corporate income taxes. For the United States and Germany, corporate tax revenues decreased further between 1986 and 2001. For the remaining countries analyzed, the revenues remained relatively stable. Individual taxpayers' capital gains taxes were relatively unimportant for all countries in the sample.

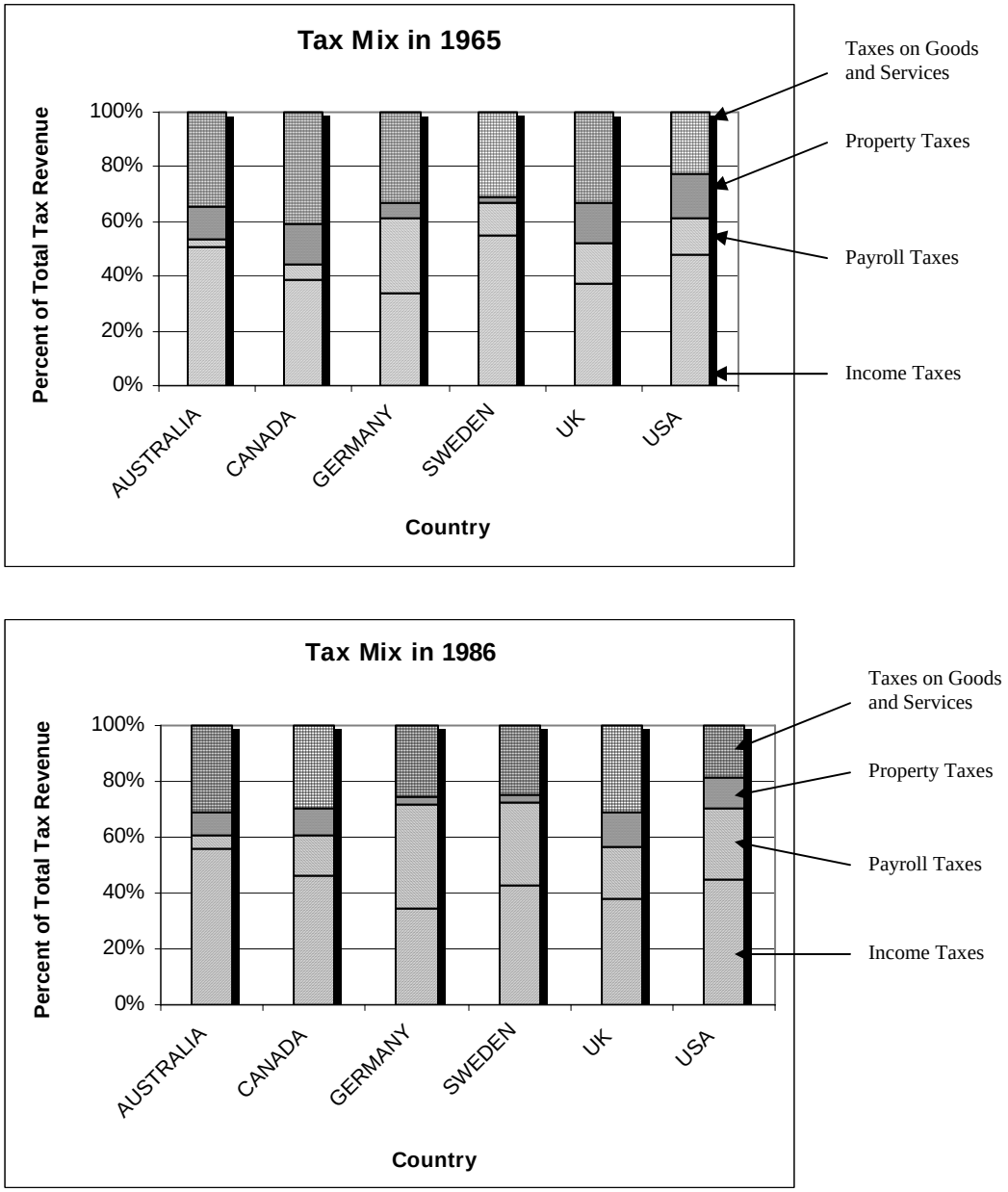
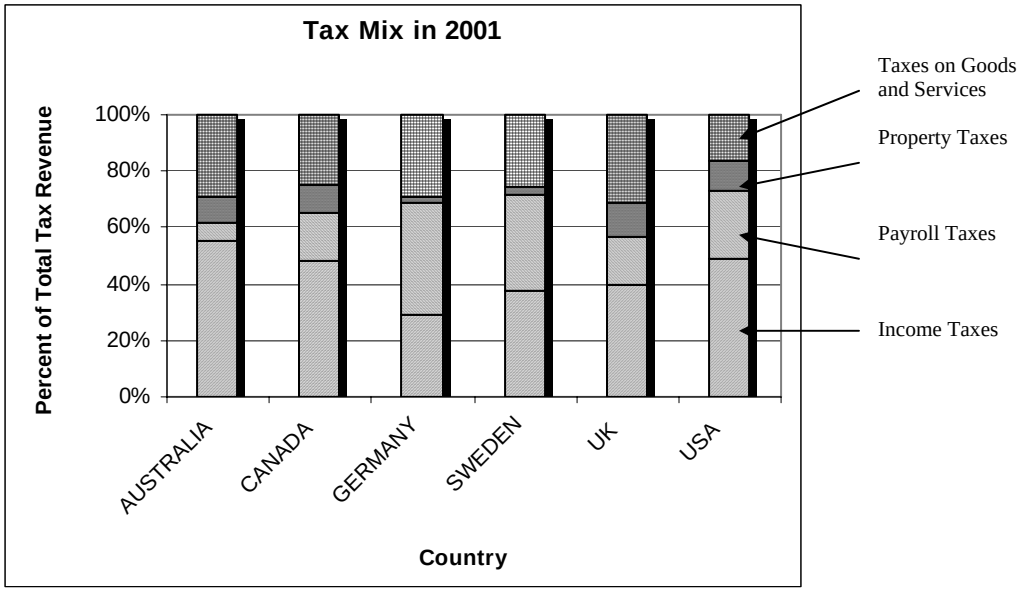


Figure 2.6 Income, payroll, property, and consumption tax revenues in percent of total tax revenues for six OECD countries (years 1965, 1986, and 2001)



Source: OECD (2002).

Figure 2.6 Continued

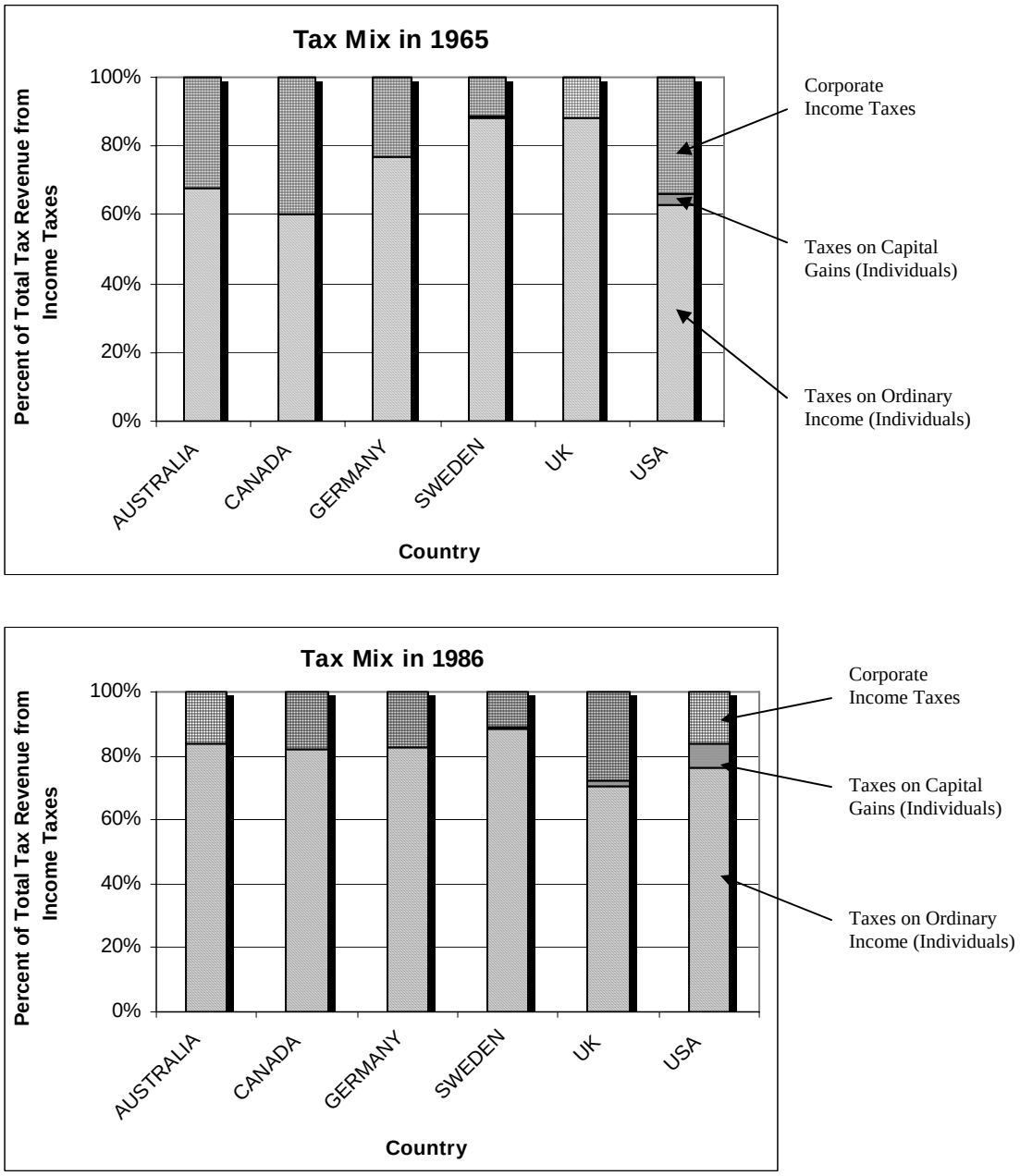
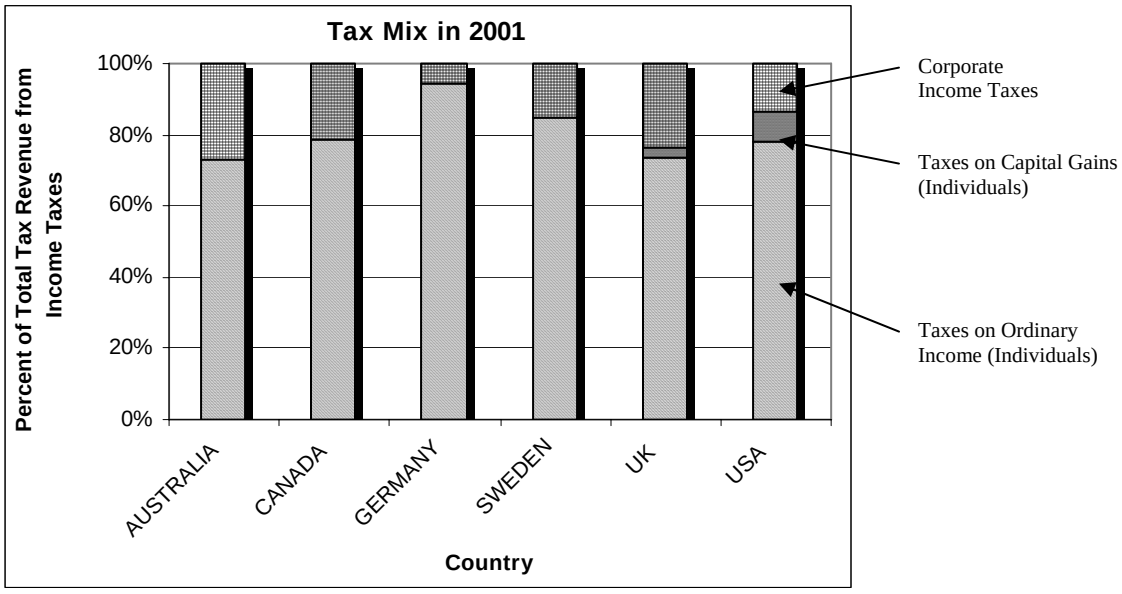


Figure 2.7 Taxes on ordinary income (individuals), capital gains (individuals), and corporate income in percent of total income tax revenues for six OECD countries (years 1965, 1986, and 2001)



Source: OECD (2002).

Figure 2.7 Continued

The preceding figures present statistical data that serve as one vehicle for comparing the various attributes of the international tax systems examined herein. However, the primary focus of this study deals with examining how a country's tax and transfer system impacts more human factors, such as social welfare and human well-being, the literature of which is discussed below.

The Impact of Taxation on Income Distribution, Poverty, and Human Well-Being

Researchers from diverse disciplines have investigated the impact of tax systems on country's economic performance as well as other aspects of human well-being.

Taxes and Economic Growth

Extant research examines the link between tax systems and economy. The term "economy" is often narrowly defined using objective measurements, such as gross domestic product (GDP) per capita or GDP growth (Alesina and Rodrik 1994, Persson and Tabellini, 1994, Rebelo, 1991, and Engen and Skinner, 1996). While some empirical and/or analytical evidence exists to suggest that lower tax rates or the absence of taxation on capital, consumption or labor have positive impacts on economic growth (e.g., Widmalm, 2001, and Myles, 2000), the majority of empirical results concludes that the effect of taxation on economic growth is relatively small (e.g., Engen and Skinner, 1996, and Myles, 2000).

GDP adjusted for inflation and population is clearly the most common factor used to measure a country's economic performance. Furthermore, GDP per capita is also frequently used to measure standard of living. Unfortunately, neither GDP growth nor GDP per capita accurately measure the more latent variable of individual "well-being." For example, GDP does not correlate with child mortality or education, both factors in assessing human well-being. In fact, for the past decade, the United States ranked second in the world (after Luxembourg) in real GDP per capita.[4] Yet, in 1994, the United States ranked 25th out of 37 with regard to infant mortality with 8 deaths per 1,000 infants per year where the lower the ranking, the lower infant mortality rate.[5] In 2003, the mortality

[4] Source: Penn World Tables. URL = http://pwt.econ.upenn.edu/php_site/pwt61_form.php. Years 1990 through 2000.

[5] URL = http://staff.hightechhigh.org/~agloag/Infant%20Mortality%20Data.htm.

rate declined to 7 deaths per 1,000 ranking the United States still at 27 behind most other OECD countries including Poland, Ireland, and the Czech Republic.[6]

Likewise the United States does not rank at the top with regard to education. In the recent PISA study (Programme for International Student Assessment), American students performed relatively poorly compared to other OECD countries with fewer economic resources. The 2003 results of the students' mean performance on the science scale indicate that the United States ranks significantly below the OECD average. In reading ability (PISA, 2000 results), the United States ranks just above the OECD average (at rank 15).[7]

These are just two examples illustrating that high GDP does not necessarily equate to high overall well-being. Common criticisms regarding the use of GDP as measurement of well-being are that real gross domestic product fails to consider (i) the value of unpaid work, such as housework and community service, (ii) the quality of life changes, such as increased life expectancy and more leisure time, as well as increased traffic and pollution, (iii) the quality of goods changes, and (iv) the changes in distribution of income and wealth (McConnell and Brue, 1996: 137–139, Riddell et al., 1998: 311–314). Consequently, since the traditional measure of standard of living – real GDP per capita – fails to adequately capture human well-being and social welfare, alternate measurement tools must be considered to capture this dependent variable.

[6] According to data from the UNICEF: URL = http://www.unicef.org/sowc05/english/statistics.html.

[7] URL = http://www.pisa.oecd.org.

Taxes and Social Welfare

Social welfare is an integral component to a good tax system. The optimal taxation literature (e.g., Heady, 1993, and Heady, 2001) defines social welfare as an assessment of a society's well-being, the latent nature of which is a function of the individuals' utility functions. One such model of social welfare is as follows:

$$W = Y_1 + Y_2 + \ldots + Y_n ,$$

where W represents social welfare and Y_x is the income of the x^{th} individual in a society. This model illustrates a simplified case where maximizing total income maximizes social welfare. On the other hand, the max-min utility function relates social welfare to the income of the poorest person in the society based on the concept of distributive justice (Rawls, 1971: 150–161):

$$W = \min(Y_1, Y_2, \cdots, Y_n).$$

Maximizing welfare in this case means maximizing the income of the poorest person without regard to the income of others. Stated differently, social welfare is not necessarily the sum of the individual utilities. Rather, it also depends on how these utilities are distributed among the population. Many economists believe that social welfare decreases as the distribution of utility becomes more unequal (Heady, 1993, Milanovic, 2003, and Griffith, 2004).

This study attempts to empirically measure the relationship between taxes and: 1) income distribution, 2) poverty, and 3) collective happiness, based on the contention that a key issue of importance is not so much to maximize a society's aggregate income but rather its social welfare.

Income Distribution, the Pareto Principle, and Poverty

Dalton (1920) suggests that inequality impacts social welfare. Yet, many economic theorists posit that income and wealth inequality is a relatively unimportant issue to social welfare. The Pareto Principle provides that social welfare is not impacted by the increase of one society member's income or wealth as long as the increase is not accompanied by the relative decrease of another society member's income or wealth. For example, if one group of peers receives $1,000 more than anyone else in the society, inequality in the entire society goes up but no person is worse off than they were before (Feldstein, 1998). Stated another way, it is irrelevant to social welfare if the rich get richer as long as the poor do not get poorer.

Milanovic (2003) posits that this logic is flawed. In his study, he presents a scenario in which a group of peers all receive an increase in wealth with most receiving some amount between 25 and 75 cents while one person receives $20,000. Under the Pareto Principle, all should be comfortable with this distribution because everybody is in a financially better situation. However, the likely reaction is that those receiving 25 to 75 cents will not feel that they are better off, as Feldstein (1998) suggests, but rather feel worse (cheated). Milanovic explains the underlying rationale for this reaction is that the income/wealth of our peers factors into individual utility functions. As such, income inequality ultimately affects social welfare.

Milanovic further suggests that even if this reaction is due to an emotion such as envy or "spiteful egalitarism" (Feldstein 1998: 358), such issues are nonetheless integral to an individual's utility function. Furthermore, in some cases, the cause may not

actually be envy but rather a sense of justice. Fong, Bowles, and Gintis (2004) provide experimental evidence that, under certain conditions, people refuse to improve their economic situation because they feel that others' situations would be improved by an unfairly high amount.[8] Milanovic further posits that it is illogical to claim we care about poverty but not about inequality: if (a) all incomes are fair and (b) people do not care about their peers' income, why should they care about the number of poor people? While some economists, such as Feldstein, suggest that poverty matters whereas overall inequality does not, Milanovic's arguments are supported by empirical evidence (see for example Grabka, 2000, Christoph and Noll, 2003, Layard, 2003, Layard, 2003a, and Griffith, 2004).

The max-min social welfare function includes poverty as a factor. In fact, when social welfare is determined based on the max-min function, the only variable of importance is the income of the poorest person in the society. No economic activity increases social welfare unless it improves the position of the person worst off in this society. This methodology demonstrates an extreme form of risk aversion by the society as a whole, since the only concern is the worst condition a member of the society could face. Alternatively stated, poverty matters not only to the poor people but also to the society as a whole.

Poverty is of importance to the non-poor for two main reasons. First, non-poor members of a society feel a moral obligation – possibly out of guilt – to help the poor out

[8] In an ultimatum game two people are instructed to divide a given amount of money. Person A makes an offer and Person B either accepts or rejects it. If B rejects, neither A nor B get anything. The experiment showed that overwhelmingly the offers are rejected when they are less than 30 percent of the given amount of money.

of poverty. Second, the non-poor also bear the social and financial burden of poverty, such as higher crime rates, drug abuse, prostitution, and educational failure. Statistics show, for example, that poor children are twice as likely not to finish high school.[9] Poverty also impacts the economy directly. For example, children growing up in poverty have a statistically greater likelihood of being less productive, thereby consuming less.[10] Or, as Chairman and CEO of ChevronTexaco Corporation, David O'Reilly, stated: "Business must care not only for ethical and moral reasons, which I think we all share, but, quite frankly, it's also in our own financial interest to care."[11]

The question whether a tax system should redistribute income has been considered by many. Adam Smith believed that equality means proportionality (first maxim of a good tax, see footnote 2). However, many economists now consider a progressive tax system more equitable than a proportional tax. Proponents of vertical equity argue that progressivity makes sense because a rich person receives less disutility from paying 10 percent in taxes than a poor person does (Griffith, 2004). Texas multimillionaire Bernard Rapoport looks at tax progressivity this way:

> You make fifty thousand dollars a year, you pay nine thousand in income taxes – that doesn't out you in the poorhouse, but it sure as hell tightens your budget. I make a million dollars a year, I pay four hundred thousand in income taxes – that leaves me with six

[9] The Children's Defense Fund (1994). Wasting America's Future: The Children's Defense Fund Report on the Cost of Child Poverty. Beacon Press: Boston, MA.

[10] The Children's Defense Fund estimates that for every year when more than 12 million children live in poverty it will cost the society $130 billion in future economic output. Arloc Sherman (1997). Poverty Matters: The Cost of Child Poverty in America. Children's Defense Fund, Washington, DC: 1.

[11] Poverty: Why Business Must Care. Remarks by David J. O'Reilly Chairman and CEO, ChevronTexaco Corporation to the World Economic Forum Davos, Switzerland. Jan. 23, 2004. URL = http://www.chevron.com/news/speeches/2004/23jan2004_oreilly.asp.

> hundred thousand to live on. That doesn't cramp my lifestyle. I'm still rich. You gonna feel sorry for me?[12]

Interestingly, empirical studies show that, on average, Europeans think differently about inequality and poverty than Americans. It appears that national income inequality makes Europeans unhappy while it does not affect the happiness of Americans (Alesina et al., 2004). Moreover, Americans have a different perspective on poverty than do Europeans. Sixty percent (twenty-six percent) of Americans (Europeans) believe that the poor are lazy. Most Europeans think that the poor are trapped in poverty and that income is determined by luck while in America only a minority believes that contention (Alesina et al., 2004). Data from the European System of Social Indicators (EUSI)[13] suggests that the majority of Europeans believes the income gap is too large and it is government's responsibility to reduce inequality. The data further indicates that more Europeans believe in government intervention to decrease inequality now than ten years ago. Given that the United States and European countries maintain democratically elected governments, it is likely that taxpayers' attitudes toward inequality and poverty are reflected in the respective tax and transfer systems. Thus, it is also likely that European tax and transfer systems are more effective at redistributing income and wealth than the United States tax and transfer system.

Several empirical studies examine how a country's tax system affects income distribution and poverty. Weinberg (1987) estimates the effects of the United States

[12] Ivins, Molly and Dubose, Lou (2003). Bushwacked. Life in George W. Bush's America. Random House, New York, NY: 32.

[13] GESIS (German Social Science Infrastructure Service): URL = http://www.gesis.org/en/social_monitoring/social_indicators/Data/EUSI/index.htm.

individual income tax system on the income distribution. The results suggest that the tax system implemented in 1979, 1983, and 1986 failed to reduce inequality. De Nardi et al. (2000) study the redistribution policies of five different OECD countries (the United States, Canada, Germany, Sweden, and Finland). The authors provide confirmatory evidence of an economic trade-off between income and wealth redistribution and efficiency. Karoly (in Slemrod, 1994: 95–129) suggests that the lower marginal tax rate structure of the 1980s contributed to increased inequality. Other factors, such as change in the demographic composition of families, increased importance of secondary workers' earnings, and rise in wage inequality, also affected the income distribution.

In general, proponents of income redistribution not only believe that income should be more equal but also that poverty needs to be reduced or eliminated (see for example, Sen, 1997, Kakwani, 1997, and Wolff, 2002). A redistributive tax system can increase social welfare in two ways: if designed to collect money from the rich and distribute (most of) the revenues to the poor, it simultaneously decreases inequality and reduces poverty.

Kim (2000) investigates the effectiveness of taxes and transfers in reducing poverty. Using micro data from the Luxembourg Income Study (LIS), Kim examines eleven western countries. The findings suggest that poverty varies widely across these welfare states (partially due to differences in anti-poverty effectiveness of taxes and transfers). Market generated poverty (pre-tax-transfer poverty) rose during the 1980s and early 1990s, but at the same time the overall level of welfare benefits were increased (although, in most cases, not enough to offset the increase in market generated poverty).

DeFina and Thanawala (2002) study the relationship between taxes and transfers and three alternative poverty indices using LIS data for 17 countries for the years 1969 through 1997. While the authors find that taxes and transfers reduce all three elements of poverty (i.e., income dispersion among the poor, headcount rate, and poverty gap) for every country examined, a corresponding increase in human well-being resulting from the decrease in poverty failed to surface.[14]

Taxes and Human Well-Being (Collective Happiness)

There is a paucity of empirical research examining the effect of taxes on human well-being/happiness likely due to the latent nature of the dependent variable. In addition, no single definition or explicit measure for human well-being exists.[15] For example, in many instances, standard of living, (economic) well-being, and quality of life are used interchangeably. Paim (1995) summarizes the academic literature regarding definition and measurement of well-being. The author notes that definitions of well-being vary from those relying on objectively measured criteria to those relying on more subjective criteria, depending on the purpose of the study. Objective measurements are

[14] The Human Development Index (HDI) was used to test for human well-being. One possible reason for not finding an association between the HDI and poverty reduction is likely the HDI's lack of differentiation among highly developed countries (Lind, 2004).

[15] A quick search on the Internet provides definitions like (1) "Wellbeing: The state of being healthy, happy, or prosperous." (www.answers.com), (2) "Human well-being has several key components: the basic material needs for a good life, freedom and choice, health, good social relations, and personal security. Well-being exists on a continuum with poverty, which has been defined as pronounced deprivation in well-being." (www.milleniumassessment.org), and (3) "… well-being (individual and collective) …[has] several components, including: 1) the fulfillment of all elemental needs necessary for survival; 2) the preservation of human dignity; and 3) the capacity to act on a more or less level civic and moral playing field." (Daniel Sarewitz, Consortium for Science, Policy & Outcomes, Arizona State University).

normally economic variables while subjective measurements refer to someone's state of life satisfaction or happiness. Generally, researchers agree that while economic measures do not encompass all aspects of life they are easier to measure. Thus, in the absence of better measurement tools, objective measurements, such as the United Nations' Human Development Index (HDI), are often used as "intermediate" social indicators.

Another alternative assesses human well-being using a "human happiness" variable, typically obtained drawing on one or more responses from a survey instrument.[16] Introduced over three decades ago by Easterlin (1974), the topic "economics of happiness" has become more common in recent economics literature (Kahneman and Krueger, 2006). Critics of these "happiness measures" contend that the latent nature of such subjective matters as happiness or sadness makes the resulting variables imperfect at best. Among other issues prevailing at the time, people may respond inconsistently to a survey due to such factors as cultural differences, recent events, or economic situations (Griffith, 2004). Nonetheless, Griffith (2004), Alesina et al. (2004), and Kahneman and Krueger (2006) suggest that happiness measures from properly developed and administered surveys can result in effective measurements of respondents' overall happiness.[17]

[16] For example, "Taken all together, how would you say things are these days[?] [W]ould you say that you are very happy, pretty happy, or not too happy?" (This question was asked of U.S. citizens by the National Opinion Research Center. National Opinion Resource Center, University of Chicago, General Social Survey: 1972–2004).

[17] For example, people who consider themselves pretty happy are less likely to be absent from work, less likely to die prematurely, and less likely to have headaches. Self-reported happy people also smile more and are more capable of recalling positive life events (Alesina et al., 2004, and Griffith, 2004). Furthermore, results from neurological research provide some support for the notion that a correlation between self-reported degree of life satisfaction and the individual's emotional state exists (Kahneman and Krueger, 2006).

A good tax system should, in theory, strive to achieve multiple goals including improving overall human well-being. For example, the progressive nature of a tax system is ultimately designed, in part, to redistribute income from the rich to the poor, consequently making the income and wealth distribution more equal (Feeny, 2003, and Multinational Monitor, 2003). Thus, according to Heady (1993), Christoph and Noll (2003), and Griffith (2004), in a country where a progressive tax system effectively redistributes wealth to promote greater equality, the result is a society in which greater happiness exists because less inequality is present

The impact of the tax burden on human well-being continues to be controversial. First, one cannot answer this question by examining tax revenues alone. A bigger determinant is likely how the government revenues are spent. Second, the answer depends on political-philosophical views. Libertarians, for example, believe that individual rights are of paramount importance and that such rights cannot be violated even for the sake of aggregate welfare. Thus, libertarians feel that taxation is a negative influence because it infringes on individual ownership rights in order to improve well-being of the entire society. Utilitarians, on the other hand, believe that the goal should be to maximize the sum of total happiness. To that end, taxation is fair under utilitarian principles if the revenues are used to increase aggregate welfare.[18]

Griffith (2004) examines the potential welfare gains from redistributive tax policies by incorporating, in part, findings of the happiness literature (e.g., Alesina et al.,

[18] More about different political-philosophical views can be found in White, Stuart. Social Minimum. *The Stanford Encyclopedia of Philosophy (Winter 2004 Edition),* Edward N. Zalta (ed.). URL = http://plato.stanford.edu/archives/win2004/entries/social-minimum/.

2004, Layard, 2003, Layard, 2003a, and Di Tella et al., 2003) that maintain that the distribution of income impacts subjective well-being more than actual income level.

Layard (2003a) finds 1) that people with more income tend to be happier than people with less income and 2) that overall, average happiness in a society did not increase between the 1970s and the 1990s even though average income increased significantly.[19] Stated differently, people appear to care more about the relative than the absolute level of income. One possible explanation for this phenomenon is adaptation: people grow accustomed to what they have. Interestingly, adaptation is greater for material possessions (house, car, etc.) than immaterial concepts like social connections, family time, etc. (Frank, 1999). Based on these findings, Griffith (2004) claims that a (more) progressive income structure increases social welfare because marginal utility derived from additional income declines throughout the income distribution and, therefore, the impact of additional income on different income groups may be of a very different nature. Poor individuals purchase goods to satisfy their basic needs. Most of these goods will be non-positional. Furthermore, income satisfying basic needs is less likely to decline in value from adaptation. Rich people, on the other hand will benefit more from additional leisure time than additional income because rich people adapt less to more leisure time than to more money. Stated differently, according to the studies mentioned above (Layard, 2003, Layard, 2003a, Frank, 1999, and Griffith, 2004), the often cited labor-leisure trade-off – i.e., the fear that increased marginal tax rates cause

[19] This phenomenon is sometimes described as "Easterlin's puzzle" (Di Tella and MacCulloch, 2006: 25), based on Easterlin's (1974) findings that increase in income does not necessarily lead to increase in happiness.

rich people to work less – may actually contribute to social welfare even if it does not lead to increased economic output.

Summary

The literature examining the relationship between taxes and economic performance is plentiful. Yet, few studies examine the effect of taxes on human well-being or happiness. Therefore, in order to extend and contribute to the tax system/human well-being literature, this dissertation focuses on empirically measuring the impact of tax and transfer systems on aspects of overall social welfare using the following dependent variables: 1) income distribution, 2) poverty, and 3) collective happiness. A multinational comparison of tax systems is provided so that variances in how each system approaches social welfare can be used to render conclusions on the effectiveness of different tax models to achieve positive social welfare outcomes.

CHAPTER III

RESEARCH QUESTIONS AND HYPOTHESIS DEVELOPMENT

Research Questions

Based on the preceding literature review, the following tax policy research questions are presented for purposes of investigation:

(1) How is the progressivity of a country's tax and transfer system related to income distribution, poverty level, and collective happiness?

(2) How does a country's overall tax burden affect income distribution, poverty level, and collective happiness?

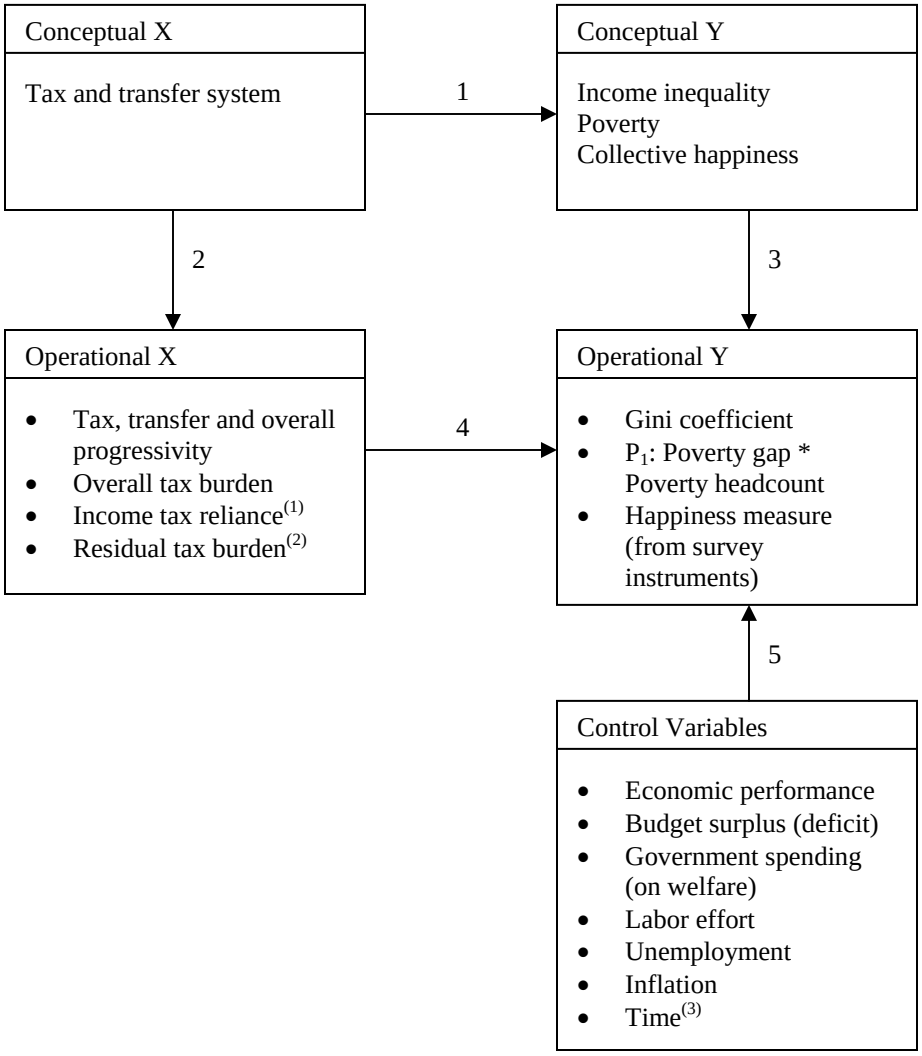
(3) How is the composition of a nation's tax system related to income distribution, poverty level, and collective happiness?

(4) In what dimensions do European tax and transfer systems differ significantly from the United States tax and transfer system?

(5) Is the impact of tax and transfer systems on income inequality, poverty, and collective happiness different in the United States than in Europe?

Predictive Framework and Hypotheses

The graphical representation of the predictive validity framework (Figure 3.1) based on Libby et al. (2002) maps the empirical part of this study.



Notes:

(1) Income tax reliance: tax revenues from income taxes in percent of total tax revenues.

(2) Residual tax burden: overall tax burden net of income taxes in percent of GDP.

(3) Time: dummy variable equaling one for the years after 1990 and zero otherwise.

Figure 3.1 Framework adapted from Libby et al. (2002) ("Libby Boxes")

Link 1 represents the relationship in the underlying theory. Since no theory can be tested directly, it is tested by assessing the relationship between the operational

definitions of key concepts in the theory (i.e., link 4). For this test to be valid, the links between the concepts and operational definitions (i.e., links 2 and 3) must be valid and other factors that might affect the dependent variable must be controlled for or have no effect (i.e., link 5). Links 2 and 3 of the "Libby boxes" connect the conceptual X and Y to the operational X and Y.

The Dependent Variables

This study examines the relationship between tax systems and social welfare. The aforementioned literature provides that social welfare is affected by income inequality, poverty, and happiness each representing a dependent variable in this study, a description of which is detailed below:

Income Inequality

Each country's income distribution is measured using the after-tax Gini coefficient, the most commonly used measure for income inequality. Correlation analysis shows that, for the countries and years in the sample, the Gini coefficient is highly correlated (Pearson correlation coefficient of 0.85 and higher) with alternative measures of income inequality such as the Atkinson index and decile ratios.

The Gini coefficient is based on the Lorenz curve, a graphical representation of income inequality. If the income distribution is exactly equal, the Lorenz curve is a straight line at the 45-degree angle (the "equality line"). The further the Lorenz curve lies below the equality line the more unequal is the distribution of income. The Gini

coefficient is calculated as: [the area between the equality line and the Lorenz curve]/[the total area below the equality line (which is always 1/2)]. If the income distribution is exactly equal, the area between the Lorenz curve and the equality line is non-existent and the Gini coefficient is zero. If, on the other hand, one person in a society receives all the income and everybody else receives nothing, the Gini coefficient equals one. Stated differently, the Gini coefficient – theoretically – ranges from zero to one, higher values representing higher inequality.

Poverty

A simple poverty measure is the "poverty headcount," i.e., the proportion of people living under a pre-defined poverty line. Unfortunately, this measurement alone fails to provide an indication of the severity of poverty in terms of lack of income. In addition, the headcount measure is unaffected by policies that make the poor even poorer.[20]

Two alternative poverty measures are the poverty gap and the squared coefficient of variation of income among poor households, CV^2 (DeFina and Thanawala, 2002). Foster et al. (1984) develop a class of poverty indices that depends on poverty aversion:

$$P_\alpha = \frac{1}{nz^\alpha} \sum_{i=1}^{q} g_i^\alpha$$

Where n is the total number of households (rank-ordered in increasing income levels), z is the (pre-defined) poverty line, g_i is the income shortfall (i.e., the difference

[20] Economic Research Service/USDA: Measuring the Well-Being of the Poor. Demographics of Low-Income Households. TB-1898: 7. [URL = http://www.ers.usda.gov/publications/tb1898/tb1898f.pdf]

between the i^{th} household's income and the poverty line), q is the number of households for which g_i is greater than zero and α measures the "aversion to poverty" (higher numbers indicating greater aversion).[21] DeFina and Thanawala (2002) show how for α = 0, 1, and 2 the index increases in complexity. For $\alpha = 0$, P_0 is the headcount ratio, H = q/n (P_0 = H). For $\alpha = 1$, P_1 measures the average poverty-gap ratio, $I = 1 - (\mu_z/z)$ where μ_z is the average income of poor households, *and* the headcount measure, H ($P_1 = H * I$). Finally, for $\alpha = 2$, $P_2 = H*[I^2 + (1 - I)^2 - CV^2]$, where CV^2 is the squared coefficient of variation of income among poor households.

In this study, poverty is measured using P_1 (i.e., the combination of headcount ratio and poverty-gap ratio) using LIS data. The poverty line is defined at 50 percent of the median income. This measure overcomes the weaknesses of the headcount ratio while maintaining relative ease of interpretation. Headcount ratio and P_1 are relatively highly correlated for the countries and years in the sample (Pearson correlation coefficient of 0.8).

Collective Happiness

The third dependent variable in this study is collective happiness/human well-being. Griffith (2004) suggests that taxes affect collective happiness. Specifically, he posits that a more redistributive tax system results in higher social welfare and therefore a happier population because redistribution makes the rich less unhappy than it makes the

[21] Note that for very large α, P_α becomes a "Rawlsian" measure because – in accordance with the max-min social welfare function – it only takes into account the position of the poorest person in the society (Foster et al., 1984).

poor happy. Similar to Alesina at al. (2004), this research uses survey data from the U.S. General Social Survey and the Euro-Barometer Survey (see Alesina et al., 2004) to measure collective happiness. Of particular interest are the responses to the questions 1) *"Taken all together, how would you say things are these days – would you say that you are very happy, pretty happy, or not too happy?"* (U.S. General Social Survey Series) and 2) *"On the whole, are you very satisfied, fairly satisfied, not very satisfied, or not at all satisfied with the life you lead?"* (Euro-Barometer Survey Series). While some researchers are critical of using such vague and "soft" survey data to measure happiness, recent studies indicate that, despite the relative weaknesses, happiness questions from surveys are useful measures of general happiness (Alesina et al., 2004, Griffith, 2004, Kahneman and Krueger, 2006).

The Euro-Barometer Survey employs a four-point scale ("very satisfied," "fairly satisfied," "not very satisfied," and "not at all satisfied") while U.S. General Social Survey uses a three-point scale ("very happy," "pretty happy," and "not too happy"). In order to be able to compare the data across countries, the last two categories of the Euro-Barometer Survey data ("not very satisfied" and "not at all satisfied") are combined into one.[22] Values of 3 through 1 were assigned to the categories (3 = "very happy" / "very satisfied"; 2 = "pretty happy" / "fairly satisfied"; 1 = "not too happy" / "not very satisfied" and "not at all satisfied").

[22] Combining the last two categories into one turns an even number likert scale into an uneven number scale. In general, uneven number likert scales allow undecided or indifferent respondents to choose the neutral response, while even number likert scales force them to answer either positively or negatively. However, in this case, no response is strictly neutral and the respondents were given the option to answer "don't know" if they were truly unsure about their state of satisfaction / happiness.

Explanatory Variables

Tax Variables

Progressivity is one measurement used to describe a country's tax system. In this study, Mahler and Jesuit's (2005) measurements for tax, transfer, and overall progressivity are used.[23] Mahler and Jesuit (2005), using Luxembourg Income Study (LIS) data for multiple countries, examine 1) whether income redistribution is achieved mainly through taxes or transfers, 2) if such redistribution is correlated with size or internal target efficiency of social benefits, and 3) how the redistributive effect of different transfers compare. Note that tax (transfer) progressivity is computed as the percentage change in income distribution (Gini coefficient) due to taxes (transfers). By definition, the goal of a tax and transfer system with a greater emphasis on redistribution of income and wealth, is a more equal income and wealth distribution. The nature of a progressive tax structure is rooted in the ability to pay doctrine (Heady, 1993). Stated differently, the more income/wealth taxpayers maintain, the greater ability they have to pay taxes with less negative impact on overall quality of life. For this reason, a progressive tax structure is often used to redistribute income where the government requires taxpayers with greater income to contribute a greater percentage of that income to taxes. The goal of this type of system is to adequately fund government operations with no particular group of taxpayers being overly burdened once the taxes have been paid (Musgrave, 1959: 91–94).

[23] The data can be obtained from the LIS database: URL = http://www.lisproject.org/publications/fiscalredistdata/fiscred.htm.

However, higher progressivity and, by implication, income and wealth redistribution will only lead to more equality if the government spends the money collected from the wealthier taxpayers on the less fortunate taxpayers. Thus, the very nature of a progressive tax system is presumably to effect wealth redistribution (Atkinson, 1973, Heady, 1993). Traditionally, income taxes are more progressive than consumption, property, or payroll taxes (see for example Suits, 1977, Guthrie, 1979, and Verbist, 2004). This factor is largely a practical matter since consumption taxes, such as sales or value-added taxes, are often collected at point of sale. Therefore, it is simply not practical to have varying rate structures for consumption taxes based on relative wealth because the level of wealth is not verifiable at the time of collection. Thus, by their nature, taxes other than income taxes often tend to be more proportional. Consequently, owing to the more progressive nature of income taxes, income taxes are expected to be more negatively related to income inequality than consumption and other taxes. This leads to the first set of hypotheses (stated in the alternative form):

H1a: Progressivity is negatively related to income inequality.

H1b: Tax burden (i.e., tax revenues in percent of GDP) is negatively related to income inequality.

H2a: Income tax reliance (i.e., proportion of total tax revenues from income taxes) is negatively related to income inequality.

H2b: Residual tax burden (i.e., total tax burden net of income taxes) is negatively related to income inequality.

H2c: The impact of income tax reliance on income inequality is greater than the impact of the residual tax burden.

Redistribution is not only designed to equalize the income distribution but also to reduce poverty (Sen, 1997, Kakwani, 1997, and Wolff, 2002). As with the income distribution, higher progressivity should, in theory, decrease poverty levels unless the money collected from the rich is not mostly spent on the poor. More progressive types of taxes, such as income taxes, reduce poverty more than less progressive taxes, such as consumption taxes. This leads to the following set of hypotheses (stated in the alternative form):

H3a: Progressivity is negatively related to poverty.

H3b: Tax burden (i.e., tax revenues in percent of GDP) is negatively related to poverty.

H4a: Income tax reliance (i.e., proportion of total tax revenues from income taxes) is negatively related to poverty.

H4b: Residual tax burden (i.e., total tax burden net of income taxes) is negatively related to poverty.

H4c: The impact of income tax reliance on poverty is greater than the impact of the residual tax burden.

The above hypotheses (H1a–H4c) are tested using data from the following countries: Australia, Belgium, Canada, Denmark, Finland, France, Germany, the Netherlands, Norway, Sweden, Switzerland, the United Kingdom, and the United States (Table 4.1).

Griffith (2004) basing his reasoning on Layard (2003 and 2003a), suggests that progressive taxes lead to more collective happiness for two reasons:

- For rich taxpayers, marginal utility derived from additional income is smaller than marginal utility derived from additional leisure time. Thus,

rich people are happier working less – even if that means earning less – than working more for additional monetary gain. A progressive tax may influence their behavior leading them to trade off leisure for labor.

- The additional (redistributed) income to the poor people reduces both poverty and inequality and increases the utility of the poor by more than the rich people's utility decreases.

This leads to the following hypotheses (stated in the alternative form):

H5a: Progressivity is positively related to collective happiness.

H5b: Tax burden (i.e., tax revenues in percent of GDP) is positively related to collective happiness.

H6a: Income tax reliance (i.e., proportion of total tax revenues from income taxes) is positively related to collective happiness.

H6b: Residual tax burden (i.e., total tax burden net of income taxes) is positively related to collective happiness.

H6c: The impact of income tax reliance on collective happiness is greater than the impact of the residual tax burden.

The above hypotheses (H5a–H6c) are tested using data from the following countries: Belgium, Denmark, Finland, France, Germany, the Netherlands, Sweden, the United Kingdom, and the United States (Table 4.1).

Alesina et al. (2004) find that Americans feel differently about inequality and poverty than Europeans. Specifically, Americans do not perceive inequality as negatively as do Europeans. Given that the European countries and the United States are democratic societies, where, theoretically, the median voter decides on the design of the tax and transfer system, the relative belief structure toward inequality and poverty should

be reflected in their countries' respective tax systems. In light of Alesina et al. (2004), the following is hypothesized (stated in the alternative form):

> **H7a**: The United States tax and transfer system redistributes less income than European tax and transfer systems.
>
> **H7b**: The United States tax and transfer system reduces poverty less than European tax and transfer systems.
>
> **H7c:** The United States tax and transfer system positively impacts collective happiness less than European tax and transfer systems.

The above hypotheses (H7a–H7c) are tested using data from the following countries: Belgium, Denmark, Finland, France, Germany, the Netherlands, Norway, Sweden, Switzerland, the United Kingdom, and the United States.

Non-Tax Variables

Link 4 of the "Libby boxes" makes an assessment of the relation between the operational independent and the operational dependent variable(s) (Figure 3.1). A study can suffer from internal validity when confounding variables are not included in the model. Accordingly, link 5 introduces control variables. For this study, the following non-tax variables (control variables) are included in the model: economic performance (GDP per capita and economic growth), budget surplus (deficit), government (welfare) spending, labor effort, unemployment rate, and inflation.

Several studies suggest that economic performance (GDP per capita and GDP growth) is positively related to well-being and happiness. For instance, Oswald (1997), Hagerty and Veenhoven (2003), Christoph and Noll (2003), and Di Tella et al. (2003)

find a positive relationship between average income and happiness, indicating that higher economic performance leads to more collective happiness. The relationship of economic performance on inequality and poverty depends on the beneficiaries of income growth. If poor people incur higher income growth than the rich, economic performance will be negatively related to inequality and poverty. Kuznets (1963) hypothesizes that the relationship between inequality and economic growth resembles an inverted "U" (the "Kuznets curve"), suggesting that, depending on the country's stage of economic development, the relationship between growth and inequality may be positive or negative. Gupta and Singh (1984) find empirical support for this hypothesis. Empirical data from the LIS database suggests that, in the past two decades, for most countries in the sample poverty and inequality remained stable or increased despite economic growth. In fact, the United States with the second highest GDP per capita (see footnote 4) ranks at the top among developed countries with regard income inequality and poverty. Moreover, in the past three decades, income inequality increased more in the United States than in any other developed country (Smeeding, 2004; see also income inequality and poverty data from the LIS database, Figures 4.1 and 4.2.)

The budget surplus (deficit) variable, defined as budget surplus (deficit) in percent of GDP, is included owing to the possible impact on future generations' income, poverty, and happiness. Some economists suggest that a budget surplus today infers that existing debt can be serviced leaving future generations with more spending resources while a deficit implies the opposite relationship: future generations will be saddled with excess debt and experience future spending restraints. If a deficit (surplus) exists because the

government is currently (not) spending money to decrease inequality and poverty, the relationship between deficit (surplus) and inequality and poverty will be negative (positive). On the other hand, in a budget deficit (surplus) situation, if the people are concerned (happy) with the relative price of national debt (Kotlikoff and Burns, 2004), the relationship between deficit (surplus) and happiness will be negative (positive). This implies that status of a country's budget surplus or deficit should be included in the analysis.

Government welfare spending is designed to have a negative effect on inequality and poverty. Thus, in terms of measuring income and wealth redistribution and poverty, welfare-spending should be negatively correlated with income inequality and with poverty (i.e., the more welfare spending, the more income redistribution and the lower the poverty level). In terms of measuring happiness, if declining inequality and poverty positively affects happiness – as suggested by utilitarians and welfarists –, the relationship between government (welfare) spending and happiness should be positive. For instance, Di Tella et al. (2003) find that the generosity of publicly provided unemployment insurance is positively associated with happiness. Owing to data availability constraints, this study uses overall government spending (in percent of GDP) as proxy for government welfare spending.

Since the model controls for unemployment and the countries in the sample are democratic[24], labor effort (i.e., the average number of hours worked per person in the

[24] Theoretically, in democratic countries, the people decide their average workweek, either directly via vote, or indirectly via their representative(s) in the parliament.

workforce per year) measures the length of time the employment force wishes to work.[25] The effect labor effort has on income inequality and poverty is theoretically unclear. However, according to Griffith (2004) and Layard (2003 and 2003a), leisure time increases happiness. Unemployment rates and inequality as well as poverty are likely to be positively correlated unless only rich people are unemployed. Unemployment has a more severe impact on poor people because they do not have the resources to survive for weeks or months without income. Furthermore, they may not be eligible for unemployment benefits. Studies also show that unemployment is negatively related to happiness (e.g., Oswald, 1997, and Di Tella et al., 2003). In fact, high unemployment not only reduces the happiness of the unemployed but also the well-being of those employed – possibly because of fear of becoming jobless (Di Tella et al., 2003). It seems unclear what effect inflation, i.e., the annual change of the respective consumer price index, has on poverty and inequality.[26] However, some studies show that inflation affects happiness negatively (Di Tella et al., 2003).

Table 3.1 summarizes predictions for each dependent and each explanatory variable.

[25] An interesting measure – which, unfortunately, is not available – is the measurement of inequality in labor effort. Correlation of labor effort inequality and income inequality could be an indicator as to how much of the income inequality is attributable to labor–leisure trade-offs.

[26] Generally, prices increase before wages and salaries. During high inflation or hyperinflation this is a big problem – especially for poor people who have no financial reserves. Thus, one can argue that inflation does have a positive impact on poverty and possibly inequality.

Table 3.1
Dependent variables, explanatory variables, and predicted signs

Dependent Variable	Explanatory Variable	Predicted Sign
Income Inequality	Tax and transfer progressivity	Negative
	Overall tax burden	Negative
	Income tax reliance	Negative[(1)]
	Residual tax burden	Negative[(1)]
	Economic performance	?
	Budget surplus (deficit)	?
	Government (welfare) spending	Negative
	Labor effort	?
	Unemployment	?
	Inflation	?
Poverty	Tax and transfer progressivity	Negative
	Overall tax burden	Negative
	Income tax reliance	Negative[(2)]
	Residual tax burden	Negative[(2)]
	Economic performance	?
	Budget surplus (deficit)	?
	Government (welfare) spending	Negative
	Labor effort	?
	Unemployment	?
	Inflation	?
Happiness	Tax and transfer progressivity	Positive
	Overall tax burden	Positive
	Income tax reliance	Positive[(3)]
	Residual tax burden	Positive[(3)]
	Economic performance	Positive
	Budget surplus (deficit)	Positive (negative)
	Government (welfare) spending	Positive
	Labor effort	Negative
	Unemployment	Negative
	Inflation	Negative

Notes:

[(1)] I predict that the impact of income tax reliance on income inequality is more negative than the impact of residual tax burden.

[(2)] I predict that the impact of income tax reliance on poverty is more negative than the impact of residual tax burden.

[(3)] I predict that the impact of income tax reliance on collective happiness is more positive than the impact of residual tax burden.

CHAPTER IV

DATA SOURCES AND METHODOLOGY

Data Sources and Summary Statistics

For this research, the following data sources are used (Tables A.1 and A.2):

- U.S. General Social Survey (happiness data for the Unites States),
- Euro-Barometer Survey (happiness data for EU countries),
- Luxembourg Income Study (LIS) Database (income, income inequality, poverty, and tax, transfer, and overall progressivity),
- OECD Revenue Statistics (tax and tax mix data),
- Penn World Tables (gross domestic product),
- International Financial Statistics (budget surplus (deficit), government spending, unemployment rates, and inflation rates), and
- OECD Factbook 2005 (labor effort).

Owing to data availability constraints, several countries were dropped from the sample. Table 4.1 presents the countries examined in this study.

Note that all countries in the sample are developed "western" countries. This eliminates comparability problems. For example, one can argue that the relationship between the progressivity of a tax system and inequality in a developing country where pre-tax-transfer income inequality is very high is quite different than in developed countries with moderate inequality and that it would be rather difficult to control for these differences.

Table 4.1
Countries included in sample

Dependent Variables: Inequality, Poverty	Dependent Variable: Happiness
Australia	Belgium
Belgium	Denmark
Canada	Finland
Denmark	France
Finland	Germany
France	Netherlands
Germany	Sweden
Netherlands	United Kingdom
Norway	United States
Sweden	
Switzerland	
United Kingdom	
United States	

Tables 4.2 and 4.3 and Figures 4.1 through 4.3 present the summary statistics for these data.

Table 4.2
Summary statistics

Variable	Number of Observations	Mean	Median	Standard Deviation
Dependent Variables:				
Income inequality	59	0.276	0.270	0.042
Happiness	35	2.16	2.17	0.19
Poverty	59	0.032	0.031	0.015
Explanatory Variables (TAX) (variables of interest):				
Tax progressivity	59	0.091	0.098	0.030
Transfer progressivity	59	0.269	0.275	0.086
Overall progressivity	59	0.361	0.363	0.088
Overall tax burden	59	38.10%	37.64%	7.28%
Income tax	59	39.94%	40.15%	10.06%
Residual tax burden	59	23.19%	22.56%	6.66%
Explanatory Variables (NONTAX) (control variables):				
GDP per capita	59	$20,421	$20,528	$7,407
Economic growth (GDP growth)	59	5.64%	4.91%	10.68%
Budget surplus (deficit)	58	-2.03%	-1.89%	3.43%
Government expenditures	59	19.98%	19.79%	4.10%
Labor effort	36	1,648	1,685	155
Unemployment	48	7.51%	7.64%	3.44%
Inflation	59	4.06%	3.13%	3.11%

Countries included in sample: Australia, Belgium, Canada, Denmark, Finland, France, Germany, Netherlands, Norway, Sweden, Switzerland, United Kingdom, United States.

Table 4.3
Pearson correlation coefficients

	Happiness	Income inequality	Poverty	Tax progressivity	Transfer progressivity
Income inequality	-0.1469				
p-value	0.3998				
Poverty	0.2641	**0.7119**			
p-value	0.1252	<.0001			
Tax progressivity	0.1336	**-0.3081**	-0.1148		
p-value	0.4444	0.0176	0.3866		
Transfer progressivity	0.0670	**-0.7376**	**-0.5995**	-0.0879	
p-value	0.7022	<.0001	<.0001	0.5079	
Overall progressivity	0.1128	**-0.8213**	**-0.6208**	**0.2589**	**0.9394**
p-value	0.5189	<.0001	<.0001	0.0477	<.0001

	Happiness	Income inequality	Poverty	Tax progressivity	Transfer progressivity
Overall tax burden	0.2558	**-0.7009**	**-0.5627**	-0.0074	**0.8641**
p-value	0.1380	<.0001	<.0001	0.9559	<.0001
Income tax	**0.6030**	0.1788	**0.3296**	**0.2620**	**-0.5090**
p-value	0.0001	0.1755	0.0108	0.0450	<.0001
Residual tax burden	-0.2347	**-0.5228**	**-0.5285**	-0.1654	**0.8289**
p-value	0.1747	<.0001	<.0001	0.2105	<.0001
GDP per capita	**0.3629**	0.0247	0.1612	-0.0650	0.0779
p-value	0.0321	0.8525	0.2225	0.6248	0.5574
Economic growth	**0.3245**	-0.0733	0.0388	0.0416	0.0090
p-value	0.0572	0.5812	0.7704	0.7543	0.9463

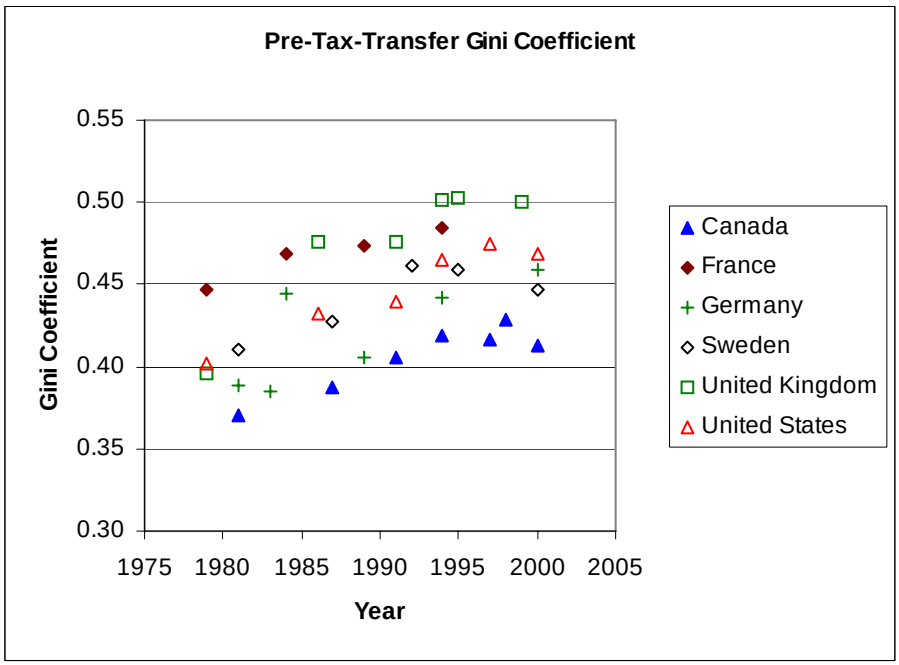
	Happiness	Income inequality	Poverty	Tax progressivity	Transfer progressivity
Deficit	0.0757	0.1609	0.1242	-0.0521	**-0.2859**
p-value	0.6703	0.2277	0.3530	0.6976	0.0296
Government expenditures	-0.0227	**-0.5381**	**-0.4408**	0.1422	**0.5877**
p-value	0.8970	<.0001	0.0005	0.2827	<.0001
Unemployment	**-0.3325**	-0.0507	**-0.2780**	0.1577	0.2218
p-value	0.0839	0.7324	0.0558	0.2846	0.1297
Labor effort	-0.2338	**0.6049**	**0.3287**	0.0228	**-0.5838**
p-value	0.2951	<.0001	0.0503	0.8952	0.0002
Inflation	-0.2615	-0.0257	-0.0114	-0.0370	**-0.2215**
p-value	0.1291	0.8470	0.9320	0.7811	0.0918

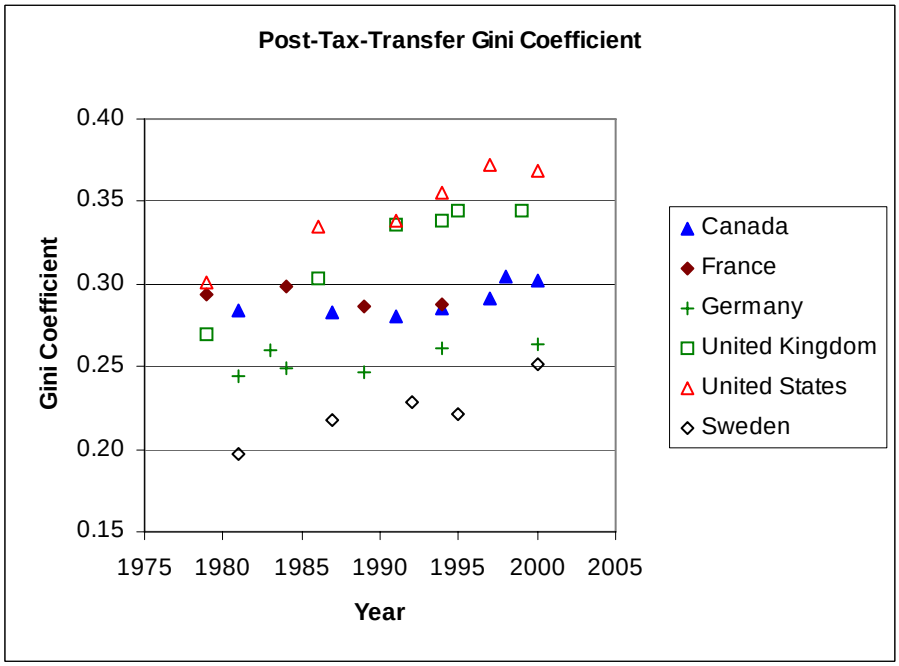
Table 4.3 Continued

	Overall progressivity	Overall tax burden	Income tax	Residual tax burden	GDP per capita
Overall tax burden	**0.8353**				
p-value	<.0001				
Income tax	**-0.4034**	**-0.3494**			
p-value	0.0015	0.0067			
Residual tax burden	**0.7468**	**0.8152**	**-0.8214**		
p-value	<.0001	<.0001	<.0001		
GDP per capita	0.0532	0.1322	0.1932	-0.0393	
p-value	0.6890	0.3182	0.1426	0.7673	
Economic growth	0.0230	0.0873	0.0929	-0.0046	-0.0493
p-value	0.8626	0.5107	0.4841	0.9723	0.7111

	Overall progressivity	Overall tax burden	Income tax	Residual tax burden	GDP per capita
Deficit	**-0.2959**	-0.0553	0.2155	-0.1684	**0.2893**
p-value	0.0241	0.6801	0.1042	0.2063	0.0276
Government expenditures	**0.6188**	**0.6510**	-0.0900	**0.4403**	-0.0309
p-value	<.0001	<.0001	0.4978	0.0005	0.8165
Unemployment	**0.2745**	0.1784	-0.1403	0.1926	**-0.2768**
p-value	0.0590	0.2251	0.3416	0.1898	0.0569
Labor effort	**-0.5579**	**-0.5167**	**0.5370**	**-0.6125**	**-0.3168**
p-value	0.0004	0.0013	0.0007	<.0001	0.0598
Inflation	**-0.2275**	-0.2162	0.0891	-0.1763	**-0.5191**
p-value	0.0831	0.1000	0.5022	0.1816	<.0001

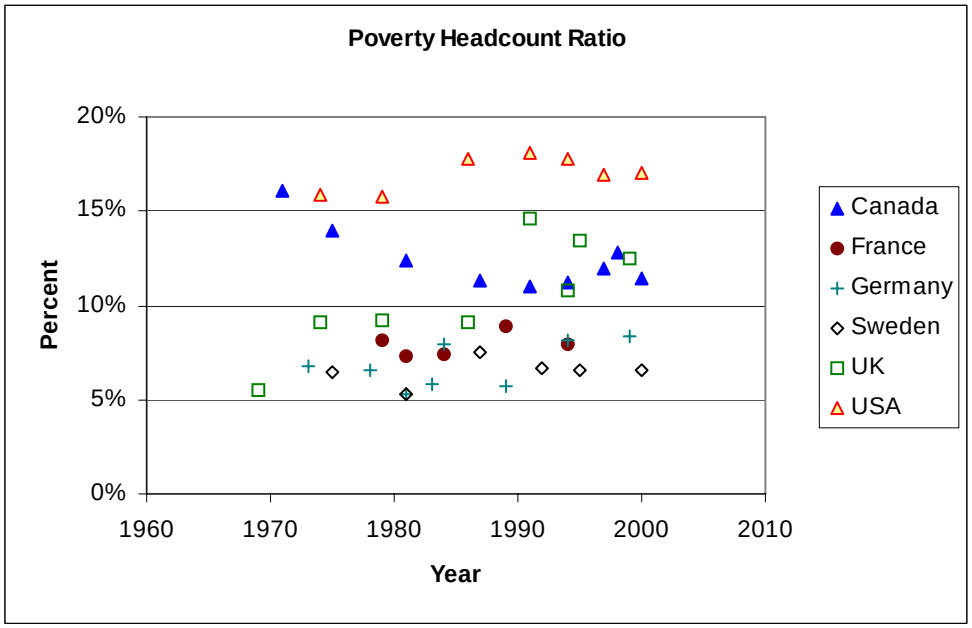
	Economic growth	Budget surplus (deficit)	Government expenditures	Unem-ployment	Labor effort
Deficit	-0.0442				
p-value	0.7420				
Government expenditures	0.0505	**-0.2639**			
p-value	0.7041	0.0453			
Unemployment	-0.0002	**-0.4278**	**0.2721**		
p-value	0.9990	0.0027	0.0614		
Labor effort	0.0810	-0.1555	-0.1390	0.1730	
p-value	0.6384	0.3724	0.4188	0.3130	
Inflation	0.1466	-0.0694	0.0615	**-0.2545**	0.1964
p-value	0.2678	0.6049	0.6436	0.0808	0.2511





Source: Luxembourg Income Study (2004).

Figure 4.1 Pre-tax-transfer and post-tax-transfer income inequality for six OECD countries (years 1979–2000)



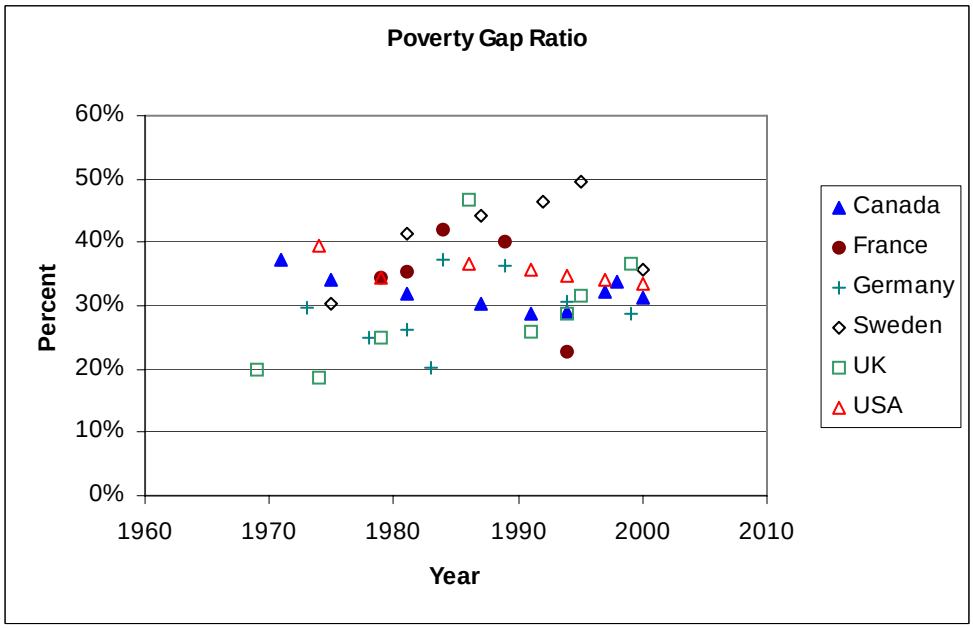
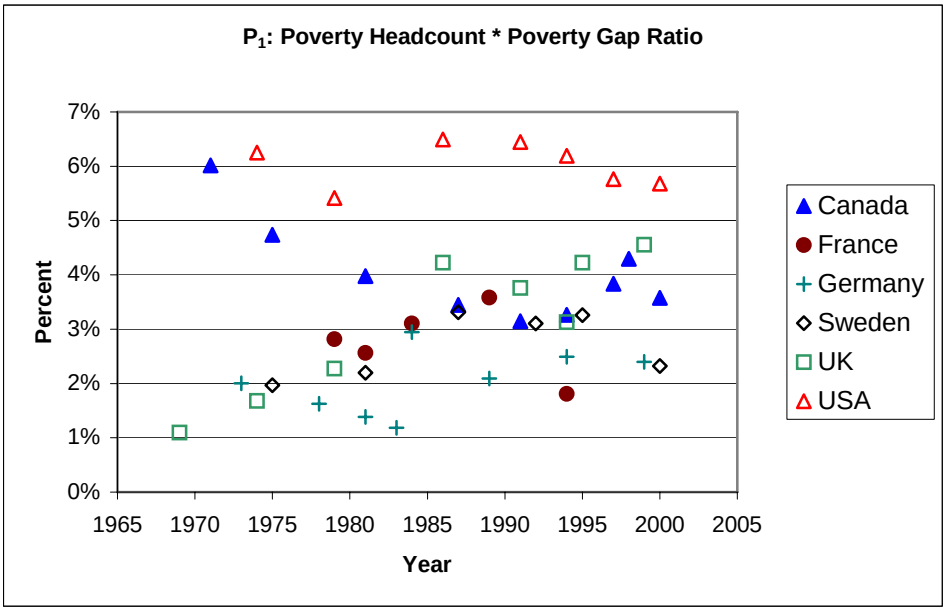


Figure 4.2 Poverty headcount ratio, poverty gap ratio, and P_1 for six OECD countries (years 1969–2000)



Source: Luxembourg Income Study (2004).

Figure 4.2 Continued

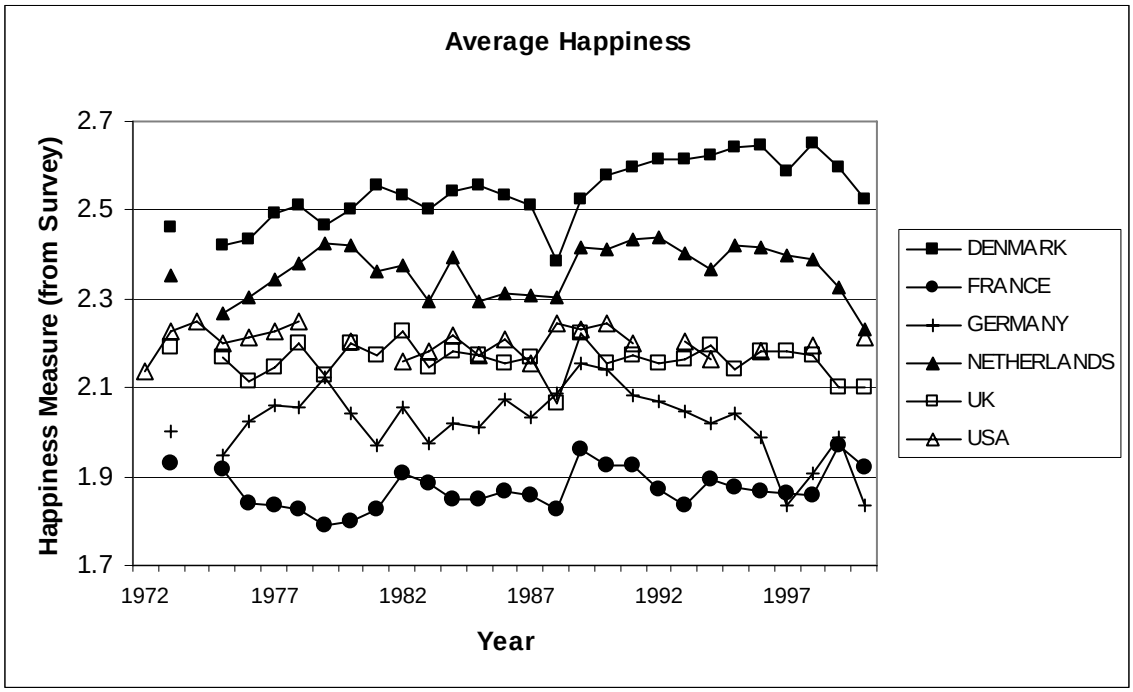


Figure 4.3 Average happiness measure for six OECD countries (years 1972–2000)

Methodology

Regression Analysis

The main focus of this study is on the following regression model:

$$WEL = \alpha + \beta TAX + \chi NONTAX ,$$

where *WEL* stands for the social welfare measures, income inequality, poverty, and collective happiness. The tax system variables (*TAX*) are tax, transfer, and overall progressivity, total tax burden (in percent of GDP), income tax reliance (i.e., the proportion of tax revenues from income taxes), and residual tax burden (i.e., total tax burden net of income taxes). *NONTAX* denotes the set of control variables, economic

performance, budget surplus (deficit), government welfare spending, labor effort, unemployment, and inflation. Owing to small sample limitations, the data are analyzed using OLS regressions and variations of bivariate regression models. Stated differently, the relationship between each variable of interest (TAX variable) and each dependent variable (WEL variable) is analyzed separately. A time dummy variable is included to account for possible time effects in the 20-year time period covered by the dataset (1980–2000). Since the control variable for labor effort (LABOREFF) is only available for the 1990s, two regressions for each relationship between dependent variable and variable of interest (TAX variable) are estimated, one where the labor effort control variable (LABOREFF) is included (models (1), (3), and (5)) and one where LABOREFF is excluded (models (2), (4), and (6)):

$$INEQ = \beta_0 + \beta_1 TAX + \beta_2 GDPPCAP + \beta_3 ECOGROWTH + \beta_4 DEFICIT + \beta_5 GOVEX + \beta_6 LABOREFF + \beta_7 UNEMPL + \beta_8 INFLATION + \varepsilon \quad (1)$$

$$INEQ = \beta_0 + \beta_1 TAX + \beta_2 TIME + \beta_3 GDPPCAP + \beta_4 ECOGROWTH + \beta_5 DEFICIT + \beta_6 GOVEX + \beta_7 UNEMPL + \beta_8 INFLATION + \varepsilon \quad (2)$$

$$POV = \beta_0 + \beta_1 TAX + \beta_2 GDPPCAP + \beta_3 ECOGROWTH + \beta_4 DEFICIT + \beta_5 GOVEX + \beta_6 LABOREFF + \beta_7 UNEMPL + \beta_8 INFLATION + \varepsilon \quad (3)$$

$$POV = \beta_0 + \beta_1 TAX + \beta_2 TIME + \beta_3 GDPPCAP + \beta_4 ECOGROWTH + \beta_5 DEFICIT + \beta_6 GOVEX + \beta_7 UNEMPL + \beta_8 INFLATION + \varepsilon \quad (4)$$

$$HAPPY = \beta_0 + \beta_1 TAX + \beta_2 GDPPCAP + \beta_3 ECOGROWTH + \beta_4 DEFICIT + \beta_5 GOVEX + \beta_6 LABOREFF + \beta_7 UNEMPL + \beta_8 INFLATION + \varepsilon \quad (5)$$

$$HAPPY = \beta_0 + \beta_1 TAX + \beta_2 TIME + \beta_3 GDPPCAP + \beta_4 ECOGROWTH + \beta_5 DEFICIT + \beta_6 GOVEX + \beta_7 UNEMPL + \beta_8 INFLATION + \varepsilon \quad (6)$$

The following definition of variables is used[27]:

INEQ	Income inequality; i.e., post-tax-transfer Gini coefficient as defined on pages 37–38 (natural log).
POV	Poverty; i.e., poverty headcount times poverty gap (P_1) as defined on pages 38–39 (natural log).
HAPPY	Collective happiness; i.e., average happiness measure for each country in the sample based on survey data from the Euro-Barometer Survey Series (European Union Countries) and from the U.S. General Social Survey Series (United States) as defined on pages 39–40 (natural log).
TAX	One of six tax system variables: (1) tax progressivity, i.e., redistribution of income through taxes (TXPROGRESS), (2) transfer progressivity, i.e., redistribution of income through transfers (TRFPROGRESS), (3) overall progressivity, i.e., redistribution of income through taxes and transfers (ALLPROGRESS), (4) overall tax burden, i.e., total tax revenues in percent of GDP (BURDEN), (5) income tax reliance, i.e., proportion of total tax revenues from income taxes (INCOME),

[27] The variables for income inequality, poverty, collective happiness, GDP per capita, and labor effort are log transformed. An analysis using the raw data (not tabulated) leads to qualitatively similar results.

	and (6) residual tax burden, i.e., total tax revenues net of income taxes in percent of GDP (RESBURDEN).[28]
TIME	Time dummy variable, equaling one for the years post 1990 and zero otherwise.
GDPPCAP	Real GDP per capita in U.S. Dollars (natural log).
ECOGROWTH	Economic growth; i.e., annual change in GDP per capita (in percent).
DEFICIT	Budget surplus or deficit in percent of GDP.
GOVEX	Total government expenditures in percent of GDP.
LABOREFF	Labor effort; i.e., the average number of hours worked per worker in the workforce per year (natural log).
UNEMPL	Unemployment rate (in percent).
INFLATION	Annual change of consumer price index (in percent).

Note that including the control variable for labor effort (LABOREFF) eliminates the data from the 1980s. For that reason, regression (1), (3), and (5) do not include the TIME dummy variable.

Diagnostic Tests

Without control variables many regression results demonstrate significant omitted variable bias (Ramsey's Reset test). Diagnostic tests indicate that adding the non-tax controls listed above eliminates this bias. The normality assumption does not appear to

[28] Each regression model (regressions (1) through (6)) is examined separately for each of the TAX variables (variables of interest). Stated differently, each regression analysis is repeated six times.

be violated (Shapiro-Wilk test) and the CUSUM test suggests stability. In order to control for bias due to heteroscedasticity and/or autocorrelation, the analysis is based on robust standard errors (using an asymptotic covariance matrix). Table 4.4 summarizes the diagnostic test results.

Table 4.4
Summary of diagnostic tests

Part (a): Diagnostic tests for bivariate OLS regressions with one control variable (TIME).

Independent variable of interest (TAX variable)	Normality test (Shapiro Wilk)	Durbin Watson test for autocorrelation	White test for heteroscedasticity	CUSUM test	Ramsey's Reset test
Dependent variable: income inequality					
TXPROGRESS	NORMAL	POSITIVE	YES	NA	NO BIAS
TRFPROGRESS	NORMAL	POSITIVE	YES	NA	NO BIAS
ALLPROGRESS	NORMAL	POSITIVE	YES	NA	NO BIAS
BURDEN	NORMAL	POSITIVE	NO	NA	NO BIAS
INCOME	NORMAL	POSITIVE	NO	NA	NO BIAS
RESBURDEN	NORMAL	POSITIVE	NO	NA	BIASED
Dependent variable: poverty					
TXPROGRESS	NORMAL	POSITIVE	NO	NA	NO BIAS
TRFPROGRESS	NORMAL	POSITIVE	YES	NA	BIASED
ALLPROGRESS	NORMAL	POSITIVE	NO	NA	BIASED
BURDEN	NORMAL	POSITIVE	NO	NA	BIASED
INCOME	NORMAL	POSITIVE	NO	NA	NO BIAS
RESBURDEN	NORMAL	POSITIVE	NO	NA	BIASED
Dependent variable: collective happiness					
TXPROGRESS	NORMAL	POSITIVE	NO	OK	NO BIAS
TRFPROGRESS	NORMAL	POSITIVE	NO	OK	NO BIAS
ALLPROGRESS	NORMAL	POSITIVE	NO	OK	NO BIAS
BURDEN	NORMAL	POSITIVE	NO	OK	NO BIAS
INCOME	NOT NORMAL	POSITIVE	NO	OK	NO BIAS
RESBURDEN	NORMAL	POSITIVE	NO	OK	NO BIAS

Table 4.4 Continued

Part (b): Diagnostic tests for OLS regressions with all control variables except TIME.

Independent variable of interest (TAX variable)	Normality test (Shapiro Wilk)	Durbin Watson test for autocorrelation	White test for heteroscedasticity	CUSUM test	Ramsey's Reset test
Dependent variable: income inequality					
TXPROGRESS	NORMAL	POSITIVE	OK	OK	NO BIAS
TRFPROGRESS	NORMAL	POSITIVE	OK	OK	NO BIAS
ALLPROGRESS	NORMAL	POSITIVE	OK	OK	NO BIAS
BURDEN	NORMAL	POSITIVE	OK	OK	NO BIAS
INCOME	NORMAL	POSITIVE	OK	OK	BIASED
RESBURDEN	NORMAL	POSITIVE	OK	OK	NO BIAS
Dependent variable: poverty					
TXPROGRESS	NORMAL	NO	OK	OK	NO BIAS
TRFPROGRESS	NORMAL	NO	OK	OK	NO BIAS
ALLPROGRESS	NORMAL	NO	OK	OK	NO BIAS
BURDEN	NORMAL	NO	OK	OK	NO BIAS
INCOME	NORMAL	NO	OK	OK	NO BIAS
RESBURDEN	NORMAL	NO	OK	OK	NO BIAS
Dependent variable: collective happiness					
TXPROGRESS	NORMAL	NO	OK	OK	NO BIAS
TRFPROGRESS	NORMAL	NO	OK	OK	NO BIAS
ALLPROGRESS	NORMAL	NO	OK	OK	NO BIAS
BURDEN	NORMAL	NO	OK	OK	NO BIAS
INCOME	NORMAL	NO	OK	OK	NO BIAS
RESBURDEN	NORMAL	NO	OK	OK	NO BIAS

Table 4.4 Continued

Notes:

- Normality test (Shapiro Wilk test): NOT NORMAL (NORMAL): At the five percent significance level, the null hypothesis of normality is rejected (cannot be rejected).
- Test for positive or negative autocorrelation (Durbin Watson test): POSITIVE (NEGATIVE, NO): At the five percent significance level, the Durbin Watson statistic indicates positive (negative, no) autocorrelation.
- Test for nonconstant variance (White test for heteroscedasticity): YES (NO): At the five percent significance level, the null hypothesis of constant variance is rejected (cannot be rejected).
- CUSUM test for stability: OK: At the five percent significance level, the CUSUM statistic is within the upper and lower bound. NA: CUSUM statistic could not be computed.
- Test for omitted variable bias (Ramsey's Reset test): NO BIAS (BIASED): At the five percent significance level, the null hypothesis of no omitted variable bias cannot be rejected (is rejected).

Further Analysis

The differences of the United States and European tax systems are investigated using t-tests. Differences in effects are examined by comparing the regression coefficients (Chow test) and by analyzing regression models that include a dummy variable for the United States ("USA," equaling one for data from the United States and zero otherwise) as well as the interaction between the USA dummy variable and the variable of interest (TAX variable[29]):

$$INEQ = \beta_0 + \beta_1 USA + \beta_2 USA*TAX + \beta_3 TAX + \beta_4 GDPPCAP + \beta_5 ECOGROWTH + \beta_6 DEFICIT + \beta_7 GOVEX + \beta_8 LABOREFF + \beta_9 UNEMPL + \beta_{10} INFLATION + \varepsilon \quad (7)$$

$$INEQ = \beta_0 + \beta_1 USA + \beta_2 USA*TAX + \beta_3 TAX + \beta_4 TIME + \beta_5 GDPPCAP + \beta_6 ECOGROWTH + \beta_7 DEFICIT + \beta_8 GOVEX + \beta_9 UNEMPL + \beta_{10} INFLATION + \varepsilon \quad (8)$$

[29] The TAX variable in regression models (7) through (12) represents the six tax system variables of interest: tax progressivity (TXPROGRESS), transfer progressivity (TRFPROGRESS), overall progressivity (ALLPROGRESS), overall tax burden (BURDEN), income tax reliance (INCOME), and residual tax burden (RESBURDEN). Stated differently, each regression model is estimated six times.

$$POV = \beta_0 + \beta_1 USA + \beta_2 USA*TAX + \beta_3 TAX + \beta_4 GDPPCAP + \beta_5 ECOGROWTH + \beta_6 DEFICIT + \beta_7 GOVEX + \beta_8 LABOREFF + \beta_9 UNEMPL + \beta_{10} INFLATION + \varepsilon \quad (9)$$

$$POV = \beta_0 + \beta_1 USA + \beta_2 USA*TAX + \beta_3 TAX + \beta_4 TIME + \beta_5 GDPPCAP + \beta_6 ECOGROWTH + \beta_7 DEFICIT + \beta_8 GOVEX + \beta_9 UNEMPL + \beta_{10} INFLATION + \varepsilon \quad (10)$$

$$HAPPY = \beta_0 + \beta_1 USA + \beta_2 USA*TAX + \beta_3 TAX + \beta_4 GDPPCAP + \beta_5 ECOGROWTH + \beta_6 DEFICIT + \beta_7 GOVEX + \beta_8 LABOREFF + \beta_9 UNEMPL + \beta_{10} INFLATION + \varepsilon \quad (11)$$

$$HAPPY = \beta_0 + \beta_1 USA + \beta_2 USA*TAX + \beta_3 TAX + \beta_4 TIME + \beta_5 GDPPCAP + \beta_6 ECOGROWTH + \beta_7 DEFICIT + \beta_8 GOVEX + \beta_9 UNEMPL + \beta_{10} INFLATION + \varepsilon \quad (12)$$

For each case, a joint test (F-test) is performed to assess the joint significance of the USA dummy variable and the interaction variable. Joint significance would indicate that the impact of the United States tax and transfer system on income inequality, poverty, and/or collective happiness is significantly different from the impact of European tax and transfer systems on these three social welfare variables.

To assess the difference in impact of income tax reliance (INCOME), i.e., proportion of tax revenues from income taxes, and residual tax burden (RESBURDEN), i.e,. overall tax burden net of income taxes (hypotheses 2c, 4c, and 6c), both variables INCOME and RESBURDEN are included in the same regression models for each of the dependent variables:

$$INEQ = \beta_0 + \beta_1 INCOME + \beta_2 RESBURDEN + \beta_3 GDPPCAP + \beta_4 ECOGROWTH + \beta_5 DEFICIT + \beta_6 GOVEX + \beta_7 LABOREFF + \beta_8 UNEMPL + \beta_9 INFLATION + \varepsilon \quad (1a)$$

$$INEQ = \beta_0 + \beta_1 INCOME + \beta_2 RESBURDEN + \beta_3 TIME + \beta_4 GDPPCAP + \beta_5 ECOGROWTH + \beta_6 DEFICIT + \beta_7 GOVEX + \beta_8 UNEMPL + \beta_9 INFLATION + \varepsilon \quad (2a)$$

$$POV = \beta_0 + \beta_1 INCOME + \beta_2 RESBURDEN + \beta_3 GDPPCAP + \beta_4 ECOGROWTH + \beta_5 DEFICIT + \beta_6 GOVEX + \beta_7 LABOREFF + \beta_8 UNEMPL + \beta_9 INFLATION + \varepsilon \quad (3a)$$

$$POV = \beta_0 + \beta_1 INCOME + \beta_2 RESBURDEN + \beta_3 TIME + \beta_4 GDPPCAP + \beta_5 ECOGROWTH + \beta_6 DEFICIT + \beta_7 GOVEX + \beta_8 UNEMPL + \beta_9 INFLATION + \varepsilon \quad (4a)$$

$$HAPPY = \beta_0 + \beta_1 INCOME + \beta_2 RESBURDEN + \beta_3 GDPPCAP + \beta_4 ECOGROWTH + \beta_5 DEFICIT + \beta_6 GOVEX + \beta_7 LABOREFF + \beta_8 UNEMPL + \beta_9 INFLATION + \varepsilon \quad (5a)$$

$$HAPPY = \beta_0 + \beta_1 INCOME + \beta_2 RESBURDEN + \beta_3 TIME + \beta_4 GDPPCAP + \beta_5 ECOGROWTH + \beta_6 DEFICIT + \beta_7 GOVEX + \beta_8 UNEMPL + \beta_9 INFLATION + \varepsilon \quad (6a)$$

F-tests and Wald tests are performed to test if the difference between the two coefficients is significant. Significantly larger regression coefficients (in absolute values) of INCOME would indicate that income tax reliance affects social welfare more than all other taxes.

To test for robustness of the results, additional analyses are performed where none or only some control variables are included. Furthermore, regressions (1) through (6) are re-estimated including time dummy variables covering 5-year instead of 10-year periods (1980–1984, 1985–1989, 1990–1994, and 1995–2000) and the regression analysis for models (1) through (4) is repeated using alternate measurements for income inequality and for poverty. To test whether some of the results were driven by the USA data, the regressions (1) through (6) are rerun without the USA data in the sample.

CHAPTER V

EMPIRICAL RESULTS

Introduction

The focus of this study is the relationship between tax and transfer system and three aspects of social welfare: income inequality, poverty, and collective happiness. In this chapter, the main empirical results as well as several sensitivity analyses are presented. In the first part of the chapter, the regression results for each variable of interest (the TAX variables) and each dependent variable, income inequality, poverty, and collective happiness, are introduced and summarized. The second part addresses the differences between the United States and European tax and transfer systems. Third, the findings with regard to the control variables are presented. Finally, results of the sensitivity analyses are discussed in the third part of the chapter.

Main Results

Tax System and Income Inequality

The first two hypotheses address the relationship between taxes and income inequality. Regression models (1) and (2) examine the data. Specifically, they assess the impact of progressivity, overall tax burden, and tax mix on income inequality. Four aspects of a country's tax and transfer system are of interest: (i) progressivity, (ii) overall tax burden, (iii) income tax reliance, and (iv) residual tax burden. Following Mahler and Jesuit (2005), this study employs three different measures for progressivity: (a) tax

progressivity (i.e., the redistribution of income attributable to taxes), (b) transfer progressivity (i.e., the redistribution of income attributable to transfers), and (c) overall progressivity (i.e., tax progressivity and transfer progressivity combined). Tax burden is measured as total tax revenues in percent of GDP. Residual tax burden is the total tax burden net of income taxes in percent of GDP. Income tax reliance is the proportion of tax revenues from income taxes. Table 5.1 through 5.4 present the regression analysis with regard to hypotheses one and two. The results indicate a negative correlation between progressivity as well as overall tax burden and income inequality. Residual tax burden and income inequality also seem to be (weakly) negatively correlated while the results show no relationship between income tax reliance and income inequality.

H1a: Progressivity is negatively related to income inequality.

Table 5.1
Progressivity and income inequality

Part (a): Tax progressivity (TXPROGRESS) and income inequality.

Regression (1): $INEQ = \beta_0 + \beta_1 TXPROGRESS + \beta_2 GDPPCAP + \beta_3 ECOGROWTH + \beta_4 DEFICIT + \beta_5 GOVEX + \beta_6 LABOREFF + \beta_7 UNEMPL + \beta_8 INFLATION + \varepsilon$

Regression (2): $INEQ = \beta_0 + \beta_1 TXPROGRESS + \beta_2 TIME + \beta_3 GDPPCAP + \beta_4 ECOGROWTH + \beta_5 DEFICIT + \beta_6 GOVEX + \beta_7 UNEMPL + \beta_8 INFLATION + \varepsilon$

	Regression (1)		Regression (2)	
VARIABLE	**PARAMETER ESTIMATE**	**ROBUST P-VALUE**	**PARAMETER ESTIMATE**	**ROBUST P-VALUE**
TXPROGRESS	-0.7800	0.3351	**-1.3048**	0.0658
TIME			0.1187	0.1888
LOG GDPPCAP	**-0.2172**	0.0505	**-0.1931**	0.0860
ECOGROWTH	0.2508	0.4308	-0.1223	0.5494
DEFICIT	0.7488	0.2538	0.5546	0.3641
GOVEX	**-1.2839**	0.0075	**-1.9640**	0.0009
LOG LABOREFF	**0.9163**	<0.0001		
UNEMPL	-0.0126	0.1516	0.0044	0.5041
INFLATION	-0.8637	0.4867	0.3522	0.7048
Adjusted R-square	0.6055		0.3363	
F-statistic	7.52		3.91	
p-value	<.0001		0.0019	

Table 5.1 Continued

Part (b): Transfer progressivity (TRFPROGRESS) and income inequality.

Regression (1): $INEQ = \beta_0 + \beta_1 TRFPROGRESS + \beta_2 GDPPCAP + \beta_3 ECOGROWTH + \beta_4 DEFICIT + \beta_5 GOVEX + \beta_6 LABOREFF + \beta_7 UNEMPL + \beta_8 INFLATION + \varepsilon$

Regression (2): $INEQ = \beta_0 + \beta_1 TRFPROGRESS + \beta_2 TIME + \beta_3 GDPPCAP + \beta_4 ECOGROWTH + \beta_5 DEFICIT + \beta_6 GOVEX + \beta_7 UNEMPL + \beta_8 INFLATION + \varepsilon$

	Regression (1)		Regression (2)	
VARIABLE	**PARAMETER ESTIMATE**	**ROBUST P-VALUE**	**PARAMETER ESTIMATE**	**ROBUST P-VALUE**
TRFPROGRESS	**-0.9647**	0.0004	**-1.2357**	<.0001
TIME			0.0985	0.1392
LOG GDPPCAP	**-0.2261**	0.0127	**-0.1666**	0.0876
ECOGROWTH	0.1297	0.5679	-0.1181	0.5258
DEFICIT	0.0153	0.9728	0.2357	0.6200
GOVEX	**-0.6649**	0.0173	**-0.5259**	0.0548
LOG LABOREFF	**0.3966**	0.0592		
UNEMPL	**-0.0119**	0.0258	0.0019	0.7777
INFLATION	-1.5931	0.1873	-1.2064	0.1270
Adjusted R-square	0.7005		0.5895	
F-statistic	10.94		9.26	
p-value	<.0001		<.0001	

Table 5.1 Continued

Part (c): Overall progressivity (ALLPROGRESS) and income inequality.

Regression (1): $INEQ = \beta_0 + \beta_1 ALLPROGRESS + \beta_2 GDPPCAP + \beta_3 ECOGROWTH + \beta_4 DEFICIT + \beta_5 GOVEX + \beta_6 LABOREFF + \beta_7 UNEMPL + \beta_8 INFLATION + \varepsilon$

Regression (2): $INEQ = \beta_0 + \beta_1 ALLPROGRESS + \beta_2 TIME + \beta_3 GDPPCAP + \beta_4 ECOGROWTH + \beta_5 DEFICIT + \beta_6 GOVEX + \beta_7 UNEMPL + \beta_8 INFLATION + \varepsilon$

	Regression (1)		Regression (2)	
VARIABLE	**PARAMETER ESTIMATE**	**ROBUST P-VALUE**	**PARAMETER ESTIMATE**	**ROBUST P-VALUE**
ALLPROGRESS	**-1.4098**	<.0001	**-1.5869**	<.0001
TIME			**0.0896**	0.0654
LOG GDPPCAP	**-0.1861**	0.0130	**-0.1451**	0.0431
ECOGROWTH	0.1453	0.4567	-0.0242	0.8470
DEFICIT	0.0701	0.8364	0.1438	0.6506
GOVEX	-0.1252	0.7207	-0.0455	0.8640
LOG LABOREFF	0.1775	0.3679		
UNEMPL	-0.0042	0.4364	0.0043	0.3640
INFLATION	-1.2222	0.2125	**-1.2496**	0.0585
Adjusted R-square	0.7955		0.7695	
F-statistic	17.54		20.20	
p-value	<.0001		<.0001	

H1b: Tax burden (i.e., tax revenues in percent of GDP) is negatively related to income inequality.

Table 5.2
Overall tax burden and income inequality

Overall tax burden (BURDEN) and income inequality.

Regression (1): $INEQ = \beta_0 + \beta_1 BURDEN + \beta_2 GDPPCAP + \beta_3 ECOGROWTH + \beta_4 DEFICIT + \beta_5 GOVEX + \beta_6 LABOREFF + \beta_7 UNEMPL + \beta_8 INFLATION + \varepsilon$

Regression (2): $INEQ = \beta_0 + \beta_1 BURDEN + \beta_2 TIME + \beta_3 GDPPCAP + \beta_4 ECOGROWTH + \beta_5 DEFICIT + \beta_6 GOVEX + \beta_7 UNEMPL + \beta_8 INFLATION + \varepsilon$

	Regression (1)		Regression (2)	
VARIABLE	**PARAMETER ESTIMATE**	**ROBUST P-VALUE**	**PARAMETER ESTIMATE**	**ROBUST P-VALUE**
BURDEN	**-1.3175**	0.0003	**-1.7373**	<.0001
TIME			**0.1045**	0.0801
LOG GDPPCAP	**-0.2265**	0.0195	**-0.2061**	0.0123
ECOGROWTH	0.0408	0.8592	-0.0610	0.7369
DEFICIT	0.7987	0.1054	**1.3372**	0.0038
GOVEX	-0.1815	0.6691	0.2263	0.5728
LOG LABOREFF	**0.4417**	0.0325		
UNEMPL	-0.0079	0.1383	0.0030	0.5447
INFLATION	-1.7092	0.2089	**-1.4734**	0.0336
Adjusted R-square	0.7023		0.6335	
F-statistic	11.02		10.94	
p-value	<.0001		<.0001	

H2a: Income tax reliance (i.e., proportion of total tax revenues from income taxes) is negatively related to income inequality.

Table 5.3
Income tax reliance and income inequality

Income tax reliance (INCOME) and income inequality.

Regression (1): $$INEQ = \beta_0 + \beta_1 INCOME + \beta_2 GDPPCAP + \beta_3 ECOGROWTH + \beta_4 DEFICIT + \beta_5 GOVEX + \beta_6 LABOREFF + \beta_7 UNEMPL + \beta_8 INFLATION + \varepsilon$$

Regression (2): $$INEQ = \beta_0 + \beta_1 INCOME + \beta_2 TIME + \beta_3 GDPPCAP + \beta_4 ECOGROWTH + \beta_5 DEFICIT + \beta_6 GOVEX + \beta_7 UNEMPL + \beta_8 INFLATION + \varepsilon$$

	Regression (1)		Regression (2)	
VARIABLE	**PARAMETER ESTIMATE**	**ROBUST P-VALUE**	**PARAMETER ESTIMATE**	**ROBUST P-VALUE**
INCOME	-0.3313	0.3207	0.2664	0.1952
TIME			0.1230	0.1861
LOG GDPPCAP	**-0.1893**	0.0696	**-0.2258**	0.0523
ECOGROWTH	0.2573	0.4185	-0.2087	0.3755
DEFICIT	0.7995	0.2192	0.4324	0.5213
GOVEX	**-1.3688**	0.0027	**-1.9401**	0.0002
LOG LABOREFF	**1.1226**	0.0008		
UNEMPL	**-0.0158**	0.0439	0.0015	0.8578
INFLATION	-0.9824	0.4488	-0.2366	0.8002
Adjusted R-square	0.6117		0.2938	
F-statistic	7.70		3.39	
p-value	<.0001		0.0049	

H2b: Residual tax burden (i.e., total tax burden net of income taxes) is negatively related to income inequality.

Table 5.4
Residual tax burden and income inequality

Residual tax burden (RESBURDEN) and income inequality.

Regression (1): $INEQ = \beta_0 + \beta_1 RESBURDEN + \beta_2 GDPPCAP + \beta_3 ECOGROWTH + \beta_4 DEFICIT + \beta_5 GOVEX + \beta_6 LABOREFF + \beta_7 UNEMPL + \beta_8 INFLATION + \varepsilon$

Regression (2): $INEQ = \beta_0 + \beta_1 RESBURDEN + \beta_2 TIME + \beta_3 GDPPCAP + \beta_4 ECOGROWTH + \beta_5 DEFICIT + \beta_6 GOVEX + \beta_7 UNEMPL + \beta_8 INFLATION + \varepsilon$

	Regression (1)		Regression (2)	
VARIABLE	**PARAMETER ESTIMATE**	**ROBUST P-VALUE**	**PARAMETER ESTIMATE**	**ROBUST P-VALUE**
RESBURDEN	-0.2654	0.5705	**-1.0214**	0.0034
TIME			0.1155	0.1610
LOG GDPPCAP	**-0.2523**	0.0322	**-0.2397**	0.0260
ECOGROWTH	0.1885	0.5304	-0.1981	0.3947
DEFICIT	0.5323	0.3810	0.6028	0.2659
GOVEX	**-1.2685**	0.0075	**-1.1960**	0.0056
LOG LABOREFF	**0.7875**	0.0039		
UNEMPL	**-0.0150**	0.0229	0.0014	0.8426
INFLATION	-1.2875	0.3568	-0.8884	0.2859
Adjusted R-square	0.5884		0.4320	
F-statistic	7.07		5.37	
p-value	<.0001		0.0002	

Hypothesis 2c implies that the regression coefficient of the variable for income tax reliance (INCOME) is significantly more negative than parameter estimate for residual tax burden (RESBURDEN). The results pertaining to the TAX variables INCOME and RESBURDEN do not support this (Table 5.3 and 5.4). To test this hypothesis further, both tax variables of interest, INCOME and RESBURDEN, were included in the models:

$$INEQ = \beta_0 + \beta_1 INCOME + \beta_2 RESBURDEN + \beta_3 GDPPCAP + \beta_4 ECOGROWTH + \beta_5 DEFICIT + \beta_6 GOVEX + \beta_7 LABOREFF + \beta_8 UNEMPL + \beta_9 INFLATION + \varepsilon \quad (1a)$$

$$INEQ = \beta_0 + \beta_1 INCOME + \beta_2 RESBURDEN + \beta_3 TIME + \beta_4 GDPPCAP + \beta_5 ECOGROWTH + \beta_6 DEFICIT + \beta_7 GOVEX + \beta_8 UNEMPL + \beta_9 INFLATION + \varepsilon \quad (2a)$$

Table 5.5 presents the results of this analysis. Both coefficients are significant and negative. The coefficient of the residual tax burden variable (RESBURDEN) is greater than the coefficient of the income tax reliance variable (INCOME). F-test and Wald test suggest a significant difference between the two coefficients indicating that the impact of the residual tax burden on income inequality is stronger than the impact of income tax reliance. Thus, hypothesis 2c does not appear to be supported.

An interaction model including both regressions could provide further insight. In the current study, however, the small sample size prevents such an analysis.

H2c: The impact of income tax reliance on income inequality is greater than the impact of the residual tax burden.

Table 5.5
Income tax reliance and income inequality versus
residual tax burden and income inequality

Part (a):

Regression (1a): $$INEQ = \beta_0 + \beta_1 INCOME + \beta_2 RESBURDEN + \beta_3 GDPPCAP + \beta_4 ECOGROWTH + \beta_5 DEFICIT + \beta_6 GOVEX + \beta_7 LABOREFF + \beta_8 UNEMPL + \beta_9 INFLATION + \varepsilon$$

VARIABLE	PARAMETER ESTIMATE	ROBUST P-VALUE
INCOME	**-1.4647**	0.0005
RESBURDEN	**-2.5147**	0.0003
TIME		
LOG GDPPCAP	**-0.1756**	0.0650
ECOGROWTH	0.0950	0.6723
DEFICIT	**1.1571**	0.0239
GOVEX	-0.0687	0.8967
LOG LABOREFF	**0.7254**	0.0171
UNEMPL	-0.0077	0.2131
INFLATION	-1.3829	0.1720
Adjusted R-square	0.7518	
F-statistic	12.44	
p-value	<.0001	

F-TEST	p-value	**0.0141**
WALD TEST	p-value	**0.0083**

Table 5.5 Continued

Part (b):

Regression (2a): $INEQ = \beta_0 + \beta_1 INCOME + \beta_2 RESBURDEN + \beta_3 TIME + \beta_4 GDPPCAP + \beta_5 ECOGROWTH + \beta_6 DEFICIT + \beta_7 GOVEX + \beta_8 UNEMPL + \beta_9 INFLATION + \varepsilon$

VARIABLE	PARAMETER ESTIMATE	ROBUST P-VALUE
INCOME	**-1.6863**	<.0001
RESBURDEN	**-3.4713**	<.0001
TIME	**0.0894**	0.0666
LOG GDPPCAP	**-0.1816**	0.0194
ECOGROWTH	-0.0763	0.6199
DEFICIT	**1.4952**	0.0053
GOVEX	0.3071	0.5431
LOG LABOREFF		
UNEMPL	0.0046	0.3983
INFLATION	**-1.1846**	0.0632
Adjusted R-square	0.6381	
F-statistic	10.01	
p-value	<.0001	

F-TEST	P-VALUE	**<.0001**
WALD TEST	P-VALUE	**<.0001**

Tax System and Poverty

Hypotheses three and four focus on the relationship between taxes and poverty. Regression models (3) and (4) examine the data testing the correlation between progressivity, tax burden, and tax mix and poverty. Again, four aspects of a country's tax system (measured as progressivity, overall tax burden, income tax reliance, and residual tax burden) are examined. Tables 5.6 through 5.9 present the results of the regression analysis. In general, the findings suggest a negative relationship between progressivity as

well as overall and residual tax burden and poverty. Income tax reliance appears to be either positively (regression (4)) or not at all (regression (3)) related to poverty.

H3a: Progressivity is negatively related to poverty.

Table 5.6
Progressivity and poverty

Part (a): Tax progressivity (TXPROGRESS) and poverty.

Regression (3): $POV = \beta_0 + \beta_1 TXPROGRESS + \beta_2 GDPPCAP + \beta_3 ECOGROWTH + \beta_4 DEFICIT + \beta_5 GOVEX + \beta_6 LABOREFF + \beta_7 UNEMPL + \beta_8 INFLATION + \varepsilon$

Regression (4): $POV = \beta_0 + \beta_1 TXPROGRESS + \beta_2 TIME + \beta_3 GDPPCAP + \beta_4 ECOGROWTH + \beta_5 DEFICIT + \beta_6 GOVEX + \beta_7 UNEMPL + \beta_8 INFLATION + \varepsilon$

	Regression (3)		Regression (4)	
VARIABLE	**PARAMETER ESTIMATE**	**ROBUST P-VALUE**	**PARAMETER ESTIMATE**	**ROBUST P-VALUE**
TXPROGRESS	0.6711	0.8386	-1.9970	0.4763
TIME			0.2196	0.4296
LOG GDPPCAP	**-0.8195**	0.0881	-0.5338	0.1734
ECOGROWTH	0.8062	0.5211	-0.0165	0.9849
DEFICIT	-0.4740	0.8640	-0.0167	0.9949
GOVEX	-3.3094	0.1784	**-4.2729**	0.0271
LOG LABOREFF	1.3088	0.1777		
UNEMPL	**-0.0996**	0.0061	-0.0457	0.1197
INFLATION	-3.6935	0.4277	-1.1190	0.7459
Adjusted R-square	0.3090		0.1284	
F-statistic	2.90		1.85	
p-value	0.0188		0.0982	

Table 5.6 Continued

Part (b): Transfer progressivity (TRFPROGRESS) and poverty.

Regression (3): $POV = \beta_0 + \beta_1 TRFPROGRESS + \beta_2 GDPPCAP + \beta_3 ECOGROWTH + \beta_4 DEFICIT + \beta_5 GOVEX + \beta_6 LABOREFF + \beta_7 UNEMPL + \beta_8 INFLATION + \varepsilon$

Regression (4): $POV = \beta_0 + \beta_1 TRFPROGRESS + \beta_2 TIME + \beta_3 GDPPCAP + \beta_4 ECOGROWTH + \beta_5 DEFICIT + \beta_6 GOVEX + \beta_7 UNEMPL + \beta_8 INFLATION + \varepsilon$

	Regression (3)		Regression (4)	
VARIABLE	**PARAMETER ESTIMATE**	**ROBUST P-VALUE**	**PARAMETER ESTIMATE**	**ROBUST P-VALUE**
TRFPROGRESS	**-3.2183**	0.0467	**-3.1570**	0.0027
TIME			0.1659	0.4483
LOG GDPPCAP	**-0.7676**	0.0604	-0.4565	0.1882
ECOGROWTH	0.5343	0.6009	0.0575	0.9413
DEFICIT	-2.1936	0.3155	-0.8323	0.7261
GOVEX	-0.7745	0.7950	-0.5498	0.8228
LOG LABOREFF	-0.3866	0.7789		
UNEMPL	**-0.0836**	0.0039	**-0.0498**	0.0724
INFLATION	-4.8182	0.1482	**-4.8283**	0.0924
Adjusted R-square	0.4267		0.3204	
F-statistic	4.16		3.71	
p-value	0.0026		0.0027	

Table 5.6 Continued

Part (c): Overall progressivity (ALLPROGRESS) and poverty.

Regression (3): $POV = \beta_0 + \beta_1 ALLPROGRESS + \beta_2 GDPPCAP + \beta_3 ECOGROWTH + \beta_4 DEFICIT + \beta_5 GOVEX + \beta_6 LABOREFF + \beta_7 UNEMPL + \beta_8 INFLATION + \varepsilon$

Regression (4): $POV = \beta_0 + \beta_1 ALLPROGRESS + \beta_2 TIME + \beta_3 GDPPCAP + \beta_4 ECOGROWTH + \beta_5 DEFICIT + \beta_6 GOVEX + \beta_7 UNEMPL + \beta_8 INFLATION + \varepsilon$

	Regression (3)		Regression (4)	
VARIABLE	**PARAMETER ESTIMATE**	**ROBUST P-VALUE**	**PARAMETER ESTIMATE**	**ROBUST P-VALUE**
ALLPROGRESS	**-3.5681**	0.0416	**-3.7726**	0.0026
TIME			0.1486	0.4739
LOG GDPPCAP	-0.6748	0.1028	-0.4116	0.2023
ECOGROWTH	0.6460	0.5510	0.2691	0.7058
DEFICIT	-1.6039	0.4355	-0.9939	0.6411
GOVEX	0.0028	0.9993	0.3285	0.9060
LOG LABOREFF	-0.5300	0.6746		
UNEMPL	**-0.0672**	0.0272	**-0.0440**	0.0759
INFLATION	-3.5435	0.2739	**-4.7014**	0.0920
Adjusted R-square	0.4316		0.3924	
F-statistic	4.23		4.71	
p-value	0.0024		0.0005	

H3b: Tax burden (i.e., tax revenues in percent of GDP) is negatively related to poverty.

Table 5.7
Overall tax burden and poverty

Overall tax burden (BURDEN) and poverty.

Regression (3): $POV = \beta_0 + \beta_1 BURDEN + \beta_2 GDPPCAP + \beta_3 ECOGROWTH + \beta_4 DEFICIT + \beta_5 GOVEX + \beta_6 LABOREFF + \beta_7 UNEMPL + \beta_8 INFLATION + \varepsilon$

Regression (4): $POV = \beta_0 + \beta_1 BURDEN + \beta_2 TIME + \beta_3 GDPPCAP + \beta_4 ECOGROWTH + \beta_5 DEFICIT + \beta_6 GOVEX + \beta_7 UNEMPL + \beta_8 INFLATION + \varepsilon$

	Regression (3)		Regression (4)	
VARIABLE	**PARAMETER ESTIMATE**	**ROBUST P-VALUE**	**PARAMETER ESTIMATE**	**ROBUST P-VALUE**
BURDEN	**-3.9872**	0.0240	**-4.3826**	0.0017
TIME			0.1816	0.3943
LOG GDPPCAP	**-0.7720**	0.0620	**-0.5573**	0.0684
ECOGROWTH	0.2930	0.7929	0.1995	0.7952
DEFICIT	0.3507	0.8826	1.9569	0.3811
GOVEX	0.4618	0.8913	1.2998	0.6506
LOG LABOREFF	-0.0919	0.9335		
UNEMPL	**-0.0727**	0.0096	**-0.0472**	0.0479
INFLATION	-5.0401	0.2040	**-5.4600**	0.0401
Adjusted R-square	0.4071		0.3427	
F-statistic	3.92		4.00	
p-value	0.0038		0.0016	

H4a: Income tax reliance (i.e., proportion of total tax revenues from income taxes) is negatively related to poverty.

Table 5.8
Income tax reliance and poverty

Income tax reliance (INCOME) and poverty.

Regression (3): $POV = \beta_0 + \beta_1 INCOME + \beta_2 GDPPCAP + \beta_3 ECOGROWTH + \beta_4 DEFICIT + \beta_5 GOVEX + \beta_6 LABOREFF + \beta_7 UNEMPL + \beta_8 INFLATION + \varepsilon$

Regression (4): $POV = \beta_0 + \beta_1 INCOME + \beta_2 TIME + \beta_3 GDPPCAP + \beta_4 ECOGROWTH + \beta_5 DEFICIT + \beta_6 GOVEX + \beta_7 UNEMPL + \beta_8 INFLATION + \varepsilon$

	Regression (3)		Regression (4)	
VARIABLE	**PARAMETER ESTIMATE**	**ROBUST P-VALUE**	**PARAMETER ESTIMATE**	**ROBUST P-VALUE**
INCOME	0.8747	0.3996	**1.4057**	0.0321
TIME			0.2341	0.4132
LOG GDPPCAP	**-0.9278**	0.0466	**-0.6710**	0.0858
ECOGROWTH	0.7330	0.5604	-0.2407	0.8000
DEFICIT	-0.9164	0.7307	-0.6645	0.7999
GOVEX	-3.2847	0.1974	**-3.9680**	0.0320
LOG LABOREFF	0.7478	0.5625		
UNEMPL	**-0.0970**	0.0033	**-0.0533**	0.0843
INFLATION	-3.9351	0.4055	-3.2278	0.3015
Adjusted R-square	0.3258		0.1924	
F-statistic	3.05		2.37	
p-value	0.0146		0.0354	

H4b: Residual tax burden (i.e., total tax burden net of income taxes) is negatively related to poverty.

Table 5.9
Residual tax burden and poverty

Residual tax burden (RESBURDEN) and poverty.

Regression (3): $POV = \beta_0 + \beta_1 RESBURDEN + \beta_2 GDPPCAP + \beta_3 ECOGROWTH + \beta_4 DEFICIT + \beta_5 GOVEX + \beta_6 LABOREFF + \beta_7 UNEMPL + \beta_8 INFLATION + \varepsilon$

Regression (4): $POV = \beta_0 + \beta_1 RESBURDEN + \beta_2 TIME + \beta_3 GDPPCAP + \beta_4 ECOGROWTH + \beta_5 DEFICIT + \beta_6 GOVEX + \beta_7 UNEMPL + \beta_8 INFLATION + \varepsilon$

	Regression (3)		Regression (4)	
VARIABLE	**PARAMETER ESTIMATE**	**ROBUST P-VALUE**	**PARAMETER ESTIMATE**	**ROBUST P-VALUE**
RESBURDEN	**-3.2171**	0.0614	**-3.3373**	0.0049
TIME			0.2056	0.4288
LOG GDPPCAP	**-0.9925**	0.0254	**-0.6698**	0.0562
ECOGROWTH	0.4593	0.6947	-0.1570	0.8627
DEFICIT	-0.8478	0.7208	0.1395	0.9519
GOVEX	-1.6686	0.5471	-1.6807	0.4308
LOG LABOREFF	-0.1344	0.9089		
UNEMPL	**-0.0868**	0.0022	**-0.0518**	0.0603
INFLATION	-4.7827	0.2757	**-4.7098**	0.0972
Adjusted R-square	0.3800		0.2877	
F-statistic	3.60		3.32	
p-value	0.0061		0.0056	

Hypothesis 4c suggests a more negative relationship between income taxes and poverty than between residual tax burden and poverty, which is not supported by the results introduced by Tables 5.8 and 5.9.

Table 5.10 presents the results when both tax variables, INCOME and RESBURDEN, are included in the same regression models (regression models (3a) and (4a)):

$$POV = \beta_0 + \beta_1 INCOME + \beta_2 RESBURDEN + \beta_3 GDPPCAP + \beta_4 ECOGROWTH + \beta_5 DEFICIT + \beta_6 GOVEX + \beta_7 LABOREFF + \beta_8 UNEMPL + \beta_9 INFLATION + \varepsilon \quad (3a)$$

$$POV = \beta_0 + \beta_1 INCOME + \beta_2 RESBURDEN + \beta_3 TIME + \beta_4 GDPPCAP + \beta_5 ECOGROWTH + \beta_6 DEFICIT + \beta_7 GOVEX + \beta_8 UNEMPL + \beta_9 INFLATION + \varepsilon \quad (4a)$$

In one case, income tax reliance and residual tax burden are both significant and negative (regression (4a)). The parameter estimate for residual tax burden is higher than the parameter estimate for income tax reliance. F-test and Wald test imply that the effect of the residual tax burden on poverty is stronger than the effect of income tax reliance. In the case of regression model (3a), only the coefficient for RESBURDEN is significant. Thus, hypothesis 4c does not appear to be supported.

An interaction model including both regressions could provide further insight. In the current study, however, the small sample size prevents such an analysis.

H4c: The impact of income tax reliance on poverty is greater than the impact of the residual tax burden.

Table 5.10
Income tax reliance and poverty versus
residual tax burden and poverty

Part (a):

Regression (3a): $$POV = \beta_0 + \beta_1 INCOME + \beta_2 RESBURDEN + \beta_3 GDPPCAP + \beta_4 ECOGROWTH + \beta_5 DEFICIT + \beta_6 GOVEX + \beta_7 LABOREFF + \beta_8 UNEMPL + \beta_9 INFLATION + \varepsilon$$

VARIABLE	**PARAMETER ESTIMATE**	**ROBUST P-VALUE**
INCOME	-1.8684	0.2120
RESBURDEN	**-6.0864**	0.0481
TIME		
LOG GDPPCAP	**-0.8946**	0.0370
ECOGROWTH	0.3401	0.7682
DEFICIT	-0.0509	0.9840
GOVEX	-0.1381	0.9674
LOG LABOREFF	-0.2135	0.8674
UNEMPL	**-0.0774**	0.0046
INFLATION	-4.9044	0.2327
Adjusted R-square	0.3819	
F-statistic	3.33	
p-value	0.0083	

F-TEST	p-value	**0.0533**
WALD TEST	p-value	**0.0425**

Table 5.10 Continued

Part (b):

Regression (4a): $POV = \beta_0 + \beta_1 INCOME + \beta_2 RESBURDEN + \beta_3 TIME + \beta_4 GDPPCAP + \beta_5 ECOGROWTH + \beta_6 DEFICIT + \beta_7 GOVEX + \beta_8 UNEMPL + \beta_9 INFLATION + \varepsilon$

VARIABLE	PARAMETER ESTIMATE	ROBUST P-VALUE
INCOME	**-2.5809**	0.0701
RESBURDEN	**-7.0869**	0.0073
TIME	0.1656	0.4729
LOG GDPPCAP	**-0.5808**	0.0735
ECOGROWTH	0.0295	0.9707
DEFICIT	1.5052	0.5342
GOVEX	0.6198	0.8243
LOG LABOREFF		
UNEMPL	**-0.0470**	0.0594
INFLATION	**-5.1632**	0.0555
Adjusted R-square	0.3195	
F-statistic	3.40	
p-value	0.0039	

F-TEST	p-value	**0.0011**
WALD TEST	p-value	**0.0004**

Tax System and Collective Happiness

The potential impact of taxes on collective happiness is addressed by hypotheses five and six. Regression models (5) and (6) test the data. In particular, the relationships between progressivity, tax burden, and tax mix and collective happiness are examined. As with income inequality and poverty, the focus of this study is on four different aspects of a country's tax and transfer system: progressivity, overall and residual tax burden, and income tax reliance. Tables 5.11 through 5.14 present the main results of the regression analysis. The findings suggest, to some extent, a positive association between

progressivity as well as overall tax burden and collective happiness. Specifically, the results show a significant and positive relationship between overall progressivity and collective happiness as well as between overall tax burden and collective happiness for regression model (6), but not for regression model (5). Note that, in the case of regression model (5), the inclusion of the labor effort control variable reduces the already small sample even further. Thus, the lack of significance may be attributable to the small sample size. Income tax reliance and collective happiness also appear to be positively correlated. On the other hand, the relationship between residual tax burden and collective happiness seems not to be significant.

H5a: Progressivity is positively related to collective happiness.

Table 5.11
Progressivity and collective happiness

Part (a): Tax progressivity (TXPROGRESS) and collective happiness.

Regression (5): $HAPPY = \beta_0 + \beta_1 TXPROGRESS + \beta_2 GDPPCAP + \beta_3 ECOGROWTH + \beta_4 DEFICIT + \beta_5 GOVEX + \beta_6 LABOREFF + \beta_7 UNEMPL + \beta_8 INFLATION + \varepsilon$

Regression (6): $HAPPY = \beta_0 + \beta_1 TXPROGRESS + \beta_2 TIME + \beta_3 GDPPCAP + \beta_4 ECOGROWTH + \beta_5 DEFICIT + \beta_6 GOVEX + \beta_7 UNEMPL + \beta_8 INFLATION + \varepsilon$

	Regression (5)		Regression (6)	
VARIABLE	**PARAMETER ESTIMATE**	**ROBUST P-VALUE**	**PARAMETER ESTIMATE**	**ROBUST P-VALUE**
TXPROGRESS	0.4336	0.6307	0.6130	0.2338
TIME			0.0324	0.3175
LOG GDPPCAP	0.0488	0.7689	-0.0096	0.8850
ECOGROWTH	**0.5189**	0.0241	**0.5334**	<.0001
DEFICIT	0.3507	0.5162	0.4525	0.1070
GOVEX	0.2700	0.4945	0.3259	0.3943
LOG LABOREFF	-0.3316	0.1355		
UNEMPL	-0.0098	0.1317	**-0.0125**	0.0020
INFLATION	1.2299	0.4018	-0.5344	0.2449
Adjusted R-square	0.1934		0.3333	
F-statistic	1.60		2.62	
p-value	0.2233		0.0424	

Table 5.11 Continued

Part (b): Transfer progressivity (TRFPROGRESS) and collective happiness.

Regression (5): $HAPPY = \beta_0 + \beta_1 TRFPROGRESS + \beta_2 GDPPCAP + \beta_3 ECOGROWTH + \beta_4 DEFICIT + \beta_5 GOVEX + \beta_6 LABOREFF + \beta_7 UNEMPL + \beta_8 INFLATION + \varepsilon$

Regression (6): $HAPPY = \beta_0 + \beta_1 TRFPROGRESS + \beta_2 TIME + \beta_3 GDPPCAP + \beta_4 ECOGROWTH + \beta_5 DEFICIT + \beta_6 GOVEX + \beta_7 UNEMPL + \beta_8 INFLATION + \varepsilon$

	Regression (5)		Regression (6)	
VARIABLE	**PARAMETER ESTIMATE**	**ROBUST P-VALUE**	**PARAMETER ESTIMATE**	**ROBUST P-VALUE**
TRFPROGRESS	0.1413	0.7522	0.2773	0.1115
TIME			0.0042	0.9297
LOG GDPPCAP	0.1286	0.2440	0.0718	0.2738
ECOGROWTH	**0.4593**	0.0504	**0.5474**	0.0002
DEFICIT	0.2971	0.5682	0.4655	0.1457
GOVEX	0.0992	0.8816	-0.1382	0.7091
LOG LABOREFF	-0.2896	0.4239		
UNEMPL	-0.0089	0.1647	**-0.0118**	0.0080
INFLATION	1.7695	0.2021	0.1897	0.7278
Adjusted R-square	0.1770		0.3474	
F-statistic	1.54		2.73	
p-value	0.2419		0.0366	

Table 5.11 Continued

Part (c): Overall progressivity (ALLPROGRESS) and collective happiness.

Regression (5): $HAPPY = \beta_0 + \beta_1 ALLPROGRESS + \beta_2 GDPPCAP + \beta_3 ECOGROWTH + \beta_4 DEFICIT + \beta_5 GOVEX + \beta_6 LABOREFF + \beta_7 UNEMPL + \beta_8 INFLATION + \varepsilon$

Regression (6): $HAPPY = \beta_0 + \beta_1 ALLPROGRESS + \beta_2 TIME + \beta_3 GDPPCAP + \beta_4 ECOGROWTH + \beta_5 DEFICIT + \beta_6 GOVEX + \beta_7 UNEMPL + \beta_8 INFLATION + \varepsilon$

	Regression (5)		Regression (6)	
VARIABLE	**PARAMETER ESTIMATE**	**ROBUST P-VALUE**	**PARAMETER ESTIMATE**	**ROBUST P-VALUE**
ALLPROGRESS	0.2434	0.6247	**0.3510**	0.0215
TIME			0.0026	0.9552
LOG GDPPCAP	0.1102	0.3823	0.0607	0.3590
ECOGROWTH	**0.4659**	0.0214	**0.5339**	0.0001
DEFICIT	0.3165	0.5192	0.4332	0.1666
GOVEX	0.0365	0.9568	-0.1431	0.6604
LOG LABOREFF	-0.2219	0.6012		
UNEMPL	-0.0104	0.2164	**-0.0134**	0.0025
INFLATION	1.7947	0.2196	0.2099	0.6812
Adjusted R-square	0.1980		0.3966	
F-statistic	1.62		3.14	
p-value	0.2183		0.0209	

H5b: Tax burden (i.e., tax revenues in percent of GDP) is positively related to collective happiness.

Table 5.12
Overall tax burden and collective happiness

Overall tax burden (BURDEN) and collective happiness.

Regression (5): $HAPPY = \beta_0 + \beta_1 BURDEN + \beta_2 GDPPCAP + \beta_3 ECOGROWTH + \beta_4 DEFICIT + \beta_5 GOVEX + \beta_6 LABOREFF + \beta_7 UNEMPL + \beta_8 INFLATION + \varepsilon$

Regression (6): $HAPPY = \beta_0 + \beta_1 BURDEN + \beta_2 TIME + \beta_3 GDPPCAP + \beta_4 ECOGROWTH + \beta_5 DEFICIT + \beta_6 GOVEX + \beta_7 UNEMPL + \beta_8 INFLATION + \varepsilon$

	Regression (5)		Regression (6)	
VARIABLE	**PARAMETER ESTIMATE**	**ROBUST P-VALUE**	**PARAMETER ESTIMATE**	**ROBUST P-VALUE**
BURDEN	0.4889	0.2187	**0.4808**	0.0086
TIME			0.0046	0.9219
LOG GDPPCAP	0.1376	0.2931	0.0694	0.2849
ECOGROWTH	**0.4422**	0.0305	**0.5256**	0.0002
DEFICIT	-0.0325	0.9561	0.0689	0.8186
GOVEX	-0.1949	0.7217	-0.3388	0.3026
LOG LABOREFF	-0.1874	0.4871		
UNEMPL	**-0.0110**	0.0622	**-0.0131**	0.0015
INFLATION	2.1817	0.1646	0.3468	0.5217
Adjuster R-square	0.2675		0.4128	
F-statistic	1.91		3.29	
p-value	0.1500		0.0172	

H6a: Income tax reliance (i.e., proportion of total tax revenues from income taxes) is positively related to collective happiness.

Table 5.13
Income tax reliance and collective happiness

Income tax reliance (INCOME) and collective happiness.

Regression (5): $HAPPY = \beta_0 + \beta_1 INCOME + \beta_2 GDPPCAP + \beta_3 ECOGROWTH + \beta_4 DEFICIT + \beta_5 GOVEX + \beta_6 LABOREFF + \beta_7 UNEMPL + \beta_8 INFLATION + \varepsilon$

Regression (6): $HAPPY = \beta_0 + \beta_1 INCOME + \beta_2 TIME + \beta_3 GDPPCAP + \beta_4 ECOGROWTH + \beta_5 DEFICIT + \beta_6 GOVEX + \beta_7 UNEMPL + \beta_8 INFLATION + \varepsilon$

	Regression (5)		Regression (6)	
VARIABLE	**PARAMETER ESTIMATE**	**ROBUST P-VALUE**	**PARAMETER ESTIMATE**	**ROBUST P-VALUE**
INCOME	**0.6847**	<.0001	**0.3258**	0.0805
TIME			0.0340	0.3115
LOG GDPPCAP	**-0.1333**	0.0213	-0.0488	0.5052
ECOGROWTH	**0.3838**	0.0011	**0.3719**	0.0085
DEFICIT	0.0348	0.9010	0.1917	0.5971
GOVEX	0.1647	0.3267	0.2276	0.5221
LOG LABOREFF	**-0.5913**	<.0001		
UNEMPL	**-0.0090**	0.0018	**-0.0105**	0.0130
INFLATION	-0.0462	0.9583	**-1.0707**	0.0964
Adjusted R-square	0.8739		0.4403	
F-statistic	18.32		3.56	
p-value	<.0001		0.0121	

H6b: Residual tax burden (i.e., total tax burden net of income taxes) is positively related to collective happiness.

Table 5.14
Residual tax burden and collective happiness

Residual tax burden (RESBURDEN) and collective happiness.

Regression (5): $HAPPY = \beta_0 + \beta_1 RESBURDEN + \beta_2 GDPPCAP + \beta_3 ECOGROWTH + \beta_4 DEFICIT + \beta_5 GOVEX + \beta_6 LABOREFF + \beta_7 UNEMPL + \beta_8 INFLATION + \varepsilon$

Regression (6): $HAPPY = \beta_0 + \beta_1 RESBURDEN + \beta_2 TIME + \beta_3 GDPPCAP + \beta_4 ECOGROWTH + \beta_5 DEFICIT + \beta_6 GOVEX + \beta_7 UNEMPL + \beta_8 INFLATION + \varepsilon$

	Regression (5)		Regression (6)	
VARIABLE	**PARAMETER ESTIMATE**	**ROBUST P-VALUE**	**PARAMETER ESTIMATE**	**ROBUST P-VALUE**
RESBURDEN	**-0.8245**	0.0064	-0.1012	0.7476
TIME			0.0284	0.4096
LOG GDPPCAP	-0.0370	0.6898	0.0150	0.8182
ECOGROWTH	**0.4595**	0.0021	**0.5315**	<.0001
DEFICIT	0.4825	0.3884	0.5023	0.1081
GOVEX	0.5723	0.1510	0.2473	0.6124
LOG LABOREFF	**-0.6365**	0.0010		
UNEMPL	-0.0058	0.2366	**-0.0101**	0.0402
INFLATION	0.1092	0.9338	-0.5006	0.4232
Adjusted R-square	0.4486		0.2857	
F-statistic	3.03		2.30	
p-value	0.0409		0.0678	

Hypothesis 6c posits that the relationship between income tax reliance and collective happiness is stronger (more positive) than the relationship between residual tax burden and collective happiness. The results introduced by Table 5.13 and 5.14 indicate support for this hypothesis. Table 5.15 presents the regression results when both tax variables, INCOME and RESBURDEN, are included in the same model (regression models (5a) and (6a)).

$$HAPPY = \beta_0 + \beta_1 INCOME + \beta_2 RESBURDEN + \beta_3 GDPPCAP + \beta_4 ECOGROWTH + \beta_5 DEFICIT + \beta_6 GOVEX + \beta_7 LABOREFF + \beta_8 UNEMPL + \beta_9 INFLATION + \varepsilon \quad (5a)$$

$$HAPPY = \beta_0 + \beta_1 INCOME + \beta_2 RESBURDEN + \beta_3 TIME + \beta_4 GDPPCAP + \beta_5 ECOGROWTH + \beta_6 DEFICIT + \beta_7 GOVEX + \beta_8 UNEMPL + \beta_9 INFLATION + \varepsilon \quad (6a)$$

The results indicate that the coefficient of INCOME is greater than the coefficient of RESBURDEN – suggesting a stronger relationship between income tax reliance and collective happiness than between residual tax burden and collective happiness – if the control variable labor effort is included (regression (5a)) and smaller otherwise (regression (6a)). In the first case (regression (5a)), F-test and Wald test imply a significant difference between the two coefficients lending support to the hypothesis that income taxes affect collective happiness more than all other taxes. In the second case (regression (6a)), the difference between the two coefficients is not significant suggesting that the impact of income tax reliance on collective happiness does not differ significantly from the effect of all other taxes.

An interaction model including both regressions could provide further insight. In the current study, however, the small sample size prevents such an analysis.

H6c: The impact of income tax reliance on collective happiness is greater than the impact of the residual tax burden.

Table 5.15
Income tax reliance and collective happiness versus
residual tax burden and collective happiness

Part (a):

Regression (5a): $$HAPPY = \beta_0 + \beta_1 INCOME + \beta_2 RESBURDEN + \beta_3 GDPPCAP + \beta_4 ECOGROWTH + \beta_5 DEFICIT + \beta_6 GOVEX + \beta_7 LABOREFF + \beta_8 UNEMPL + \beta_9 INFLATION + \varepsilon$$

VARIABLE	**PARAMETER ESTIMATE**	**ROBUST P-VALUE**
INCOME	**0.8902**	<.0001
RESBURDEN	**0.5028**	0.0173
TIME		
LOG GDPPCAP	**-0.1173**	0.0295
ECOGROWTH	**0.3675**	0.0022
DEFICIT	-0.1544	0.5005
GOVEX	-0.0659	0.6380
LOG LABOREFF	**-0.4924**	<.0001
UNEMPL	**-0.0107**	<.0001
INFLATION	0.3420	0.6850
Adjusted R-square	0.9069	
F-statistic	22.64	
p-value	<.0001	

F-TEST	p-value	**0.0241**
WALD TEST	p-value	**0.0089**

Table 5.15 Continued

Part (b):

Regression (6a): $HAPPY = \beta_0 + \beta_1 INCOME + \beta_2 RESBURDEN + \beta_3 TIME + \beta_4 GDPPCAP + \beta_5 ECOGROWTH + \beta_6 DEFICIT + \beta_7 GOVEX + \beta_8 UNEMPL + \beta_9 INFLATION + \varepsilon$

VARIABLE	PARAMETER ESTIMATE	ROBUST P-VALUE
INCOME	**1.0122**	<.0001
RESBURDEN	**1.2224**	<.0001
TIME	0.0151	0.5656
LOG GDPPCAP	-0.0393	0.4008
ECOGROWTH	**0.2596**	0.0321
DEFICIT	**-0.5339**	0.0718
GOVEX	-0.4387	0.1637
LOG LABOREFF		
UNEMPL	**-0.0145**	0.0002
INFLATION	-0.5626	0.2383
Adjusted R-square	0.6817	
F-statistic	7.19	
p-value	0.0003	

F-TEST	p-value	0.2506
WALD TEST	p-value	0.2342

Differences between Tax Systems in the United States and in Europe

Hypothesis 7 addresses the differences between the United States tax and transfer system and European tax and transfer systems. Particularly, the differences in impact of the various tax system variables, i.e. progressivity, tax burden, and tax mix on income inequality, poverty, and collective happiness are tested. To investigate these differences, in a first step, each variable of the regression model is examined using t-tests. Table 5.16 illustrates how the average European tax and transfer system differs significantly from

the United States tax and transfer system. While tax progressivity appears to be higher in the United States than in European countries, United States transfer and overall progressivity is significantly lower than the European average. Similarly, on average, overall and residual tax burden are significantly higher in European countries than in the United States. Income tax reliance (i.e., the proportion of tax revenues from income taxes) is higher in the United States. For many control variables, the t-tests do not imply significant differences between the United States and Europe. However, overall government expenditures and unemployment rates are significantly higher in Europe than in the United States. Average labor effort (i.e., the average number of hours worked per worker in the workforce per year), on the other hand, is significantly lower in Europe than in the United States.

Table 5.16
Comparison of United States and Europe (t-tests)

	Europe	USA	p-value (equal variances)	p-value (unequal variances)
Dependent Variables				
INEQUALITY	0.261	0.345	**<.0001**	**<.0001**
LOG INEQUALITY	-1.353	-1.067	**<.0001**	**<.0001**
POVERTY	0.027	0.060	**<.0001**	**<.0001**
LOG POVERTY	-3.715	-2.816	**<.0001**	**<.0001**
HAPPINESS	2.149	2.198	0.5675	0.2158
LOG HAPPINESS	0.761	0.788	0.4991	0.1448
Independent Variables: TAX (variables of interest)				
TXPROGRESS	0.0869	0.1025	0.2788	**0.0248**
TRFPROGRESS	0.3114	0.1262	**<.0001**	**<.0001**
ALLPROGRESS	0.3983	0.2287	**<.0001**	**<.0001**
BURDEN	0.4095	0.2744	**<.0001**	**<.0001**
INCOME	0.3611	0.4725	**0.0053**	**<.0001**
RESBURDEN	0.2617	0.1445	**<.0001**	**<.0001**
Independent Variables: NONTAX (control variables)				
GDPPCAP	$20,608	$23,756	0.3650	0.4144
LOG GDPPCAP	9.852	10.013	0.3895	0.3998
ECOGROWTH	0.059	0.057	0.9604	0.9140
DEFICIT	-0.022	-0.017	0.7662	0.7175
GOVEX	0.207	0.159	**0.0118**	**<.0001**
LABOREFFORT	1,583	1,829	**0.0017**	**<.0001**
LOG LABOREFFORT	7.363	7.511	**0.0029**	**<.0001**
UNEMPLOYMENT	7.518	5.778	0.2976	**0.0456**
INFLATION	0.038	0.043	0.7143	0.7642

The Chow test is used to test for differences in effects for each regression model (regressions (1) through (6)). The differences are tested further performing regression analyses where a dummy variable ("USA") equaling one for data from the United States and zero otherwise and the interaction term between the USA dummy and the TAX variable are included in the models (regression models (7) through (12)). For each

regression analysis, joint tests (F-tests) are executed to assess the joint significance of the USA dummy and the interaction variable. Each regression model (models (1) through (12)) is examined separately for each of the six TAX variables. Table 5.17 and 5.18 present the results with regard to the impact of tax system variables (TAX variables) on income inequality in Europe and in the United States (hypothesis 7a). Table 5.17 lists the p-values of the predictive Chow test for each regression analysis (regressions (1) and (2)). Table 5.18 provides information with regard to the coefficients and p-values of the USA dummy and the interaction variable for each regression analysis. It further presents the p-value of the F-test testing for the joint significance of the USA dummy variable and the interaction variable for each regression model (regressions (7) and (8)). The predictive Chow tests and the F-tests suggest structural differences between the United States and the European countries in the case of tax progressivity, overall and residual tax burden, and income tax reliance (regression (8)). Stated differently, it appears that tax progressivity, overall and residual tax burden, and income tax reliance affect income inequality differently in the United States than in Europe.

H7a: The United States tax and transfer system redistributes less income than European tax and transfer systems.

Table 5.17
Differences in effects: United States versus Europe: Chow test
(dependent variable: income inequality)

Regression (1): $INEQ = \beta_0 + \beta_1 TAX + \beta_2 GDPPCAP + \beta_3 ECOGROWTH + \beta_4 DEFICIT + \beta_5 GOVEX + \beta_6 LABOREFF + \beta_7 UNEMPL + \beta_8 INFLATION + \varepsilon$

Regression (2): $INEQ = \beta_0 + \beta_1 TAX + \beta_2 TIME + \beta_3 GDPPCAP + \beta_4 ECOGROWTH + \beta_5 DEFICIT + \beta_6 GOVEX + \beta_7 UNEMPL + \beta_8 INFLATION + \varepsilon$

Variable of interest (TAX)	Regression (1) PCHOW p-value	Regression (2) PCHOW p-value
TXPROGRESS	0.2951	**0.0001**
TRFPROGRESS	0.9444	0.8398
ALLPROGRESS	0.5197	0.4907
BURDEN	0.5637	0.2871
INCOME	0.7871	**0.0343**
RESBURDEN	0.8293	0.2251

Table 5.18
Differences in effects: United States versus Europe:
Regressions with dummy and interaction variables
(dependent variable: income inequality)

Part (a):

Regression (7): $INEQ = \beta_0 + \beta_1 USA + \beta_2 USA*TAX + \beta_3 TAX + \beta_4 GDPPCAP + \beta_5 ECOGROWTH + \beta_6 DEFICIT + \beta_7 GOVEX + \beta_8 LABOREFF + \beta_9 UNEMPL + \beta_{10} INFLATION + \varepsilon$

Variable of interest (TAX)		USA Dummy (1 = USA, 0 = EUROPE)	Interaction (TAX * USA Dummy)	Test for joint significance (F-test)
TXPROGRESS	Parameter estimate	-0.0549	2.5775	
	p-value	0.9526	0.7836	**0.0824**
TRFPROGRESS	Parameter estimate	0.4176	-3.5730	
	p-value	0.4266	0.3852	0.6181
ALLPROGRESS	Parameter estimate	1.0224	-4.3934	
	p-value	0.2081	0.2205	0.3821
BURDEN	Parameter estimate	**-1.6487**	**6.1110**	
	p-value	0.0915	0.0813	0.1315
INCOME	Parameter estimate	-0.2219	0.7567	
	p-value	0.8218	0.7202	0.2583
RESBURDEN	Parameter estimate	2.4078	-15.5167	
	p-value	0.5253	0.5439	0.3115

Table 5.18 Continued

Part (b):

Regression (8): $INEQ = \beta_0 + \beta_1 USA + \beta_2 USA*TAX + \beta_3 TAX + \beta_4 TIME + \beta_5 GDPPCAP + \beta_6 ECOGROWTH + \beta_7 DEFICIT + \beta_8 GOVEX + \beta_9 UNEMPL + \beta_{10} INFLATION + \varepsilon$

Variable of interest (TAX)		USA Dummy (1 = USA, 0 = EUROPE)	Interaction (TAX * USA Dummy)	Test for joint significance (F-test)
TXPROGRESS	Parameter estimate	0.6769	-3.3616	
	p-value	0.2148	0.5280	**<.0001**
TRFPROGRESS	Parameter estimate	0.5597	-4.0644	
	p-value	0.3966	0.4300	0.6446
ALLPROGRESS	Parameter estimate	0.5805	-2.3708	
	p-value	0.3855	0.4142	0.5216
BURDEN	Parameter estimate	**-1.7213**	**6.5740**	
	p-value	0.0711	0.0568	**0.0513**
INCOME	Parameter estimate	0.2884	-0.0190	
	p-value	0.7768	0.9930	**0.0027**
RESBURDEN	Parameter estimate	-1.3373	10.5076	
	p-value	0.3682	0.3033	**0.0365**

Tables 5.19 and 5.20 present the results with regard to the relationship between tax and transfer system and poverty. Table 5.19 reports the p-values of the predictive Chow test for each regression analysis (regressions (3) and (4)). Table 5.20 lists the coefficients and p-values of the USA dummy variables and the interaction variables as well as the p-value of the F-test testing for the joint significance of the USA dummy and the interaction variable for each regression analysis (regressions (9) and (10)). The predictive Chow tests do not suggest major structural differences between the United States and the European countries. The F-tests indicate that cross-continental differences

in the impact of tax system variables on poverty may exist in the case of tax progressivity and income tax reliance (regression (10)).

> **H7b:** The United States tax and transfer system reduces poverty less than European tax and transfer systems.

Table 5.19
Differences in effects: United States versus Europe: Chow test
(dependent variable: poverty)

Regression (3): $POV = \beta_0 + \beta_1 TAX + \beta_2 GDPPCAP + \beta_3 ECOGROWTH + \beta_4 DEFICIT + \beta_5 GOVEX + \beta_6 LABOREFF + \beta_7 UNEMPL + \beta_8 INFLATION + \varepsilon$

Regression (4): $POV = \beta_0 + \beta_1 TAX + \beta_2 TIME + \beta_3 GDPPCAP + \beta_4 ECOGROWTH + \beta_5 DEFICIT + \beta_6 GOVEX + \beta_7 UNEMPL + \beta_8 INFLATION + \varepsilon$

Variable of interest (TAX)	Regression (3) PCHOW p-value	Regression (4) PCHOW p-value
TXPROGRESS	0.4161	0.1256
TRFPROGRESS	0.8807	0.9394
ALLPROGRESS	0.7904	0.9588
BURDEN	0.7693	0.9232
INCOME	0.6367	0.4879
RESBURDEN	0.7130	0.8260

Table 5.20
Differences in effects: United States versus Europe:
Regressions with dummy and interaction variables
(dependent variable: poverty)

Part (a):

Regression (9): $POV = \beta_0 + \beta_1 USA + \beta_2 USA * TAX + \beta_3 TAX + \beta_4 GDPPCAP + \beta_5 ECOGROWTH + \beta_6 DEFICIT + \beta_7 GOVEX + \beta_8 LABOREFF + \beta_9 UNEMPL + \beta_{10} INFLATION + \varepsilon$

Variable of interest (TAX)		USA Dummy (1 = USA, 0 = EUROPE)	Interaction (TAX * USA Dummy)	Test for joint significance (F-test)
TXPROGRESS	Parameter estimate	0.7095	1.8428	
	p-value	0.8706	0.9667	0.1030
TRFPROGRESS	Parameter estimate	0.3240	2.0638	
	p-value	0.9147	0.9304	0.4443
ALLPROGRESS	Parameter estimate	0.3143	1.1211	
	p-value	0.9593	0.9672	0.3211
BURDEN	Parameter estimate	0.0234	2.0769	
	p-value	0.9971	0.9275	0.2719
INCOME	Parameter estimate	1.1658	-1.0162	
	p-value	0.7921	0.9145	0.1696
RESBURDEN	Parameter estimate	1.0754	-2.9483	
	p-value	0.9513	0.9802	0.2166

Table 5.20 Continued

Part (b):

Regression (10): $POV = \beta_0 + \beta_1 USA + \beta_2 USA*TAX + \beta_3 TAX + \beta_4 TIME + \beta_5 GDPPCAP + \beta_6 ECOGROWTH + \beta_7 DEFICIT + \beta_8 GOVEX + \beta_9 UNEMPL + \beta_{10} INFLATION + \varepsilon$

Variable of interest (TAX):		USA Dummy (1 = USA, 0 = EUROPE)	Interaction (TAX * USA Dummy)	Test for joint significance (F-test)
TXPROGRESS	Parameter estimate	0.6488	2.8459	
	p-value	0.7965	0.9087	**0.0020**
TRFPROGRESS	Parameter estimate	0.1591	3.7159	
	p-value	0.9562	0.8694	0.2764
ALLPROGRESS	Parameter estimate	-1.2770	7.5322	
	p-value	0.7718	0.6939	0.3053
BURDEN	Parameter estimate	0.7989	-0.9269	
	p-value	0.8636	0.9559	0.2152
INCOME	Parameter estimate	2.1242	-2.9033	
	p-value	0.5738	0.7170	**0.0284**
RESBURDEN	Parameter estimate	-0.4445	7.3268	
	p-value	0.9384	0.8525	0.1314

Tables 5.21 and 5.22 present the results pertaining to the relationship between tax and transfer system and collective happiness. Table 5.21 shows the p-values of the predictive Chow test for each regression analysis (regression (5) and (6)). In Table 5.22, the coefficients and the p-values for the USA dummy and the interaction variables as well as the p-values of the tests for joint significance (F-tests) are recorded for each regression model (regressions (11) and (12)). The predictive Chow tests and the F-tests do not suggest major differences in effects of tax system variables on collective happiness. With the exceptions of the income tax reliance variable (INCOME) (regression (12)) the

impact of tax system variables on collective happiness in the United States and in European countries appears to be similar.

> **H7c:** The United States tax and transfer system positively impacts collective happiness less than European tax and transfer systems.

Table 5.21
Differences in effects: United States versus Europe: Chow test
(dependent variable: collective happiness)

Regression (5): $HAPPY = \beta_0 + \beta_1 TAX + \beta_2 GDPPCAP + \beta_3 ECOGROWTH + \beta_4 DEFICIT + \beta_5 GOVEX + \beta_6 LABOREFF + \beta_7 UNEMPL + \beta_8 INFLATION + \varepsilon$

Regression (6): $HAPPY = \beta_0 + \beta_1 TAX + \beta_2 TIME + \beta_3 GDPPCAP + \beta_4 ECOGROWTH + \beta_5 DEFICIT + \beta_6 GOVEX + \beta_7 UNEMPL + \beta_8 INFLATION + \varepsilon$

Variable of interest (TAX)	Regression (5) PCHOW p-value	Regression (6) PCHOW p-value
TXPROGRESS	0.8920	0.5730
TRFPROGRESS	0.8514	0.5096
ALLPROGRESS	0.8853	0.5977
BURDEN	0.8720	0.4964
INCOME	0.4632	**0.0158**
RESBURDEN	0.7595	0.1453

Table 5.22
Differences in effects: United States versus Europe:
Regressions with dummy and interaction variables
(dependent variable: collective happiness)

Part (a):

Regression (11): $HAPPY = \beta_0 + \beta_1 USA + \beta_2 USA*TAX + \beta_3 TAX + \beta_4 GDPPCAP + \beta_5 ECOGROWTH + \beta_6 DEFICIT + \beta_7 GOVEX + \beta_8 LABOREFF + \beta_9 UNEMPL + \beta_{10} INFLATION + \varepsilon$

Variable of interest (TAX)		USA Dummy (1 = USA, 0 = EUROPE)	Interaction (TAX * USA Dummy)	Test for joint significance (F-test)
TXPROGRESS	Parameter estimate	0.3655	-3.6245	
	p-value	0.6212	0.6340	0.8742
TRFPROGRESS	Parameter estimate	-0.4510	3.6437	
	p-value	0.4508	0.4067	0.6548
ALLPROGRESS	Parameter estimate	-0.5042	2.4148	
	p-value	0.6597	0.6227	0.7653
BURDEN	Parameter estimate	1.0749	-3.7225	
	p-value	0.3122	0.3403	0.4859
INCOME	Parameter estimate	0.0497	-0.0210	
	p-value	0.8734	0.9759	0.5374
RESBURDEN	Parameter estimate	-0.4190	2.7321	
	p-value	0.8729	0.8763	0.9770

Table 5.22 Continued

Part (b):

Regression (12): $HAPPY = \beta_0 + \beta_1 USA + \beta_2 USA*TAX + \beta_3 TAX + \beta_4 TIME + \beta_5 GDPPCAP + \beta_6 ECOGROWTH + \beta_7 DEFICIT + \beta_8 GOVEX + \beta_9 UNEMPL + \beta_{10} INFLATION + \varepsilon$

Variable of interest (TAX)		USA Dummy (1 = USA, 0 = EUROPE)	Interaction (TAX * USA Dummy)	Test for joint significance (F-test)
TXPROGRESS	Parameter estimate	0.1401	-1.9474	
	p-value	0.7536	0.6667	0.5910
TRFPROGRESS	Parameter estimate	-0.3245	2.8699	
	p-value	0.4833	0.4064	0.5865
ALLPROGRESS	Parameter estimate	-0.1533	0.8794	
	p-value	0.8334	0.7761	0.7309
BURDEN	Parameter estimate	**1.2539**	**-4.3761**	
	p-value	0.0557	0.0665	0.1185
INCOME	Parameter estimate	0.2835	-0.8828	
	p-value	0.5497	0.3886	**0.0443**
RESBURDEN	Parameter estimate	0.3218	-2.8635	
	p-value	0.7309	0.6514	0.3798

Hypotheses 7a, 7b, and 7c posit that the impact of tax system variables on income inequality, poverty, and collective happiness is greater in Europe than in the United States. In other words, the hypotheses are directional implying that in European countries – compared to the United States – a more negative relationship between tax system variables and income inequality and poverty and a more positive relationship between tax system variables and collective happiness exists. Table 5.23 informs about the direction of the difference in impact for the regression models where USA dummy and interaction variable were jointly significant. The coefficient of the USA dummy variable indicates the difference in intercept and the coefficient of the interaction term the

difference in slope. The results indicate that the effect of tax progressivity (TXPROGRESS) on income inequality is either opposite (regression model (7)) or more negative (regression model (8)) in the United States than in Europe. The impact of overall tax burden (BURDEN) and residual tax burden (RESBURDEN) on income inequality also appears to be opposite in the United States than in Europe while the impact of income tax reliance (INCOME) seems to be more negative in the United States (regression (8)). Joint significance tests indicate that differences in impact of taxes on poverty and on collective happiness are present only for two and one tax system variable(s) respectively. The correlation between tax progressivity (TXPROGRESS) and poverty appears to be more negative in European countries than in the United States and the effect of income tax reliance (INCOME) on poverty and on collective happiness seems to be opposite.

Table 5.23
Direction of differences in effects (parameter estimates for USA dummy, interaction, and TAX variable)

Part (a): Dependent variable: income inequality

Regression Model (7)

Independent Variable: TAX	USA dummy (difference in intercept)	Interaction (difference in slope)	TAX variable	Interaction variable and TAX variable (Impact in USA)
Tax Progressivity	-0.0549	2.5775	-1.2742	1.3033

Regression Model (8)

Tax Progressivity	0.6769	-3.3616	-2.3931	-5.7546
Tax Burden	-1.7213	6.5740	-1.9526	4.6214
Income Tax	0.2884	-0.0190	-0.1072	-0.1261
Residual Tax Burden	-1.3373	10.5076	-0.8195	9.6881

Table 5.23 Continued

Part (b): Dependent variable: poverty

Regression Model (10)

Independent Variable: TAX	USA dummy (difference in intercept)	Interaction (difference in slope)	TAX variable	Interaction variable and TAX variable (Impact in USA)
Tax Progressivity	0.6488	2.8459	-5.3589	-2.5130
Income Tax	2.1242	-2.9033	0.2147	-2.6886

Part (c): Dependent variable: collective happiness

Regression Model (12)

Independent Variable: TAX	USA dummy (difference in intercept)	Interaction (difference in slope)	TAX variable	Interaction variable and TAX variable (Impact in USA)
Income Tax	0.2835	-0.8828	0.5031	-0.3797

The lack of significant results supporting hypothesis 7 despite the fact that the tax and transfer system in the United States is significantly different from European tax and transfer systems leads to the question if and how cross-continental comparisons are possible. Although all countries in the sample are developed "western" countries with similar economies important cultural differences exist. For example, attitudes toward state and government differ significantly across continents (Haller, 2002: 35–104), which implies a different attitude toward tax authority and taxes in general. Furthermore, different beliefs about the role of government most likely impact the difference in design of tax and transfer systems across continents.

Control Variables

The following control variables are included in the regression models:

- GDP per capita (real GDP in U.S. dollars per capita),
- economic growth (annual change of real GDP in percent),
- budget surplus (deficit) (budget surplus (deficit) in percent of GDP),
- government expenditures (total government expenditures in percent of GDP),
- labor effort (average number of hours worked per worker in the workforce per year),
- unemployment (unemployment rate in percent), and
- inflation (annual change of the respective consumer price index in percent).

In general, GDP per capita is negatively associated with income inequality and poverty. The data suggest no correlation between GDP per capita and collective happiness. Economic growth, on the other hand, appears to be positively associated with collective happiness but not related to income inequality and poverty. The results further suggest no association between budget surplus (deficit) and income inequality, poverty as well as collective happiness.

As expected, overall government expenditures, the proxy for government welfare expenditures, is generally negatively related to income inequality and poverty. The data suggest no relationship between government expenditures and collective happiness. Labor effort and income inequality (collective happiness) appear to be positively

(negatively) correlated. The regression results indicate no relationship between poverty and labor effort. Note that including labor effort in the regression analysis eliminates the data from the 1980s, thereby significantly reducing the number of observations in the already small sample. For that reason, each regression model is re-estimated excluding the labor effort control variable (regression models (2), (2a), (4), (4a), (6), (6a), (8), (10), and (12)).

As expected, the association between unemployment and collective happiness is negative. On the other hand, surprisingly, unemployment rate and income inequality and poverty appear to be negatively correlated as well, suggesting that higher unemployment rates lead to lower income inequality and to lower poverty. This result is puzzling. Several explanations are possible. In this sample, countries with relatively high unemployment rates, such as Sweden, the Netherlands, Finland, Norway, France, and Denmark, also tend to have higher social welfare expenditures. In some countries, higher unemployment benefits, a type of government welfare expenditures, may provide incentives for people to remain unemployed until they are presented with better job opportunities. On the other hand, in countries with lower unemployment benefits people may accept jobs with substantially lower pay which could lead to an increase in poverty rates (and possibly inequality) while, at the same time, unemployment rates decrease. The proxy in the model for these types of social expenditures (i.e., overall government expenditures, GOVEX) is not optimal and therefore may be capturing only part of that phenomenon. Thus, some of the remaining effects of government welfare transfers on income inequality and poverty may be captured by the control variable for

unemployment. Another explanation is that measuring unemployment has traditionally been difficult.[30] It is likely that accuracy and composition of the unemployment measure varies among countries.[31] Further, cultural differences not captured in the model (e.g., differences in incentives to stay or not to stay in the workforce, such as absence/presence of a larger "underground" economy) could be responsible for some variation in unemployment rates.

Finally, the regression results indicate no association between inflation and income inequality, poverty, as well as collective happiness. The effects of time variables on income inequality, poverty, and collective happiness are discussed below.

Table 5.24 summarizes the results for each dependent and each control variable.

[30] For example, http://en.wikipedia.org/wiki/unemployment; and http://www.bls.gov/cps/cps_htgm.htm.

[31] For example, Blanchard and Portugal (2001) found that although the official unemployment rate of the United States and of Portugal has been the same (at around 6.3 percent) for 15 years, average duration of unemployment in Portugal is about three times longer than in the United States indicating two very different labor markets. Blanchard, Olivier and Portugal, Pedro (2001). What Hides Behind an Unemployment Rate: Comparing Portuguese and U.S. Labor Markets. *The American Economic Review*, 91 (1): 187–207.

Table 5.24
Sign and significance of control variables

	Dependent Variable:		
	Income inequality	Poverty	Collective happiness
LOG GDPPCAP	Negative relationship	Negative relationship	No relationship
ECOGROWTH	No relationship	No relationship	Positive relationship
DEFICIT	No relationship	No relationship	No relationship
GOVEX	Negative relationship	Some negative relationship	No relationship
LOG LABOREFF	Positive relationship	No relationship	Some negative relationship
UNEMPL	Some negative relationship	Negative relationship	Negative relationship
INFLATION	No relationship	No relationship	No relationship

Sensitivity Analysis

To test for sensitivity of the analysis, the OLS regressions (1) through (6) are re-estimated using none or only some of the control variables. Specifically, for each dependent variable, the following regression models were examined:

- Explanatory variable(s): just the respective TAX variable (i.e., TXPROGRESS, TRFPROGRESS, ALLPROGRESS, BURDEN, INCOME, or RESBURDEN), no controls.
- Explanatory variable(s): the respective TAX variable and the time dummy variable (TIME) to test for potential time effects.

- Explanatory variable(s): the respective TAX variable, the time dummy variable (TIME) and the control variable for economic growth (ECOGROWTH).
- Explanatory variable(s): the respective TAX variable, the time dummy variable (TIME) and the control variable for government expenditures (GOVEX).

Overall, the results hold. Stated differently, adding or removing control variables does not change sign or significance of the coefficients of most variables of interest (TAX variables) in the regression models. Table 5.25 summarizes the results.

Table 5.25
Analysis with no or only some control variables (summary)

Part (a): Dependent variable: income inequality

Variable of interest (TAX)	Regression model			
	No control variables added	Add: TIME dummy	Add: TIME dummy and ECOGROWTH	Add: TIME dummy and GOVEX
TXPROGRESS	Negative	Negative	Negative	Negative
TRFPROGRESS	Negative	Negative	Negative	Negative
ALLPROGRESS	Negative	Negative	Negative	Negative
BURDEN	Negative	Negative	Negative	Negative
INCOME	Not significant	Not significant	Not significant	Not significant
RESBURDEN	Negative	Negative	Negative	Negative

Table 5.25 Continued

Part (b): Dependent variable: poverty

Variable of interest (TAX)	Regression model			
	No control variables added	Add: TIME dummy	Add: TIME dummy and ECOGROWTH	Add: TIME dummy and GOVEX
TXPROGRESS	Not significant	Not significant	Not significant	Not significant
TRFPROGRESS	Negative	Negative	Negative	Negative
ALLPROGRESS	Negative	Negative	Negative	Negative
BURDEN	Negative	Negative	Negative	Negative
INCOME	Positive	Positive	Positive	Positive
RESBURDEN	Negative	Negative	Negative	Negative

Part (c): Dependent variable: collective happiness

Variable of interest (TAX)	Regression model			
	No control variables added	Add: TIME dummy	Add: TIME dummy and ECOGROWTH	Add: TIME dummy and GOVEX
TXPROGRESS	Not significant	Not significant	Not significant	Not significant
TRFPROGRESS	Not significant	Not significant	Not significant	Not significant
ALLPROGRESS	Not significant	Not significant	Not significant	Not significant
BURDEN	Not significant	Not significant	Not significant	Positive
INCOME	Positive	Positive	Positive	Positive
RESBURDEN	Not significant	Not significant	Not significant	Not significant

As stated above, adding a control variable for labor effort (LABOREFF) reduces the already small sample. To test how this affects the results, OLS regressions (1), (3), and (5) were re-estimated for the same sample (i.e., the years 1990 through 2000) excluding the labor effort control variable (regression models (1c), (3c), and (5c)). The results (summarized in Table 5.26) indicate that, in general, for income inequality and poverty the relationship between variable of interest and dependent variable is not affected by the labor effort control variable. In the case of collective happiness including

labor effort does change the results. Recall that happiness data are only available for nine countries in the sample. The reason for the inconsistencies of the results could, therefore, be related to the very small sample rather than to the effect of labor effort on collective happiness. This indicates that the results of regression model (5) should be interpreted with caution.

Table 5.26
Effects of the labor effort control variable
(years 1990 through 2000)

Part (a): Dependent variable: income inequality

Variable of interest (TAX)	Regression model:	
	All controls except for TIME dummy variables (regression (1))	All controls except for LABOREFF and TIME dummy variables (regression (1c))
TXPROGRESS	Not significant	Not significant
TRFPROGRESS	Negative	Negative
ALLPROGRESS	Negative	Negative
BURDEN	Negative	Negative
INCOME	Not significant	Not significant
RESBURDEN	Not significant	Negative

Part (b): Dependent variable: poverty

Variable of interest (TAX)	Regression model:	
	All controls except for TIME dummy variables (regression (3))	All controls except for LABOREFF and TIME dummy variables (regression (3c))
TXPROGRESS	Not significant	Not significant
TRFPROGRESS	Negative	Negative
ALLPROGRESS	Negative	Negative
BURDEN	Negative	Negative
INCOME	Not significant	Positive
RESBURDEN	Negative	Negative

Table 5.26 Continued

Part (c): Dependent variable: collective happiness

Variable of interest (TAX)	Regression model:	
	All controls except for TIME dummy variables (regression (5))	All controls except for LABOREFF and TIME dummy variables (regression (5c))
TXPROGRESS	Not significant	Not significant
TRFPROGRESS	Not significant	Positive
ALLPROGRESS	Not significant	Positive
BURDEN	Not significant	Positive
INCOME	Positive	Not significant
RESBURDEN	Negative	Not significant

Several time variables were included in the model to test for potential time effects. Including one time dummy variable for the 1990s indicates higher income inequality in the 1990s than in the 1980s. In the case of poverty and collective happiness, the time dummy variable is not significant, implying that there is no time effect. To test for sensitivity, alternate time dummy variables were included in the regression models (regression models (1b) through (6b)). The time variables are defined as follows:

TIME85 Dummy variable, equaling one for the years 1985 through 1989 and zero otherwise.

TIME90 Dummy variable equaling one for the years 1990 through 1994 and zero otherwise.

TIME95 Dummy variable equaling one for the years 1995 through 2000 and zero otherwise.

Table 5.28 shows that, in general, including more time dummy variables does not change sign or significance of the variables of interest (TAX variables). Moreover, additional time dummies confirm the positive time trend in the case of income inequality and the absence of a time trend for poverty and collective happiness. Table 5.28 summarizes the time effects.

Table 5.27
Time effects

Part (a): Dependent variable: income inequality

(1): $INEQ = \beta_0 + \beta_1 TAX + \beta_2 GDPPCAP + \beta_3 ECOGROWTH + \beta_4 DEFICIT + \beta_5 GOVEX + \beta_6 LABOREFF + \beta_7 UNEMPL + \beta_8 INFLATION + \varepsilon$

(1b): $INEQ = \beta_0 + \beta_1 TAX + \beta_2 TIME95 + \beta_3 GDPPCAP + \beta_4 ECOGROWTH + \beta_5 DEFICIT + \beta_6 GOVEX + \beta_7 LABOREFF + \beta_8 UNEMPL + \beta_9 INFLATION + \varepsilon$

(2): $INEQ = \beta_0 + \beta_1 TAX + \beta_2 TIME + \beta_3 GDPPCAP + \beta_4 ECOGROWTH + \beta_5 DEFICIT + \beta_6 GOVEX + \beta_7 UNEMPL + \beta_8 INFLATION + \varepsilon$

(2b): $INEQ = \beta_0 + \beta_1 TAX + \beta_2 TIME85 + \beta_3 TIME90 + \beta_4 TIME95 + \beta_5 GDPPCAP + \beta_6 ECOGROWTH + \beta_7 DEFICIT + \beta_8 GOVEX + \beta_9 UNEMPL + \beta_{10} INFLATION + \varepsilon$

Variable of interest (TAX)	Regression model:			
	(1)	(1b)	(2)	(2b)
TXPROGRESS	Not significant	Not significant	Negative	Negative
TRFPROGRESS	Negative	Negative	Negative	Negative
ALLPROGRESS	Negative	Negative	Negative	Negative
BURDEN	Negative	Negative	Negative	Negative
INCOME	Not significant	Not significant	Not significant	Not significant
RESBURDEN	Not significant	Not significant	Negative	Negative

Table 5.27 Continued

Part (b): Dependent variable: poverty

(3): $$POV = \beta_0 + \beta_1 TAX + \beta_2 GDPPCAP + \beta_3 ECOGROWTH + \beta_4 DEFICIT + \beta_5 GOVEX + \beta_6 LABOREFF + \beta_7 UNEMPL + \beta_8 INFLATION + \varepsilon$$

(3b): $$POV = \beta_0 + \beta_1 TAX + \beta_2 TIME95 + \beta_3 GDPPCAP + \beta_4 ECOGROWTH + \beta_5 DEFICIT + \beta_6 GOVEX + \beta_7 LABOREFF + \beta_8 UNEMPL + \beta_9 INFLATION + \varepsilon$$

(4): $$POV = \beta_0 + \beta_1 TAX + \beta_2 TIME + \beta_3 GDPPCAP + \beta_4 ECOGROWTH + \beta_5 DEFICIT + \beta_6 GOVEX + \beta_7 UNEMPL + \beta_8 INFLATION + \varepsilon$$

(4b): $$POV = \beta_0 + \beta_1 TAX + \beta_2 TIME85 + \beta_3 TIME90 + \beta_4 TIME95 + \beta_5 GDPPCAP + \beta_6 ECOGROWTH + \beta_7 DEFICIT + \beta_8 GOVEX + \beta_9 UNEMPL + \beta_{10} INFLATION + \varepsilon$$

Variable of interest (TAX)	Regression model:			
	(3)	(3b)	(4)	(4b)
TXPROGRESS	Not significant	Not significant	Not significant	Not significant
TRFPROGRESS	Negative	Negative	Negative	Negative
ALLPROGRESS	Negative	Negative	Negative	Negative
BURDEN	Negative	Negative	Negative	Negative
INCOME	Not significant	Not significant	Positive	Positive
RESBURDEN	Negative	Negative	Negative	Negative

Table 5.27 Continued

Part (c): Dependent variable: collective happiness

(5): $$HAPPY = \beta_0 + \beta_1 TAX + \beta_2 GDPPCAP + \beta_3 ECOGROWTH + \beta_4 DEFICIT + \beta_5 GOVEX + \beta_6 LABOREFF + \beta_7 UNEMPL + \beta_8 INFLATION + \varepsilon$$

(5b): $$HAPPY = \beta_0 + \beta_1 TAX + \beta_2 TIME95 + \beta_3 GDPPCAP + \beta_4 ECOGROWTH + \beta_5 DEFICIT + \beta_6 GOVEX + \beta_7 LABOREFF + \beta_8 UNEMPL + \beta_9 INFLATION + \varepsilon$$

(6): $$HAPPY = \beta_0 + \beta_1 TAX + \beta_2 TIME + \beta_3 GDPPCAP + \beta_4 ECOGROWTH + \beta_5 DEFICIT + \beta_6 GOVEX + \beta_7 UNEMPL + \beta_8 INFLATION + \varepsilon$$

(6b): $$HAPPY = \beta_0 + \beta_1 TAX + \beta_2 TIME85 + \beta_3 TIME90 + \beta_4 TIME95 + \beta_5 GDPPCAP + \beta_6 ECOGROWTH + \beta_7 DEFICIT + \beta_8 GOVEX + \beta_9 UNEMPL + \beta_{10} INFLATION + \varepsilon$$

Variable of interest (TAX)	Regression model:			
	(5)	(5b)	(6)	(6b)
TXPROGRESS	Not significant	Not significant	Not significant	Not significant
TRFPROGRESS	Not significant	Not significant	Not significant	Not significant
ALLPROGRESS	Not significant	Not significant	Positive	Positive
BURDEN	Not significant	Positive	Positive	Positive
INCOME	Positive	Positive	Positive	Positive
RESBURDEN	Negative	Negative	Not significant	Not significant

Table 5.28
Sign and significance of time dummy variables (summary)

	Dependent variable:		
	Income inequality	Poverty	Happiness
TIME	Some positive relationship	No relationship	No relationship
TIME85	Some positive relationship	No relationship	No relationship
TIME90	Some positive relationship	No relationship	No relationship
TIME95	Some positive relationship	No relationship	No relationship

Hypotheses 2b, 4b, and 6b address the relationship between residual tax burden (i.e., total tax revenues net of income taxes in percent of GDP) and income inequality, poverty, and collective happiness respectively. An alternative approach tests the relationship between different types of taxes (i.e., the tax mix variables) other than income taxes and the dependent variables. To that end, each OLS regression model (regressions (1) through (6)) is re-estimated using (i) proportion of tax revenues from taxes on goods and services (GOODS), (ii) proportion of tax revenues from payroll taxes (PAYROLL), and (iii) proportion of tax revenues from property taxes (PROPERTY) as variables of interest (TAX variables).

Table 5.29 summarizes this analysis. Interestingly, the results indicate a negative relationship between the proportion of tax revenues from consumption taxes (GOODS) and income inequality as well as poverty, implying that a tax system with a relatively high proportion of tax revenues from consumption taxes leads to lower income inequality and lower poverty. This is surprising because, in general, taxes on goods and services are less progressive and therefore less redistributive than income taxes. In the sample used

for this study, countries with relatively high consumption taxes, such as the Scandinavian countries, also experience lower income inequality and poverty than other countries likely due to higher social welfare spending. One way to control for this phenomenon is to include a variable measuring government transfers to the poor. Unfortunately, such a variable is not available for all countries in the sample. Overall government expenditures (GOVEX) are used as proxy which does not capture all effects of redistribution. It is therefore possible that the tax mix variable for taxes on goods and services (GOODS) captures some of these effects.

The results suggest no relationship between the proportion of taxes on goods and services and collective happiness. Payroll taxes appear to be negatively correlated with income inequality, poverty, as well as collective happiness while property taxes are positively related to income inequality and poverty and not associated with collective happiness.

Table 5.29
Tax mix variables and income inequality, poverty, and collective happiness

Part (a): Dependent variable: income inequality

		Regression model:		
Variable of interest (TAX)	(1)	(2)	No controls	Add: TIME dummy
GOODS	Not significant	Negative	Negative	Negative
PAYROLL	Not significant	Negative	Negative	Negative
PROPERTY	Positive	Positive	Positive	Positive

Table 5.29 Continued

Part (b): Dependent variable: poverty

	Regression model:			
Variable of interest (TAX)	(3)	(4)	No controls	Add: TIME dummy
GOODS	Negative	Negative	Negative	Negative
PAYROLL	Not significant	Negative	Negative	Negative
PROPERTY	Positive	Positive	Positive	Positive

Part (c): Dependent variable: collective happiness

	Regression model:			
Variable of interest (TAX)	(5)	(6)	No controls	Add: TIME dummy
GOODS	Not significant	Not significant	Not significant	Not significant
PAYROLL	Negative	Not significant	Negative	Negative
PROPERTY	Not significant	Negative	Not significant	Not significant

The United States tax and transfer system differs significantly from European tax and transfer systems (Table 5.16). At the same time income inequality and poverty are significantly higher in the United States compared to all other countries in the sample. It is therefore possible that some results, such as the positive relationship between income inequality and labor effort, are driven by United States data. To test for that contention, regression models (1) through (6) were re-estimated excluding United States data from the sample. Owing to small sample limitations, it is not possible to re-estimate the regression models for the United States alone. Table 5.30 shows that, overall, sign and significance of the coefficients do not change when the United States data is dropped

from the sample. The results of regression model (3) without United States data indicate that poverty and progressivity are not significantly correlated. However, eliminating the United States data from the sample also reduces the sample size which may be the reason for the lack of significance. Similarly, the (puzzling) positive relationship between income tax reliance and poverty does not persist when the United States observations are dropped (regression (4)). This could be an indication that high poverty rates in the United States combined with the relatively high proportion of tax revenues from income taxes is driving the results. However, as mentioned above, the reduction in sample size may be responsible for the lack of significance.

Table 5.30
Coefficients' sign and significance:
entire sample versus sample without USA data

Dependent variable: income inequality

	Regression model (1)		Regression model (2)	
	All countries	Without USA	All countries	Without USA
TXPROGRESS	Not significant	Negative	Negative	Negative
TRFPROGRESS	Negative	Negative	Negative	Negative
ALLPROGRESS	Negative	Negative	Negative	Negative
BURDEN	Negative	Negative	Negative	Negative
INCOME	Not significant	Not significant	Not significant	Not significant
RESBURDEN	Not significant	Not significant	Negative	Negative

Dependent variable: poverty

	Regression model (3)		Regression model (4)	
	All countries	Without USA	All countries	Without USA
TXPROGRESS	Not significant	Not significant	Not significant	Not significant
TRFPROGRESS	Negative	Not significant	Negative	Negative
ALLPROGRESS	Negative	Not significant	Negative	Negative
BURDEN	Negative	Negative	Negative	Negative
INCOME	Not significant	Not significant	Positive	Not significant
RESBURDEN	Negative	Negative	Negative	Negative

Table 5.30 Continued

Dependent variable: happiness

	Regression model (5)		Regression model (6)	
	All countries	Without USA	All countries	Without USA
TXPROGRESS	Not significant	Not significant	Not significant	Not significant
TRFPROGRESS	Not significant	Not significant	Not significant	Positive
ALLPROGRESS	Not significant	Not significant	Positive	Positive
BURDEN	Not significant	Not significant	Positive	Positive
INCOME	Positive	Positive	Positive	Positive
RESBURDEN	Negative	Negative	Not significant	Not significant

Finally, the sensitivity of the measurement choice for income inequality and poverty is tested.[32] In this study, income inequality and poverty are measured using the Gini coefficient and P_1 (headcount ratio times poverty gap ratio) respectively. As stated above, correlation analysis shows that the measurements for income inequality (Gini coefficient, Atkinson index, and 90/10 decile ratio) and those for poverty (headcount ratio and P_1) are highly correlated. To further test for robustness, regressions (1) and (2) were re-estimated using the Atkinson index ($\varepsilon = 0.5$) and the 90/10 decile ratio to measure income inequality while regressions (3) and (4) were repeated with the headcount ratio as poverty measure. As reported in Table 5.31, largely, the results hold which indicates that the measurement choice for income inequality and poverty does not impact the overall results.

[32] Note that this robustness test cannot be performed for the happiness variable due to lack of alternative measurements for collective happiness.

Table 5.31
Sensitivity tests using alternate measurements for
income inequality and poverty

Part (a): Control variable for labor effort (LABOREFF) included.

Regression (1): $INEQ = \beta_0 + \beta_1 TAX + \beta_2 GDPPCAP + \beta_3 ECOGROWTH + \beta_4 DEFICIT + \beta_5 GOVEX + \beta_6 LABOREFF + \beta_7 UNEMPL + \beta_8 INFLATION + \varepsilon$

Regression (3): $POV = \beta_0 + \beta_1 TAX + \beta_2 GDPPCAP + \beta_3 ECOGROWTH + \beta_4 DEFICIT + \beta_5 GOVEX + \beta_6 LABOREFF + \beta_7 UNEMPL + \beta_8 INFLATION + \varepsilon$

	Regression (1) Dependent variable: income inequality			Regression (3) Dependent variable: poverty	
Variable of Interest (TAX)	Measurement for INEQ			Measurement for POV	
	Gini coefficient	Atkinson index ($\varepsilon = 0.5$)	Decile ratio (90/10)	P_1	Headcount ratio
TXPROGRESS	Not significant	Not significant	Not significant	Not significant	Not significant
TRFPROGRESS	Negative	Negative	Negative	Negative	Negative
ALLPROGRESS	Negative	Negative	Negative	Negative	Negative
BURDEN	Negative	Negative	Negative	Negative	Negative
INCOME	Not significant	Not significant	Not significant	Not significant	Not significant
RESBURDEN	Not significant	Not significant	Not significant	Negative	Negative

Table 5.31 Continued

Part (b): Control variable for labor effort (LABOREFF) excluded.

Regression (2): $INEQ = \beta_0 + \beta_1 TAX + \beta_2 TIME + \beta_3 GDPPCAP + \beta_4 ECOGROWTH + \beta_5 DEFICIT + \beta_6 GOVEX + \beta_7 UNEMPL + \beta_8 INFLATION + \varepsilon$

Regression (4): $POV = \beta_0 + \beta_1 TAX + \beta_2 TIME + \beta_3 GDPPCAP + \beta_4 ECOGROWTH + \beta_5 DEFICIT + \beta_6 GOVEX + \beta_7 UNEMPL + \beta_8 INFLATION + \varepsilon$

	Regression (2) Dependent variable: income inequality			Regression (4) Dependent variable: poverty	
Variable of Interest (TAX)	Measurement for INEQ			Measurement for POV	
	Gini coefficient	Atkinson index ($\varepsilon = 0.5$)	Decile ratio (90/10)	P_1	Headcount ratio
TXPROGRESS	Negative	Negative	Not significant	Not significant	Not significant
TRFPROGRESS	Negative	Negative	Negative	Negative	Negative
ALLPROGRESS	Negative	Negative	Negative	Negative	Negative
BURDEN	Negative	Negative	Negative	Negative	Negative
INCOME	Not significant	Not significant	Positive	Positive	Positive
RESBURDEN	Negative	Negative	Negative	Negative	Negative

Summary

In this chapter, the results of the regression analysis and further statistical tests such as the Chow test and F-tests for joint significance are presented.

Taken altogether, the results lend considerable support to the overall assumption that tax system variables impact income inequality, poverty, and collective happiness. The progressivity of a country's tax and transfer system as well as its overall and residual tax burden appear to be negatively associated with income inequality and poverty. Furthermore, the results provide evidence that some relationship between progressivity, overall tax burden, and income tax reliance and collective happiness exists. In general, the sensitivity tests confirm these findings. However, some results remain unexplained.

For example, the negative relationship between unemployment rate and income inequality and poverty is puzzling. Similarly, the fact that the proportion of tax revenues from consumption taxes is negatively correlated with income inequality and with poverty cannot be explained using the models and data presented in this study. Further analysis (possibly with a better control variable for government transfers to the poor) is necessary.

CHAPTER VI

SUMMARY AND CONCLUSIONS

The issue of determining what type of tax system is optimal for a particular jurisdiction is certainly not new. Prior research has shown that the effect of taxes on economic performance is mixed, at best. This study presents an attempt to further the tax literature by examining the extent to which a nation's tax and transfer system impacts overall social welfare rather than economic performance. Not only is this research designed to fill a gap in the tax policy literature, but it also contributes to society as a whole by attempting to measure some of the more human elements of a tax system. The findings of this study are of interest not only to researchers in the fields of public finance and public policy but also to tax policy makers. Much of the focus of current tax policy has been on potential economic effects of tax rate changes hereby disregarding some of the other elements of social welfare. The findings of this study suggest that, if reducing inequality and/or poverty is an objective of tax policy, reducing progressivity and overall tax burden may not be the optimal choice. Moreover, as suggested by Griffith (2004), higher tax burdens and/or progressivity do not affect collective happiness negatively as one may assume. On the contrary, the findings of this study indicate the possibility of a positive relationship between overall tax burden and collective happiness and between income tax reliance and collective happiness.

Conclusions

This section summarizes the results and relates them to each of the hypotheses and to the research questions.

Tax System and Income Inequality

Hypotheses one and two pertain to the relationship between a country's tax and transfer system and income inequality:

H1a: Progressivity is negatively related to income inequality.

H1b: Tax burden (i.e., tax revenues in percent of GDP) is negatively related to income inequality.

H2a: Income tax reliance (i.e., proportion of total tax revenues from income taxes) is negatively related to income inequality.

H2b: Residual tax burden (i.e., total tax burden net of income taxes) is negatively related to income inequality.

H2c: The impact of income tax reliance on income inequality is greater than the impact of the residual tax burden.

The empirical results indicate a strong negative relationship between progressivity and income inequality and between overall and residual tax burden and income inequality. Income tax reliance and income inequality do not appear to be correlated. These findings lend support to hypotheses 1a, 1b, and 2b while hypotheses 2a and 2c are not supported. Overall, sensitivity analyses confirm the results.

Tax System and Poverty

Hypotheses three and four address the relationship between a country's tax and transfer system and poverty.

H3a: Progressivity is negatively related to poverty.

H3b: Tax burden (i.e., tax revenues in percent of GDP) is negatively related to poverty.

H4a: Income tax reliance (i.e., proportion of total tax revenues from income taxes) is negatively related to poverty.

H4b: Residual tax burden (i.e., total tax burden net of income taxes) is negatively related to poverty.

H4c: The impact of income tax reliance on poverty is greater than the impact of the residual tax burden.

The regression results imply a negative relationship between transfer and overall progressivity and poverty and between overall and residual tax burden and poverty. Income tax reliance and poverty appear to be positively (regression (4)) or not at all (regression (3)) correlated. These findings lend support to hypotheses 3a, 3b, and 4b while hypotheses 4a and 4c are not supported. Generally, sensitivity analyses confirm the results.

Tax System and Collective Happiness

Hypotheses five and six relate a country's tax and transfer system to the collective happiness of the citizens/taxpayers:

H5a: Progressivity is positively related to collective happiness.

H5b: Tax burden (i.e., tax revenues in percent of GDP) is positively related to collective happiness.

H6a: Income tax reliance (i.e., proportion of total tax revenues from income taxes) is positively related to collective happiness.

H6b: Residual tax burden (i.e., total tax burden net of income taxes) is positively related to collective happiness.

H6c: The impact of income tax reliance on collective happiness is greater than the impact of the residual tax burden.

The empirical results provide some evidence of a positive relationship between overall progressivity and collective happiness and overall tax burden and collective happiness. Note that, owing to data availability constraints and to the latent nature of the variable, the results for the happiness variable must be interpreted with caution. In some cases, lack of significance may be attributable to the small sample size. Income tax reliance and collective happiness seem to be positively correlated while the coefficient of the residual tax burden variable is not significant (regression (6)) or negative (regression (5)). These findings lend weak support to hypotheses 5a and 5b, strong support to hypotheses 6a and 6c, and no support to hypothesis 6b. Sensitivity analyses largely confirm the results.

Comparison of Tax Systems in the United States and in Europe

Hypothesis seven addresses the differences between the United States and European tax and transfer systems. Specifically, it posits that, due to differences in belief systems (Alesina et al., 2004), the effects of tax system variables on income inequality, poverty, and collective happiness are different in the United States than in Europe.

H7a: The United States tax and transfer system redistributes less income than European tax and transfer systems.

H7b: The United States tax and transfer system reduces poverty less than European tax and transfer systems.

H7c: The United States tax and transfer system positively impacts collective happiness less than European tax and transfer systems.

The results of simple t-tests for each tax system variable indicate that, as expected, the United States tax and transfer system differs significantly from the average European tax and transfer system. To test for the differences in effects (i.e., whether tax system variables impact income inequality, poverty, and collective happiness differently in Europe than in the United States) Chow tests and regression analyses with USA dummy and interaction variables were performed. Overall, the results evidence some structural differences between the two sub-samples only in the case of income inequality. However, the findings do not indicate a clear direction of the difference in impact. Specifically, the impact of tax progressivity on income inequality appears to be either opposite or more negative in the United States than in European countries. The effect of the overall and residual tax burden seems to be opposite in the United States than in European countries while the impact of income tax reliance appears to be more negative in the United States. The effects of tax system variables on poverty and on collective happiness do not seem to differ much across continents despite the differences in tax systems. Thus, the empirical findings lend some support to hypothesis 7a while hypotheses 7b and 7c are not supported.

Table 6.1 states the findings for each hypothesis.

Table 6.1
Summary of results

	Hypothesis	Supported
H1a	Progressivity is negatively related to income inequality.	Yes
H1b	Tax burden (i.e., tax revenues in percent of GDP) is negatively related to income inequality.	Yes
H2a	Income tax reliance (i.e., proportion of total tax revenues from income taxes) is negatively related to income inequality.	No
H2b	Residual tax burden (i.e., total tax burden net of income taxes) is negatively related to income inequality.	Yes
H2c	The impact of income tax reliance on income inequality is greater than the impact of the residual tax burden.	No
H3a	Progressivity is negatively related to poverty.	Yes
H3b	Tax burden (i.e., tax revenues in percent of GDP) is negatively related to poverty.	Yes
H4a	Income tax reliance (i.e., proportion of total tax revenues from income taxes) is negatively related to poverty.	No
H4b	Residual tax burden (i.e., total tax burden net of income taxes) is negatively related to poverty.	Yes
H4c	The impact of income tax reliance on poverty is greater than the impact of the residual tax burden.	No
H5a	Progressivity is positively related to collective happiness.	Some support
H5b	Tax burden (i.e., tax revenues in percent of GDP) is positively related to collective happiness.	Some support
H6a	Income tax reliance (i.e., proportion of total tax revenues from income taxes) is positively related to collective happiness.	Yes
H6b	Residual tax burden (i.e., total tax burden net of income taxes) is positively related to collective happiness.	No
H6c	The impact of income tax reliance on collective happiness is greater than the impact of the residual tax burden.	Yes
H7a	The United States tax and transfer system redistributes less income than European tax systems.	Some support
H7b	The United States tax and transfer system reduces poverty less than European tax systems.	No
H7c	The United States tax and transfer system positively impacts collective happiness less than European tax and transfer systems.	No

Research Questions

The following five research questions were presented in Chapter III:

(1) How is the progressivity of a country's tax and transfer system related to income distribution, poverty level, and collective happiness?

(2) How does a country's overall tax burden affect income distribution, poverty level, and collective happiness?

(3) How is the composition of a nation's tax system related to income distribution, poverty level, and collective happiness?

(4) In what dimensions do European tax and transfer systems differ significantly from the United States tax and transfer system?

(5) Is the impact of tax and transfer systems on income inequality, poverty, and collective happiness different in the United States than in Europe?

Hypotheses 1a, 3a, and 5a test the relationship between progressivity and income inequality, poverty and collective happiness. The results suggest a negative correlation between progressivity and income inequality and poverty while the relationship between progressivity and collective happiness is not clear. Furthermore, regression analysis indicates that transfer progressivity, i.e., the redistribution of income attributable to transfers, is more effective in reducing income inequality and poverty than tax progressivity, i.e., the redistribution of income attributable to taxes. This finding lends support to the notion that, for tax policy decisions, it is essential to take government revenues *and* government expenditures into consideration.

Hypotheses 1b, 3b, and 5b assess the relationship between overall tax burden and income inequality, poverty, and collective happiness. The regression results illustrate a negative correlation between overall tax burden and income inequality and poverty while the relationship between tax burden and collective happiness is not clear.

Hypotheses 2a, 2b, 2c, 4a, 4b, 4c, 6a, 6b, and 6c test the relationship between tax mix and income inequality, poverty, and collective happiness. The empirical results presented in this study do not provide a clear picture with regard to the relationship between the composition of a tax system and income inequality, poverty, and collective happiness. It appears that the more progressive nature of the income tax does not lead to the presumed more negative effect of income taxes on income inequality and poverty compared to all other taxes. However, collective happiness appears to be higher when proportionally more government revenues are collected from income taxes than from other taxes, lending support to Griffith (2004).

Alesina et al. (2004) find that the impact of inequality and poverty on collective happiness is less negative in the United States than in Europe. This suggests that tax and transfer systems in Europe are more likely to be designed to reduce income inequality and poverty and that the impact of a redistributive tax and transfer system on collective happiness is less positive in the United States than in Europe. The results of this study show that, indeed, the average European tax and transfer system differs significantly from the United States tax and transfer system. While, on average, tax progressivity and income tax reliance are higher in the United States, transfer and overall progressivity, as well as overall and residual tax burden are significantly higher in European countries.

However, despite the significant differences in tax and transfer systems the impact of tax system variables on income inequality, poverty, and collective happiness (hypotheses 7a, 7b, and 7c) do not vary much across continents. In fact, only in the case of income inequality several differences in effects can be found.

Limitations

As is common with empirical research, this study is not devoid of certain limitations. First, there are some gaps, longitudinal as well as omitted variables, in the data sources that resulted in the exclusion of some countries of interest. Another issue is the relatively small sample size along with the endogenous nature of some of the variables (Di Tella et al., 2003).

Cross-country comparisons often introduce additional limitations because variables of interest and/or control variables may not be available or are measured inconsistently across different countries. For example, in this study the happiness variable is taken from two different surveys, the U.S. General Social Survey and the Euro-Barometer Survey. This makes a comparison between the average happiness measures in Europe and in the United States difficult. Additionally, cultural differences between Europe and the United States with regard to attitudes toward state and government (Haller, 2002: 35–104) are most likely influencing the results. Different beliefs about the optimal role of government – e.g. welfare state versus "hands-off" government – possibly impact the difference in design of tax and transfer systems across continents.

Furthermore, as stated above, due to its nature – i.e., because happiness cannot be measured directly – the happiness variable is latent. As such, some of the effects found in this study may not be directly related to happiness but some other measure which is captured by the happiness measurements. Additionally, happiness data are only available for nine countries in the sample and for some of those countries only for a few years. Owing to these constraints, the results with respect to the happiness variable must be interpreted with caution. For example, the relatively small sample size may be part of the reason why the relationship between tax and transfer progressivity and collective happiness was found not significant.

Including the control variable for labor effort reduces the already small sample to data for the 1990s only. This is problematic and may be the explanation for lack of significance in some cases. Therefore, each regression was estimated twice, once including labor effort as control and once without that measure. The sensitivity tests indicate that in the cases where the result, i.e., the sign and/or significance of the variable of interest (TAX variable), changes when labor effort is included, these findings should be interpreted with caution.

The results suggest that the proxy for government transfers to the poor, overall government expenditures (GOVEX) is not optimal. Including a better control variable for government transfers to the poor may explain the puzzling result concerning unemployment rates as well as consumption taxes (i.e., the negative association between unemployment rates and income inequality and poverty and between taxes on goods and services and income inequality and poverty).

Finally, because of the possibility of omitted variables, one cannot conclude that correlation always equals causation. Also, it is possible that some cause-and-effect relationships are reversed. For example, the empirical results indicate that progressivity and overall tax burden are negatively related to income inequality and poverty. One may argue that the reason for this negative relationship is not so much progressivity causing a reduction in income inequality and poverty but rather countries with high pre-tax-transfer income inequality or poverty implementing tax systems with higher progressivity and overall tax burden. However, this argument is not supported by correlation and simple OLS regression analysis (not tabulated), which illustrates that pre-tax-transfer income inequality is not significantly associated with tax, transfer, and overall progressivity as well as with overall tax burden.

Limitations aside, the paucity of research in this important area continues to suggest a need for further investigation, the impetus of which is driving this study.

Further Research

This study adds to the optimal taxation literature by examining the impact of taxation on different aspects of social welfare. The findings of this study lend themselves to many future research questions and research projects. For example, it would be interesting to repeat this analysis as a longitudinal study within a country such as the United States focusing on differences between state tax systems and their impacts on social welfare. Limiting the study to one country also alleviates some of the omitted variable problems. Furthermore, as the LIS database grows more data for each country

and data from more than just thirteen countries will be available eliminating some of the small sample problems of this study. For instance, reviewing and extending the study in five or ten years when more internationally harmonized data with regard to progressivity, inequality, and poverty will be on hand may reveal more information about the relations examined herein.

Additionally, it appears that especially the relationship between tax systems and collective happiness should be investigated further. Despite the interesting findings of earlier literature (Easterlin, 1974) happiness data has only relatively recently been introduced into the economics literature (e.g., Alesina et al., 2004, Di Tella et al., 2003, Layard, 2003, Layard, 2003a, Griffith, 2004, Kahneman and Krueger, 2006, and Di Tella and MacCulloch, 2006). Future studies with regard to the "economics of happiness" may contribute to and clarify the findings of this study. Particularly, an analysis of micro data from new or existing survey instruments will make further explanations of the relationship between tax system and happiness possible. This study uses an aggregate measure for happiness, i.e., an average happiness measure for each country at different times between 1980 and 2000, and implies that overall progressivity, overall tax burden, and income tax reliance may be positively related to collective happiness. Yet, the data do not allow an investigation as to why collective happiness appears to be positively impacted by progressivity, tax burden, and income tax reliance. A possible explanation is that taking money from the rich and transferring it to the poor makes everybody – including the rich – happier. On the other hand, the rich may be discontent having to give up some of their income, but giving up money may not make them as unhappy as the

poor are happy to receive these transfers. Micro-data from surveys, especially if available over a longer period of time, could provide more insight with regard to this phenomenon.

BIBLIOGRAPHY

Alesina, Alberto and Rodrik, Dani (1994). Distributive Politics and Economic Growth. *Quarterly Journal of Economics*, 109 (2): 465–490.

Alesina, Alberto, Di Tella, Rafael and MacCulloch, Robert J. (2004). Inequality and Happiness: Are Europeans and Americans Different? *Journal of Public Economics*, 88 (9-10): 2009–2042.

Atkinson, Anthony B. (1973). How Progressive Should Income Tax Be? In Parkin, Michael and Nobay, Arelino R. (eds.): Essays in Modern Economics. London, Longman: 90–109.

Burman, Leonard E., Gale, William G. and Weiner, David (1998). Six Tax Laws Later: How Individuals' Marginal Federal Income Tax Rates Changed between 1980 and 1995. *National Tax Journal*, 51 (3): 637–652.

Christoph, Bernhard and Noll, Heinz-Herbert (2003). Subjective Well-Being in the European Union during the 90s. *Social Indicators Research*, 64 (3): 521–546.

Dalton, Hugh (1920). The Measurement of Inequality of Incomes. *The Economic Journal*, 30 (119): 348–361.

DeFina, Robert H. and Thanawala, Kishor (2002). International Evidence on the Impact of Transfers and Taxes on Alternative Poverty Indexes. LIS Working Paper Series, No. 325.

De Nardi, Mariacristina, Ren, Liqian and Wei, Chao (2000). Income Inequality and Redistribution in Five Countries. *Economic Perspectives, Federal Reserve Bank of Chicago*, 24 (2): 2–20.

Di Tella, Rafael, MacCulloch, Robert J. and Oswald, Andrew J. (2003). The Macroeconomics of Happiness. *The Review of Economics and Statistics*, 85 (4): 809–827.

Di Tella, Rafael and MacCulloch, Robert J. (2006). Some Uses of Happiness Data in Economics. *Journal of Economic Perspectives*, 20 (1): 25–46.

Easterlin, Richard (1974). Does Economic Growth Improve the Human Lot? Some Empirical Evidence. In David, Paul A. and Reder, Melvin W. (eds.): Nations and Households in Economic Growth: Essays in Honour of Moses Abramovitz. New York and London, Academic Press: 98–125.

Engen, Eric and Skinner, Jonathan (1996). Taxation and Economic Growth. *National Tax Journal*, 49 (4): 617–642.

Feeny, Simon (2003). The Impact of Foreign Aid on Poverty and Human Well-being in Papua New Guinea. *Asia Pacific Development Journal*, 10 (2): 73–93.

Feldstein, Martin (1998). Overview: Is Income Inequality Really a Problem? Income Inequality and Policy Options, Papers and Proceedings of Symposium sponsored by the Federal Reserve Bank of Kansas City, Jackson Hole, WY, August 27–29, 1998: 357–367.

Fong, Christina M., Bowles, Samuel and Gintis, Herbert (2004). Reciprocity, Self-Interest, and the Welfare State. In Mercier-Ythier, Jean, Kolm, Serge and Louis-Andre (eds.): Handbook on Economics of Giving, Reciprocity, and Altruism. Amsterdam, Elsevier.

Foster, James, Greer, Joel and Thorbecke, Erik (1984). A Class of Decomposable Poverty Measures. *Econometrica*, 52 (3): 761–766.

Frank, Robert H. (1999). Luxury Fever: Why Money Fails to Satisfy in an Era of Excess. New York, NY, Free Press.

Grabka, Markus M. (2000). Einkommensverteilung in Deutschland – Stärkere Umverteilungseffekte in Ostdeutschland. DIW Wochenbericht 19/00. URL = http://www.diw.de/deutsch/produkte/publikationen/wochenberichte/docs/00-19-1.html.

Griffith, Thomas D. (2004). Progressive Taxation and Happiness. *Boston College Law Review*, 45 (5): 1363–1398.

Gupta, Gir S. and Singh, Ram D. (1984). Income Inequality Across Nations over Time: How Much and Why. *Southern Economic Journal*, 51 (1): 250–257.

Guthrie, Robert S. (1979). Measurement of Relative Tax Progressivity. *National Tax Journal*, 32 (1): 93–95.

Hagerty, Michael R. and Veenhoven, Ruut (2003). Wealth and Happiness Revisited – Growing National Income *Does* Go With Greater Happiness. *Social Indicators Research*, 64 (1): 1–27.

Haller, Gret (2002). Die Grenzen der Solidarität. Europa und die USA im Umgang mit Staat, Nation und Religion. Berlin, Aufbau-Verlag.

Heady, Christopher (1993). Optimal Taxation as a Guide to Tax Policy: A Survey. *Fiscal Studies*, 14 (1): 15–41.

Heady, Christopher (2001). Tax System of Quality: Theory and Practice. Centre for Tax Policy and Administration, OECD: International Seminar on Tax System and Competitiveness in Sao Paulo on May 28, 2001.

Kahneman, Daniel and Krueger, Alan B. (2006). Developments in the Measurement of Subjective Well-Being. *Journal of Economic Perspectives*, 20 (1): 3–24.

Kakwani, Nanak (1997). Inequality, Welfare and Poverty: Three Interrelated Phenomena. The University of New South Wales, School of Economics, Discussion Paper 97/18.
URL = http://wwwdocs.fce.unsw.edu.au/economics/Research/WorkingPapers/1997_18.pdf.

Kim, Hwanjoon (2000). Anti-Poverty Effectiveness of Taxes and Income Transfers in Welfare States. *International Social Security Review*, 53 (4): 105–129.

Kotlikoff, Laurence, J. and Burns, Scott (2004). The Coming Generational Storm: What You Need to Know about America's Economic Future. Cambridge, MA, The MIT Press.

Kuznets, Simon (1963). Quantitative Aspects of the Economic Growth of Nations VIII: Distribution of Income by Size. *Economic Development and Cultural Change*, 11 (2): 1–80.

Layard, Richard (2003). Towards a Happier Society. *New Statesman*, 26 March 3, 2003.

Layard, Richard (2003a). Income and Happiness: Rethinking Economic Policy. Centre for Economic Performance. Public Lectures, Lecture 2, February 27, 2003. URL = http://cep.lse.ac.uk/events/lectures/layard/RL040303.pdf.

Libby, Robert, Bloomfield, Robert and Nelson, Mark W. (2002). Experimental Research in Financial Accounting. *Accounting, Organizations and Society*, 27 (8): 775–810.

Lind, Niels C. (2004). Values Reflected in the Human Development Index. *Social Indicators Research*, 66 (3): 283–293.

Luxembourg Income Study (LIS) Microdatabase, (2004); harmonization of original surveys conducted by the Luxembourg Income Study, asbl. Luxembourg, periodic updating.

Mahler, Vincent, A. and Jesuit, David K. (2005). Fiscal Redistribution in Developed Countries: New Insights from the Luxembourg Income Study. Luxembourg Income Study Working Paper Series, No. 392. Forthcoming: *Socio-Economic Review*, 2006.

McConnell, Campbell R. and Brue, Stanley L. (1996). Economics: Principles, Problems, and Policies. New York, NY, McGraw-Hill, Inc. Thirteenth edition.

Milanovic, Branko (2003). Why we all do Care about Inequality (but are Loath to Admit it). The World Bank Group: Inequality around the World. URL: http://www.worldbank.org/research/inequality/.

Mirrlees, James A. (1971). An Exploration in the Theory of Optimum Income Taxation. *Review of Economic Studies,* 38 (114): 175–208.

Multinational Monitor (2003). A Taxing Problem; Diminishing Progressivity in the U.S. Tax System. An Interview with Robert McIntyre. 24 (5): 28–29.

Musgrave, Richard A. (1959). The Theory of Public Finance. A Study in Public Economy. New York, NY, McGraw-Hill, Inc.

Myles, Gareth D. (2000). Taxation and Economic Growth. *Fiscal Studies*, 21 (1): 141–168.

OECD (2002). Revenue Statistics, Paris, France.

Oswald, Andrew J. (1997). Happiness and Economic Performance. *The Economic Journal*, 107 (445): 1815–1831.

Paim, Laily (1995). Definitions and Measurements of Well-Being: A Review of Literature. *Journal of Economic and Social Measurement*, 21 (4): 297–309.

Perry, David B. (1995). Fiscal Figures. International Tax Comparisons. *Canadian Tax Journal*, 43 (6): 2256–2264.

Perry, David B. (1997). Fiscal Figures. International Tax Comparisons, 1995. *Canadian Tax Journal*, 45 (5): 1180–1198.

Persson, Torsten and Tabellini, Guido (1994). Is Inequality Harmful for Growth? *The American Economic Review*, 84 (3): 600–621.

Petska, Tom and Strudler, Mike (2000). Income, Taxes, and Tax Progressivity: An Examination of Recent Trends in the Distribution of Individual Income and Taxes. Internal Revenue Service, Statistics of Income Division.

Rawls, John (1971). A Theory of Justice. Cambridge, MA, The Belknap Press of Harvard University Press.

Rebelo, Sergio (1991). Long-Run Policy Analysis and Long-Run Growth. *The Journal of Political Economy*, 99 (3): 500–521.

Riddell, Tom, Shackelford, Jean and Stamos, Steve (1998). Economics: A Tool for Critically Understanding Society. Reading, MA, Addison Wesley Longman, Inc. Fifth edition.

Sen, Amartya (1997). On Economic Inequality. Enlarged Edition. Oxford, England, Clarendon Press; New York, NY, Oxford University Press.

Slemrod, Joel (ed.) (1994). Tax Progressivity and Income Inequality. Boston, MA, Cambridge University Press.

Smeeding, Timothy M. (2004). Public Policy and Economic Inequality: The United States in Comparative Perspective. Prepared for The Campbell Institute Seminar: Inequality and American Politics, February 20, 2004 (Draft, February 16, 2004).

Smith, Adam (1776). An Inquiry into the Nature and Causes of the Wealth of Nations. Indianapolis, IN, Liberty Classics, 1981.

Steinmo, Sven (2003). The Evolution of Policy Ideas: Tax Policy in the 20th Century. *British Journal of Politics and International Relations*, 5 (2): 206–236.

Steuerle, C. Eugene (2001). The 2001 Tax Legislation from a Long-Term Perspective. *National Tax Journal*, 54 (3): 427–432.

Steuerle, C. Eugene. (2004). Contemporary U.S. Tax Policy. Washington, DC, The Urban Institute Press.

Suits, Daniel B. (1977). Measurement of Tax Progressivity. *The American Economic Review*, 67 (4): 747–752.

Verbist, Gerlinde (2004). Redistributive Effect and Progressivity of Taxes: An International Comparison across the EU using EUROMOD. EUROMOD Working Paper Series. Working Paper No. EM5/04.

Weinberg, Daniel, H. (1987). The Distributional Implications of Tax Expenditures and Comprehensive Income Taxation. *National Tax Journal*, 40 (2): 237–253.

Widmalm, Frida (2001). Tax Structure and Growth: Are Some Taxes Better Than Others? *Public Choice*, 107 (3-4): 199–219.

Wolff, Edward N. (2002). Top Heavy: The Increasing Inequality of Wealth in America and What Can Be Done about it. Newly updated and expanded edition. New York, NY, The New Press.

APPENDIX A:

INFORMATION ABOUT DATA SOURCES

Table A.1
Data sources for collective happiness measure

Country	Source
United States	The United States General Social Survey (1972–2000). This survey has been conducted by the National Research Center at the University of Chicago since 1972. The following survey question is used to measure happiness: *"Taken all together, how would you say things are these days would you say that you are very happy, pretty happy, or not too happy?"* (Small numbers of "No Answer," and "Don't Know" are disregarded). URL = http://www.norc.uchicago.edu/projects/gensoc.asp.
European countries (Belgium, Denmark, Finland, France, Germany, Netherlands, Sweden, United Kingdom)	Euro-Barometer Survey Series (1973–2000). This survey has been conducted by the European Union since 1973. The following survey question is used to measure happiness: *"On the whole are you very satisfied, fairly satisfied, not very satisfied or not at all satisfied with the life you lead?"* (Small numbers of "No Answer" and "Don't Know" are disregarded). URL = http://europa.eu.int/comm/public_opinion/cf/index_en.cfm.

Table A.2
Other data sources

Source	Variables
Luxembourg Income Study (2004)	Income inequality Poverty Tax progressivity Transfer progressivity Overall progressivity
OECD Revenue Statistics (2002)	Overall tax burden Residual tax burden Proportion of tax revenues from income taxes Proportion of tax revenues from consumption taxes Proportion of tax revenues from payroll taxes Proportion of tax revenues from property taxes
Penn World Tables [http://pwt.econ.upenn.edu/php_site/pwt_index.php]	Real GDP per capita (in U.S. dollars) Economic growth
International Financial Statistics	Budget surplus (deficit) Inflation Unemployment Government expenditures
OECD Factbook (OECD 2005) [http://caliban.sourceoecd.org/vl=5525303/cl=33/nw=1/rpsv/factbook/]	Labor effort

Table A.3
Luxembourg Income Study (LIS) data information

Country	Historical Databases	Wave I (around 1980)	Wave II (around 1985)	Wave III (around 1990)	Wave IV (around 1995)	Wave V (around 2000)
Australia	.	1981	1985	1989	1994	.
Austria	.	.	1987	.	1994/1995/1997	2000
Belgium	.	.	1985	1988/1992	1995**/1997	2000
Canada	1971/1975	1981	1987	1991	1994/1997/1998	2000
Czech Republic	.	.	.	1992	1996	.
Denmark	.	.	1987	1992	1995?	2000?
Estonia	.	.	.	.	.	2000
Finland	.	.	1987	1991	1995	2000
France	.	1979/1981	1984A/1984B	1989	1994	.
Germany	1973/1978	1981	1983/1984	1989	1994	2000
Hungary	.	.	.	1991	1994	1999
Ireland	.	.	1987	.	1994/1995/1996	2000
Israel	.	1979	1986	1992	1997	2001
Italy	.	.	1986/1987	1989/1991	1993/1995	1998/2000
Luxembourg	.	.	1985	1991	1994/1997	2000
Mexico	.	.	1984	1989/1992	1994/1996/1998	2000/2002
Netherlands	.	.	1983/1986**/ 1987	1991	1994	1999
Norway	.	1979	1986	1991	1995	2000
Poland	.	.	1986	1992	1995	1999
Romania	.	.	.	.	1995/1997	.
Russia	.	.	.	1992	1995	2000
Slovak Republic	.	.	.	1992	1996	.
Slovenia	.	.	.	.	1997	1999
Spain	.	1980	.	1990	1995	2000
Sweden	1967/1975	1981	1987	1992	1995	2000
Taiwan	.	1981	1986	1991	1995/1997	2000
Switzerland	.	1982	.	1992	.	2000**/ 2002*

Table A.3 Continued

United Kingdom	1969/1974	1979	1986	1991	1995/1994	1999
United States	1969/1974	1979	1986	1991°	1994/1997	2000

**** = Lissification in process**
° = Currently being reviewed
*** = received; waiting to be lissified**
? = under negotiation

Source: Luxembourg Income Study (2004).

Notes: The following countries were used for the statistical analysis: Australia, Belgium, Canada, Denmark, Finland, France, Germany, the Netherlands, Norway, Sweden, Switzerland, the United Kingdom, and the United States.

The following countries are excluded from my sample: the Czech Republic, Estonia, Hungary, Mexico, Poland, Romania, Russia, the Slovak Republic, and Slovenia because I do not consider them truly developed countries. Further excluded is Taiwan because as Asian country with a very different history I believe that it is less comparable to the rest of the sample. For Israel, the OECD revenue data are not available. Finally, Italy is excluded because there appear to be significant measurement errors in the data.

Inequality, poverty, and progressivity measures are computed using data from the LIS database. Unfortunately, pre-tax-transfer income is not available for all countries in the LIS database. Thus, the following additional countries were eliminated: Austria, Ireland, Luxembourg, and Spain.

APPENDIX B:

ADDITIONAL REGRESSION RESULTS:

INCOME INEQUALITY

Table B.1
Tax mix and income inequality

Part (a): Taxes on goods and services (GOODS) and income inequality.

Regression (1): $INEQ = \beta_0 + \beta_1 GOODS + \beta_2 GDPPCAP + \beta_3 ECOGROWTH + \beta_4 DEFICIT + \beta_5 GOVEX + \beta_6 LABOREFF + \beta_7 UNEMPL + \beta_8 INFLATION + \varepsilon$

Regression (2): $INEQ = \beta_0 + \beta_1 GOODS + \beta_2 TIME + \beta_3 GDPPCAP + \beta_4 ECOGROWTH + \beta_5 DEFICIT + \beta_6 GOVEX + \beta_7 UNEMPL + \beta_8 INFLATION + \varepsilon$

	Regression (1)		Regression (2)	
VARIABLE	**PARAMETER ESTIMATE**	**ROBUST P-VALUE**	**PARAMETER ESTIMATE**	**ROBUST P-VALUE**
GOODS	-0.0989	0.8423	**-0.8520**	0.0338
TIME			**0.1513**	0.0965
LOG GDPPCAP	**-0.2464**	0.0390	**-0.2673**	0.0115
ECOGROWTH	0.2391	0.5064	-0.0449	0.8240
DEFICIT	0.5978	0.3896	0.7832	0.2065
GOVEX	**-1.3421**	0.0070	**-1.4377**	0.0048
LOG LABOREFF	**0.8820**	0.0008		
UNEMPL	**-0.0159**	0.0313	0.0003	0.9640
INFLATION	-1.1307	0.4200	0.0638	0.9534
Adjusted R-square	0.5837		0.3507	
F-statistic	6.96		4.11	
p-value	<.0001		0.0013	

Table B.1 Continued

Part (b): Payroll taxes (PAYROLL) and income inequality.

Regression (1): $INEQ = \beta_0 + \beta_1 PAYROLL + \beta_2 GDPPCAP + \beta_3 ECOGROWTH + \beta_4 DEFICIT + \beta_5 GOVEX + \beta_6 LABOREFF + \beta_7 UNEMPL + \beta_8 INFLATION + \varepsilon$

Regression (2): $INEQ = \beta_0 + \beta_1 PAYROLL + \beta_2 TIME + \beta_3 GDPPCAP + \beta_4 ECOGROWTH + \beta_5 DEFICIT + \beta_6 GOVEX + \beta_7 UNEMPL + \beta_8 INFLATION + \varepsilon$

	Regression (1)		Regression (2)	
VARIABLE	**PARAMETER ESTIMATE**	**ROBUST P-VALUE**	**PARAMETER ESTIMATE**	**ROBUST P-VALUE**
PAYROLL	0.0625	0.7884	**-0.3102**	0.0862
TIME			0.1044	0.2461
LOG GDPPCAP	**-0.2376**	0.0274	**-0.1888**	0.0987
ECOGROWTH	0.2400	0.4652	-0.2589	0.2917
DEFICIT	0.6286	0.3524	0.3294	0.6304
GOVEX	**-1.3701**	0.0031	**-2.0358**	0.0001
LOG LABOREFF	**0.9458**	0.0002		
UNEMPL	**-0.0162**	0.0302	0.0023	0.7660
INFLATION	-1.1418	0.4075	-0.2588	0.7699
Adjusted R-square	0.5844		0.3152	
F-statistic	6.98		3.65	
p-value	<.0001		0.0031	

Table B.1 Continued

Part (c): Property taxes (PROPERTY) and income inequality.

Regression (1): $INEQ = \beta_0 + \beta_1 PROPERTY + \beta_2 GDPPCAP + \beta_3 ECOGROWTH + \beta_4 DEFICIT + \beta_5 GOVEX + \beta_6 LABOREFF + \beta_7 UNEMPL + \beta_8 INFLATION + \varepsilon$

Regression (2): $INEQ = \beta_0 + \beta_1 PROPERTY + \beta_2 TIME + \beta_3 GDPPCAP + \beta_4 ECOGROWTH + \beta_5 DEFICIT + \beta_6 GOVEX + \beta_7 UNEMPL + \beta_8 INFLATION + \varepsilon$

	Regression (1)		Regression (2)	
VARIABLE	**PARAMETER ESTIMATE**	**ROBUST P-VALUE**	**PARAMETER ESTIMATE**	**ROBUST P-VALUE**
PROPERTY	**3.2005**	<.0001	**3.4071**	<.0001
TIME			0.0344	0.4825
LOG GDPPCAP	-0.0438	0.5769	-0.0130	0.8524
ECOGROWTH	0.1683	0.3638	-0.1351	0.2996
DEFICIT	**0.7432**	0.0338	**0.5578**	0.0701
GOVEX	**-0.7128**	0.0340	**-0.8964**	0.0054
LOG LABOREFF	0.1936	0.2344		
UNEMPL	-0.0006	0.9023	**0.0051**	0.0633
INFLATION	0.4154	0.6984	0.3371	0.6380
Adjusted R-square	0.8126		0.7913	
F-statistic	19.43		22.80	
p-value	<.0001		<.0001	

Table B.2
Tax system variables (TAX) and income inequality (years 1990–2000)
(TIME variable and LABOREFF variable excluded)

Regression (1c): $INEQ = \beta_0 + \beta_1 TAX + \beta_2 GDPPCAP + \beta_3 ECOGROWTH + \beta_4 DEFICIT + \beta_5 GOVEX + \beta_6 UNEMPL + \beta_7 INFLATION + \varepsilon$

	TX-PROGRESS	TRF-PROGRESS	ALL-PROGRESS	BURDEN	INCOME	RES-BURDEN
Adjusted R-square	0.3200	0.6933	0.7971	0.6922	0.3637	0.5374
F-statistic	3.15	11.34	18.96	11.28	3.61	6.31
p-value	0.0157	<.0001	<.0001	<.0001	0.0080	0.0002
TAX variable	-0.7707	**-1.3477**	**-1.5704**	**-1.8683**	0.4441	**-1.3561**
robust p–value	0.4053	<.0001	<.0001	<.0001	0.2370	0.0095
LOG GDPPCAP	**-0.3557**	**-0.2365**	**-0.1983**	**-0.2854**	**-0.3876**	**-0.3634**
robust p-value	0.0162	0.0167	0.0152	0.0064	0.0059	0.0029
ECOGROWTH	0.2497	0.1397	0.1681	0.0464	0.2393	0.1676
robust p-value	0.3355	0.4993	0.3965	0.8206	0.3702	0.4929
DEFICIT	0.7226	-0.1759	0.0686	**1.0755**	0.3571	0.5199
robust p-value	0.2666	0.6822	0.8322	0.0324	0.5659	0.3205
GOVEX	**-1.7729**	-0.5147	-0.0327	0.2163	**-1.7902**	**-0.9266**
robust p-value	0.0140	0.1073	0.9149	0.6015	0.0030	0.0794
UNEMPL	-0.0072	**-0.0092**	-0.0024	-0.0035	-0.0124	**-0.0101**
robust p-value	0.3586	0.0892	0.6241	0.5139	0.1244	0.0980
INFLATION	0.6323	-1.0770	-0.7646	-0.6661	0.2191	-0.2644
robust p-value	0.6173	0.4103	0.4987	0.5625	0.8620	0.8209

Table B.3
Tax system variables (TAX) and income inequality
(additional TIME dummy variables added)

Part (a): Control variable for labor effort (LABOREFF) included.

Regression (1b): $$INEQ = \beta_0 + \beta_1 TAX + \beta_2 TIME95 + \beta_3 GDPPCAP + \beta_4 ECOGROWTH + \beta_5 DEFICIT + \beta_6 GOVEX + \beta_7 LABOREFF + \beta_8 UNEMPL + \beta_9 INFLATION + \varepsilon$$

	TX-PROGRESS	TRF-PROGRESS	ALL-PROGRESS	BURDEN	INCOME	RES-BURDEN
Adjusted R-square	0.5914	0.6886	0.7888	0.6931	0.6006	0.5727
F-statistic	6.47	9.35	15.11	9.53	6.68	6.06
p-value	0.0001	<.0001	<.0001	<.0001	<.0001	0.0002
TAX variable	-0.7749	**-0.9675**	**-1.4298**	**-1.3718**	-0.3480	-0.2427
robust p–value	0.3451	0.0006	<.0001	0.0003	0.2721	0.6330
TIME95	-0.0144	0.0025	0.0139	0.0195	-0.0243	-0.0102
robust p-value	0.7561	0.9482	0.6705	0.6215	0.5912	0.8333
LOG GDPPCAP	**-0.2097**	**-0.2274**	**-0.1928**	**-0.2365**	-0.1740	**-0.2455**
robust p-value	0.0649	0.0172	0.0118	0.0176	0.1027	0.0504
ECOGROWTH	0.2629	0.1272	0.1324	0.0168	0.2800	0.1998
robust p-value	0.4244	0.5798	0.5042	0.9432	0.3921	0.5217
DEFICIT	0.8352	-0.0017	-0.0213	0.6892	0.9583	0.5981
robust p-value	0.2658	0.9972	0.9541	0.2155	0.1962	0.3948
GOVEX	**-1.2626**	**-0.6666**	-0.1285	-0.1615	**-1.3302**	**-1.2637**
robust p-value	0.0119	0.0223	0.7269	0.7142	0.0056	0.0085
LOG LABOREFF	**0.9360**	**0.3916**	0.1481	**0.3957**	**1.1669**	**0.8117**
robust p-value	<.0001	0.0754	0.4607	0.0824	0.0003	0.0090
UNEMPL	-0.0127	**-0.0119**	-0.0039	-0.0075	**-0.0159**	**-0.0152**
robust p-value	0.1528	0.0271	0.4770	0.1571	0.0431	0.0234
INFLATION	-1.0583	-1.5604	-1.0378	-1.4704	-1.2968	-1.4144
robust p-value	0.4530	0.2415	0.3288	0.3114	0.3876	0.3670

Table B.3 Continued

Part (b): Control variable for labor effort (LABOREFF) excluded.

Regression (2b): $INEQ = \beta_0 + \beta_1 TAX + \beta_2 TIME85 + \beta_3 TIME90 + \beta_4 TIME95 + \beta_5 GDPPCAP$
$\beta_6 ECOGROWTH + \beta_7 DEFICIT + \beta_8 GOVEX + \beta_9 UNEMPL + \beta_{10} INFLATION + \varepsilon$

	TX-PROGRESS	TRF-PROGRESS	ALL-PROGRESS	BURDEN	INCOME	RES-BURDEN
Adjusted R-square	0.3372	0.5775	0.7630	0.6174	0.2800	0.4104
F-statistic	3.34	7.29	15.81	8.42	2.79	4.20
p-value	0.0037	<.0001	<.0001	<.0001	0.0116	0.0007
TAX variable	**-1.3158**	**-1.2026**	**-1.5599**	**-1.7012**	0.2173	**-0.9671**
robust p–value	0.0664	<.0001	<.0001	<.0001	0.3198	0.0065
TIME85	**0.1396**	0.0809	0.0586	0.0438	0.1201	0.0710
robust p-value	0.0323	0.4976	0.4264	0.6305	0.2704	0.5454
TIME90	**0.2549**	0.1816	0.1478	0.1458	0.2413	0.1840
robust p-value	0.0499	0.1976	0.1042	0.1837	0.1253	0.2106
TIME95	**0.3012**	0.1993	**0.1659**	0.1648	**0.2771**	0.2104
robust p-value	0.0129	0.1952	0.0968	0.1793	0.0833	0.1759
LOG GDPPCAP	**-0.2531**	**-0.2023**	**-0.1712**	**-0.2250**	**-0.2731**	**-0.2683**
robust p-value	0.0340	0.0309	0.0141	0.0117	0.0224	0.0145
ECOGROWTH	-0.1205	-0.1189	-0.0263	-0.0633	-0.2029	-0.1968
robust p-value	0.5753	0.5572	0.8455	0.7456	0.4240	0.4300
DEFICIT	0.2336	0.1051	0.0229	**1.1974**	0.1995	0.4224
robust p-value	0.7251	0.8220	0.9424	0.0236	0.7783	0.4592
GOVEX	**-1.9640**	**-0.5621**	-0.0786	0.1777	**-1.9520**	**-1.2408**
robust p-value	0.0011	0.0528	0.7812	0.6621	0.0003	0.0051
UNEMPL	0.0021	0.0006	0.0033	0.0022	-0.0003	0.0003
robust p-value	0.7482	0.9176	0.4302	0.6584	0.9641	0.9656
INFLATION	1.1131	-0.7789	-0.9154	-1.1802	0.4548	-0.4363
robust p-value	0.2760	0.4270	0.2557	0.1450	0.6762	0.6600

Table B.4
Tax system variables (TAX) and income inequality
(measured using Atkinson index with ε = 0.5)

Part (a): Control variable for labor effort (LABOREFF) included.

Regression (1): $INEQ = \beta_0 + \beta_1 TAX + \beta_2 GDPPCAP + \beta_3 ECOGROWTH + \beta_4 DEFICIT + \beta_5 GOVEX + \beta_6 LABOREFF + \beta_7 UNEMPL + \beta_8 INFLATION + \varepsilon$

	TX-PROGRESS	TRF-PROGRESS	ALL-PROGRESS	BURDEN	INCOME	RES-BURDEN
Adjusted R-square	0.5866	0.6645	0.7762	0.6762	0.5772	0.5597
F-statistic	7.03	9.42	15.74	9.88	6.80	6.40
p-value	<.0001	<.0001	<.0001	<.0001	<.0001	0.0001
TAX variable	-1.8669	**-1.8290**	**-2.8074**	**-2.6060**	-0.5999	-0.6056
robust p–value	0.2509	0.0018	<.0001	0.0007	0.3945	0.5349
LOG GDPPCAP	**-0.3876**	**-0.4141**	**-0.3334**	**-0.4140**	**-0.3483**	**-0.4698**
robust p-value	0.0777	0.0286	0.0239	0.0333	0.0950	0.0433
ECOGROWTH	0.6148	0.3694	0.3919	0.1862	0.6082	0.4690
robust p-value	0.3413	0.4399	0.3277	0.6988	0.3502	0.4456
DEFICIT	1.6691	0.1923	0.2480	1.6958	1.6599	1.1559
robust p-value	0.1947	0.8408	0.7349	0.1074	0.1970	0.3399
GOVEX	**-2.4089**	**-1.2911**	-0.1467	-0.2751	**-2.6279**	**-2.3862**
robust p-value	0.0120	0.0540	0.8433	0.7716	0.0044	0.0144
LOG LABOREFF	**1.5981**	0.6084	0.1234	0.6557	**1.9664**	**1.3032**
robust p-value	0.0001	0.1859	0.7738	0.1247	0.0041	0.0183
UNEMPL	**-0.0290**	**-0.0294**	-0.0136	**-0.0211**	**-0.0367**	**-0.0350**
robust p-value	0.0852	0.0057	0.1962	0.0444	0.0151	0.0059
INFLATION	-1.2679	-2.8058	-2.1072	-3.0696	-1.6644	-2.2697
robust p-value	0.6039	0.2503	0.2866	0.2601	0.5259	0.4200

Table B.4 Continued

Part (b): Control variable for labor effort (LABOREFF) excluded.

Regression (2): $INEQ = \beta_0 + \beta_1 TAX + \beta_2 TIME + \beta_3 GDPPCAP + \beta_4 ECOGROWTH + \beta_5 DEFICIT + \beta_6 GOVEX + \beta_7 UNEMPL + \beta_8 INFLATION + \varepsilon$

	TX-PROGRESS	TRF-PROGRESS	ALL-PROGRESS	BURDEN	INCOME	RES-BURDEN
Adjusted R-square	0.3454	0.5390	0.7289	0.6025	0.2770	0.4054
F-statistic	4.03	7.72	16.46	9.72	3.20	4.92
p-value	0.0015	<.0001	<.0001	<.0001	0.0071	0.0003
TAX variable	**-2.8481**	**-2.2387**	**-2.9770**	**-3.2664**	0.4585	**-1.8791**
robust p–value	0.0491	<.0001	<.0001	<.0001	0.2480	0.0047
TIME	0.2274	0.1917	**0.1735**	0.2013	0.2357	0.2223
robust p-value	0.1825	0.1627	0.0949	0.1044	0.1934	0.1781
LOG GDPPCAP	-0.3528	-0.3083	**-0.2655**	**-0.3801**	**-0.4133**	**-0.4417**
robust p-value	0.1029	0.1278	0.0777	0.0234	0.0765	0.0425
ECOGROWTH	-0.1570	-0.1724	0.0081	-0.0605	-0.3342	-0.3178
robust p-value	0.7162	0.6724	0.9777	0.8751	0.4996	0.5151
DEFICIT	1.2679	0.6905	0.4976	**2.7397**	1.0580	1.3569
robust p-value	0.2837	0.4945	0.4878	0.0050	0.4307	0.2193
GOVEX	**-3.7544**	**-1.1668**	-0.1701	0.3492	**-3.7354**	**-2.3580**
robust p-value	0.0009	0.0631	0.7736	0.6904	0.0002	0.0047
UNEMPL	0.0038	-0.0014	0.0031	0.0006	-0.0021	-0.0023
robust p-value	0.7665	0.9227	0.7557	0.9560	0.8964	0.8693
INFLATION	0.4850	-2.4378	**-2.6018**	**-3.0281**	-0.6516	-1.8890
robust p-value	0.7746	0.1228	0.0558	0.0287	0.7131	0.2442

Table B.5
Tax system variables (TAX) and income inequality
(measured using the 90/10 decile ratio)

Part (a): Control variable for labor effort (LABOREFF) included.

Regression (1): $INEQ = \beta_0 + \beta_1 TAX + \beta_2 GDPPCAP + \beta_3 ECOGROWTH + \beta_4 DEFICIT + \beta_5 GOVEX + \beta_6 LABOREFF + \beta_7 UNEMPL + \beta_8 INFLATION + \varepsilon$

	TX-PROGRESS	TRF-PROGRESS	ALL-PROGRESS	BURDEN	INCOME	RES-BURDEN
Adjusted R-square	0.5750	0.7831	0.7955	0.7386	0.5821	0.5992
F-statistic	6.75	16.35	17.53	13.01	6.92	7.35
p-value	<.0001	<.0001	<.0001	<.0001	<.0001	<.0001
TAX variable	0.3518	**-1.9414**	**-2.1707**	**-2.3361**	-0.2804	-0.8789
robust p–value	0.7722	<.0001	<.0001	<.0001	0.5332	0.1588
LOG GDPPCAP	**-0.2905**	**-0.2605**	**-0.2038**	**-0.2637**	-0.2416	**-0.3335**
robust p-value	0.0740	0.0196	0.0918	0.0664	0.1497	0.0546
ECOGROWTH	0.2147	0.0485	0.1149	-0.0877	0.2611	0.1267
robust p-value	0.6487	0.8575	0.6816	0.7814	0.5774	0.7675
DEFICIT	0.3558	-0.6933	-0.3442	0.8298	0.6235	0.2911
robust p-value	0.7380	0.2490	0.5205	0.2184	0.5390	0.7440
GOVEX	**-1.8027**	-0.2812	0.2043	0.4009	**-1.7293**	**-1.3303**
robust p-value	0.0154	0.5508	0.7649	0.5796	0.0263	0.0731
LOG LABOREFF	**1.5679**	**0.5445**	**0.4485**	**0.7467**	**1.7543**	**1.1756**
robust p-value	<.0001	0.0625	0.0836	0.0110	0.0005	0.0027
UNEMPL	**-0.0236**	**-0.0142**	-0.0041	-0.0080	**-0.0220**	**-0.0194**
robust p-value	0.0872	0.0369	0.5768	0.2244	0.0739	0.0430
INFLATION	-1.1475	-1.8472	-1.0788	-1.9530	-0.8434	-1.3777
robust p-value	0.5557	0.2230	0.4018	0.2750	0.6620	0.4799

Table B.5 Continued

Part (b): Control variable for labor effort (LABOREFF) excluded.

Regression (2): $INEQ = \beta_0 + \beta_1 TAX + \beta_2 TIME + \beta_3 GDPPCAP + \beta_4 ECOGROWTH + \beta_5 DEFICIT + \beta_6 GOVEX + \beta_7 UNEMPL + \beta_8 INFLATION + \varepsilon$

	TX-PROGRESS	TRF-PROGRESS	ALL-PROGRESS	BURDEN	INCOME	RES-BURDEN
Adjusted R-square	0.1741	0.7083	0.7858	0.6766	0.2710	0.4815
F-statistic	2.21	14.97	22.09	13.03	3.14	6.34
p-value	0.0482	<.0001	<.0001	<.0001	0.0080	<.0001
TAX variable	-0.4578	**-2.3908**	**-2.6348**	**-3.0604**	**0.7413**	**-2.0934**
robust p–value	0.6723	<.0001	<.0001	<.0001	0.0136	<.0001
TIME	0.1169	0.0745	0.0658	0.0888	0.1236	0.1068
robust p-value	0.4715	0.3618	0.3067	0.2701	0.4175	0.3817
LOG GDPPCAP	-0.2055	-0.1394	-0.1134	**-0.2152**	-0.2735	**-0.2850**
robust p-value	0.2702	0.2312	0.2662	0.0556	0.1152	0.0540
ECOGROWTH	-0.2379	-0.1319	0.0060	-0.0427	-0.3279	-0.2883
robust p-value	0.4887	0.5468	0.9720	0.8621	0.3702	0.3952
DEFICIT	0.0786	-0.5397	-0.6044	**1.4562**	-0.2634	0.1761
robust p-value	0.9433	0.4037	0.2283	0.0344	0.8042	0.8240
GOVEX	**-2.8538**	0.0042	0.3940	**1.0718**	**-2.6713**	**-1.1988**
robust p-value	0.0034	0.9909	0.4565	0.0824	0.0017	0.0656
UNEMPL	0.0027	0.0013	0.0054	0.0032	-0.0003	0.0001
robust p-value	0.8107	0.8917	0.4241	0.6181	0.9769	0.9888
INFLATION	1.1156	-1.4781	-1.1950	**-1.7244**	0.1252	-0.9745
robust p-value	0.5300	0.1499	0.2096	0.0643	0.9343	0.4148

Table B.6
Tax system variables (TAX) and income inequality
(reduced sample: without USA data)

Part (a): Control variable for labor effort (LABOREFF) included.

Regression (1): $INEQ = \beta_0 + \beta_1 TAX + \beta_2 GDPPCAP + \beta_3 ECOGROWTH + \beta_4 DEFICIT + \beta_5 GOVEX + \beta_6 LABOREFF + \beta_7 UNEMPL + \beta_8 INFLATION + \varepsilon$

	TX-PROGRESS	TRF-PROGRESS	ALL-PROGRESS	BURDEN	INCOME	RES-BURDEN
Adjusted R-square	0.6085	0.5958	0.7564	0.6592	0.5211	0.5170
F-statistic	6.83	6.53	12.64	8.25	5.08	5.01
p-value	0.0002	0.0002	<.0001	<.0001	0.0011	0.0012
TAX variable	**-1.4554**	**-0.7711**	**-1.2994**	**-1.2661**	-0.2271	-0.3737
robust p–value	0.0225	0.0048	<.0001	0.0004	0.4385	0.3529
LOG GDPPCAP	**-0.3439**	**-0.3046**	**-0.2713**	**-0.3314**	**-0.3070**	**-0.3750**
robust p-value	0.0039	0.0018	0.0001	0.0002	0.0112	0.0020
ECOGROWTH	0.2678	0.1311	0.1289	0.0235	0.2378	0.1621
robust p-value	0.2940	0.5520	0.4532	0.9043	0.3894	0.5140
DEFICIT	**1.0450**	0.1451	0.1077	**0.7967**	0.8293	0.6000
robust p-value	0.0813	0.7677	0.7532	0.0739	0.1967	0.2929
GOVEX	-0.7053	**-0.5820**	0.0117	0.0746	**-1.0354**	**-0.8420**
robust p-value	0.1414	0.0662	0.9684	0.8398	0.0211	0.0500
LOG LABOREFF	**0.5361**	0.3011	0.0262	0.1936	**0.7782**	**0.4296**
robust p-value	0.0154	0.1665	0.8957	0.3684	0.0258	0.0914
UNEMPL	-0.0076	**-0.0117**	-0.0041	-0.0070	**-0.0143**	**-0.0131**
robust p-value	0.3253	0.0381	0.4572	0.2015	0.0513	0.0401
INFLATION	-0.6898	-1.5143	-1.1965	-1.7083	-1.1172	-1.3965
robust p-value	0.5252	0.2043	0.2105	0.1828	0.3846	0.2870

Table B.6 Continued

Part (b): Control variable for labor effort (LABOREFF) excluded.

Regression (2): $INEQ = \beta_0 + \beta_1 TAX + \beta_2 TIME + \beta_3 GDPPCAP + \beta_4 ECOGROWTH + \beta_5 DEFICIT + \beta_6 GOVEX + \beta_7 UNEMPL + \beta_8 INFLATION + \varepsilon$

	TX-PROGRESS	TRF-PROGRESS	ALL-PROGRESS	BURDEN	INCOME	RES-BURDEN
Adjusted R-square	0.5128	0.4671	0.7083	0.5868	0.3157	0.4021
F-statistic	6.26	5.38	13.14	8.10	3.31	4.36
p-value	<.0001	0.0002	<.0001	<.0001	0.0073	0.0012
TAX variable	**-1.8377**	**-0.8865**	**-1.3726**	**-1.3963**	0.1188	**-0.6734**
robust p–value	0.0007	0.0002	<.0001	<.0001	0.5093	0.0290
TIME	**0.2046**	**0.1442**	**0.1132**	**0.1462**	**0.2015**	**0.1812**
robust p-value	0.0034	0.0749	0.0564	0.0448	0.0272	0.0446
LOG GDPPCAP	**-0.3403**	**-0.2511**	**-0.2029**	**-0.2875**	**-0.3466**	**-0.3411**
robust p-value	0.0008	0.0132	0.0059	0.0007	0.0029	0.0018
ECOGROWTH	0.0385	-0.0728	-0.0203	-0.0232	-0.0634	-0.0877
robust p-value	0.8050	0.7085	0.8812	0.8965	0.7543	0.6808
DEFICIT	**1.1360**	0.5513	0.2960	**1.3922**	1.0127	**0.9801**
robust p-value	0.0146	0.3398	0.4303	0.0024	0.1094	0.0833
GOVEX	**-0.9600**	-0.5083	0.0135	0.2664	**-1.1672**	**-0.7947**
robust p-value	0.0329	0.1306	0.9543	0.4585	0.0109	0.0391
UNEMPL	0.0052	0.0022	0.0040	0.0030	0.0021	0.0019
robust p-value	0.3598	0.7536	0.4179	0.5670	0.7807	0.7869
INFLATION	0.5848	-0.6026	-1.0532	-0.9379	0.3005	-0.2216
robust p-value	0.5843	0.5485	0.2519	0.2527	0.7631	0.8033

APPENDIX C:

ADDITIONAL REGRESSION RESULTS:

POVERTY

Table C.1
Tax mix and poverty

Part (a): Taxes on goods and services (GOODS) and poverty.

Regression (3): $POV = \beta_0 + \beta_1 GOODS + \beta_2 GDPPCAP + \beta_3 ECOGROWTH + \beta_4 DEFICIT + \beta_5 GOVEX + \beta_6 LABOREFF + \beta_7 UNEMPL + \beta_8 INFLATION + \varepsilon$

Regression (4): $POV = \beta_0 + \beta_1 GOODS + \beta_2 TIME + \beta_3 GDPPCAP + \beta_4 ECOGROWTH + \beta_5 DEFICIT + \beta_6 GOVEX + \beta_7 UNEMPL + \beta_8 INFLATION + \varepsilon$

	Regression (3)		Regression (4)	
VARIABLE	**PARAMETER ESTIMATE**	**ROBUST P-VALUE**	**PARAMETER ESTIMATE**	**ROBUST P-VALUE**
GOODS	**-4.1856**	0.0085	**-4.5603**	<.0001
TIME			0.3858	0.1469
LOG GDPPCAP	**-1.2143**	0.0131	**-0.8948**	0.0157
ECOGROWTH	1.6703	0.1443	0.6338	0.4237
DEFICIT	0.6203	0.7937	1.2041	0.6062
GOVEX	-0.9358	0.7039	-1.2735	0.5016
LOG LABOREFF	0.2523	0.8090		
UNEMPL	**-0.0978**	0.0029	**-0.0594**	0.0265
INFLATION	-1.5281	0.7422	-1.6443	0.5943
Adjusted R-Square	0.4355		0.3549	
F-statistic	4.28		4.16	
p-value	0.0022		0.0012	

Table C.1 Continued

Part (b): Payroll taxes (PAYROLL) and poverty.

Regression (3): $POV = \beta_0 + \beta_1 PAYROLL + \beta_2 GDPPCAP + \beta_3 ECOGROWTH + \beta_4 DEFICIT + \beta_5 GOVEX + \beta_6 LABOREFF + \beta_7 UNEMPL + \beta_8 INFLATION + \varepsilon$

Regression (4): $POV = \beta_0 + \beta_1 PAYROLL + \beta_2 TIME + \beta_3 GDPPCAP + \beta_4 ECOGROWTH + \beta_5 DEFICIT + \beta_6 GOVEX + \beta_7 UNEMPL + \beta_8 INFLATION + \varepsilon$

	Regression (3)		Regression (4)	
VARIABLE	**PARAMETER ESTIMATE**	**ROBUST P-VALUE**	**PARAMETER ESTIMATE**	**ROBUST P-VALUE**
PAYROLL	-0.3184	0.7530	**-0.9079**	0.0739
TIME			0.1747	0.5311
LOG GDPPCAP	**-0.7978**	0.0824	-0.5080	0.1797
ECOGROWTH	0.7281	0.5952	-0.3301	0.7315
DEFICIT	-0.5954	0.8223	-0.6768	0.8013
GOVEX	-3.3444	0.1863	**-4.4163**	0.0215
LOG LABOREFF	1.1195	0.3672		
UNEMPL	**-0.0953**	0.0064	-0.0488	0.1031
INFLATION	-3.5969	0.4481	-2.5352	0.4546
Adjusted R-square	0.3109		0.1546	
F-statistic	2.92		2.05	
p-value	0.0183		0.0660	

Table C.1 Continued

Part (c): Property taxes (PROPERTY) and poverty.

Regression (3): $POV = \beta_0 + \beta_1 PROPERTY + \beta_2 GDPPCAP + \beta_3 ECOGROWTH + \beta_4 DEFICIT + \beta_5 GOVEX + \beta_6 LABOREFF + \beta_7 UNEMPL + \beta_8 INFLATION + \varepsilon$

Regression (4): $POV = \beta_0 + \beta_1 PROPERTY + \beta_2 TIME + \beta_3 GDPPCAP + \beta_4 ECOGROWTH + \beta_5 DEFICIT + \beta_6 GOVEX + \beta_7 UNEMPL + \beta_8 INFLATION + \varepsilon$

	Regression (3)		Regression (4)	
VARIABLE	**PARAMETER ESTIMATE**	**ROBUST P-VALUE**	**PARAMETER ESTIMATE**	**ROBUST P-VALUE**
PROPERTY	**9.9571**	0.0005	**9.6610**	<.0001
TIME			-0.0222	0.9166
LOG GDP	-0.2027	0.6248	-0.0110	0.9714
ECOGROWTH	0.6748	0.5105	0.0278	0.9656
DEFICIT	0.1970	0.9189	-0.0085	0.9961
GOVEX	-1.0881	0.6549	-1.1836	0.5392
LOG LABOREFF	-0.9033	0.4140		
UNEMPL	**-0.0494**	0.0957	**-0.0408**	0.0246
INFLATION	1.5243	0.6972	-0.8142	0.6834
Adjusted R-square	0.5101		0.5282	
F-statistic	5.42		7.44	
p-value	0.0004		<.0001	

Table C.2
Tax system variables (TAX) and poverty (years 1990–2000)
(TIME variable and LABOREFF variable excluded)

Regression (3c): $POV = \beta_0 + \beta_1 TAX + \beta_2 GDPPCAP + \beta_3 ECOGROWTH + \beta_4 DEFICIT + \beta_5 GOVEX + \beta_6 UNEMPL + \beta_7 INFLATION + \varepsilon$

	TX-PROGRESS	TRF-PROGRESS	ALL-PROGRESS	BURDEN	INCOME	RES-BURDEN
Adjusted R-square	0.2862	0.4644	0.4517	0.4495	0.3981	0.4627
F-statistic	2.83	4.96	4.77	4.73	4.02	4.94
p-value	0.0256	0.0013	0.0016	0.0017	0.0044	0.0013
TAX variable	1.4227	**-3.0652**	**-3.0647**	**-4.0794**	**2.0206**	**-3.9546**
robust p–value	0.6805	0.0161	0.0452	0.0170	0.0248	0.0199
LOG GDPPCAP	**-1.0333**	**-0.7277**	-0.6945	**-0.8461**	**-1.1249**	**-1.0161**
robust p-value	0.0393	0.0911	0.1561	0.0559	0.0114	0.0161
ECOGROWTH	0.9658	0.8027	0.8868	0.6070	1.0535	0.8268
robust p-value	0.4110	0.4531	0.4408	0.5921	0.3815	0.4784
DEFICIT	-0.3770	-1.6855	-0.9757	1.1125	-0.8989	-0.1184
robust p-value	0.8984	0.5005	0.6958	0.6624	0.7367	0.9622
GOVEX	**-4.1619**	-0.7877	-0.2937	0.6828	-3.4449	-1.1016
robust p-value	0.0597	0.7878	0.9309	0.8381	0.1263	0.6974
UNEMPL	**-0.0954**	**-0.0866**	**-0.0737**	**-0.0743**	**-0.0985**	**-0.0885**
robust p-value	0.0060	0.0016	0.0094	0.0046	0.0025	0.0015
INFLATION	-0.0889	-2.8639	-1.7895	-1.8357	-0.2419	-1.4178
robust p-value	0.9861	0.4195	0.6658	0.6609	0.9584	0.7382

Table C.3
Tax system variables (TAX) and poverty
(additional TIME dummy variables added)

Part (a): Control variable for labor effort (LABOREFF) included.

Regression (3b): $POV = \beta_0 + \beta_1 TAX + \beta_2 TIME95 + \beta_3 GDPPCAP + \beta_4 ECOGROWTH + \beta_5 DEFICIT + \beta_6 GOVEX + \beta_7 LABOREFF + \beta_8 UNEMPL + \beta_9 INFLATION + \varepsilon$

	TX-PROGRESS	TRF-PROGRESS	ALL-PROGRESS	BURDEN	INCOME	RES-BURDEN
Adjusted R-square	0.3265	0.4300	0.4318	0.4002	0.3368	0.3787
F-statistic	2.83	3.85	3.87	3.52	2.92	3.30
p-value	0.0192	0.0036	0.0035	0.0061	0.0165	0.0087
TAX variable	0.7619	**-3.0013**	**-3.3043**	**-3.5404**	0.7130	**-2.8008**
robust p–value	0.8162	0.0617	0.0678	0.0514	0.4142	0.0897
TIME95	-0.2535	-0.1952	-0.1836	-0.1609	-0.2348	-0.1877
robust p-value	0.1722	0.2626	0.3048	0.3689	0.1770	0.2653
LOG GDPPCAP	-0.6865	**-0.6658**	-0.5864	**-0.6896**	**-0.7794**	**-0.8678**
robust p-value	0.1185	0.0842	0.1189	0.0774	0.0691	0.0356
ECOGROWTH	1.0187	0.7209	0.8163	0.4908	0.9517	0.6677
robust p-value	0.4241	0.4944	0.4693	0.6795	0.4588	0.5858
DEFICIT	1.0460	-0.8814	-0.3941	1.2527	0.6194	0.3602
robust p-value	0.7321	0.7227	0.8754	0.6452	0.8339	0.8934
GOVEX	-2.9346	-0.6402	0.0459	0.2962	-2.9122	-1.5812
robust p-value	0.2169	0.8207	0.9891	0.9273	0.2372	0.5487
LOG LABOREFF	**1.6564**	-0.0032	-0.1410	0.2873	1.1758	0.3115
robust p-value	0.0667	0.9980	0.9063	0.7684	0.3172	0.7783
UNEMPL	**-0.1016**	**-0.0858**	**-0.0705**	**-0.0764**	**-0.0985**	**-0.0893**
robust p-value	0.0034	0.0033	0.0246	0.0074	0.0027	0.0021
INFLATION	-7.1138	**-7.3304**	-5.9850	-7.0073	-6.9748	-7.1125
robust p-value	0.1655	0.0613	0.1116	0.1061	0.1644	0.1284

Table C.3 Continued

Part (b): Control variable for labor effort (LABOREFF) excluded.

Regression (4b): $$POV = \beta_0 + \beta_1 TAX + \beta_2 TIME85 + \beta_3 TIME90 + \beta_4 TIME95 + \beta_5 GDPPCAP$$
$$\beta_6 ECOGROWTH + \beta_7 DEFICIT + \beta_8 GOVEX + \beta_9 UNEMPL + \beta_{10} INFLATION + \varepsilon$$

	TX-PROGRESS	TRF-PROGRESS	ALL-PROGRESS	BURDEN	INCOME	RES-BURDEN
Adjusted R-square	0.1057	0.3127	0.3849	0.3309	0.1704	0.2713
F-statistic	1.54	3.09	3.88	3.28	1.94	2.71
p-value	0.1643	0.0061	0.0012	0.0042	0.0707	0.0136
TAX variable	-1.8567	**-3.2093**	**-3.8069**	**-4.4507**	**1.3903**	**-3.3838**
robust p–value	0.5030	0.0017	0.0018	0.0012	0.0452	0.0047
TIME85	0.2455	0.0846	0.0442	-0.0092	0.1039	-0.0015
robust p-value	0.4314	0.8186	0.8818	0.9745	0.7872	0.9966
TIME90	0.5399	0.3341	0.2700	0.2446	0.4121	0.2748
robust p-value	0.2324	0.4363	0.4863	0.5055	0.3896	0.5298
TIME95	0.4134	0.1387	0.0810	0.0540	0.2485	0.0913
robust p-value	0.3556	0.7703	0.8398	0.8924	0.6176	0.8421
LOG GDPPCAP	-0.6372	-0.4879	-0.4262	**-0.5505**	**-0.7112**	**-0.6679**
robust p-value	0.1158	0.1453	0.1906	0.0854	0.0624	0.0513
ECOGROWTH	-0.0145	0.0680	0.2793	0.2101	-0.2322	-0.1519
robust p-value	0.9866	0.9284	0.6834	0.7777	0.8049	0.8644
DEFICIT	0.4796	0.0994	-0.0652	2.9654	0.1135	1.0784
robust p-value	0.8649	0.9715	0.9806	0.2969	0.9678	0.6885
GOVEX	**-4.1905**	-0.3924	0.4573	1.4672	**-3.8884**	-1.5659
robust p-value	0.0302	0.8596	0.8591	0.5774	0.0319	0.4313
UNEMPL	**-0.0501**	**-0.0514**	**-0.0449**	**-0.0472**	**-0.0551**	**-0.0520**
robust p-value	0.0747	0.0387	0.0598	0.0394	0.0524	0.0408
INFLATION	-0.8707	-5.5588	-5.5256	**-6.5245**	-3.6508	-5.6923
robust p-value	0.8300	0.1606	0.1260	0.0589	0.3703	0.1343

Table C.4
Tax system variables (TAX) and poverty
(measured using poverty headcount ratio)

Part (a): Control variable for labor effort (LABOREFF) included.

Regression (3): $POV = \beta_0 + \beta_1 TAX + \beta_2 GDPPCAP + \beta_3 ECOGROWTH + \beta_4 DEFICIT + \beta_5 GOVEX + \beta_6 LABOREFF + \beta_7 UNEMPL + \beta_8 INFLATION + \varepsilon$

	TX-PROGRESS	TRF-PROGRESS	ALL-PROGRESS	BURDEN	INCOME	RES-BURDEN
Adjusted R-square	0.4689	0.7750	0.7458	0.7236	0.4536	0.5520
F-statistic	4.75	15.64	13.47	12.13	4.53	6.24
p-value	0.0011	<.0001	<.0001	<.0001	0.0015	0.0002
TAX variable	1.6012	**-3.8369**	**-3.9761**	**-4.7688**	0.1622	**-2.7329**
robust p–value	0.4223	<.0001	<.0001	<.0001	0.8137	0.0106
LOG GDPPCAP	**-0.6237**	**-0.5419**	**-0.4412**	**-0.5470**	**-0.6070**	**-0.7450**
robust p-value	0.0320	0.0040	0.0503	0.0224	0.0673	0.0148
ECOGROWTH	0.3440	0.0521	0.1999	-0.2376	0.3901	0.0909
robust p-value	0.6947	0.9175	0.7360	0.6777	0.6563	0.9036
DEFICIT	0.6048	-1.2673	-0.4647	1.7685	0.8509	0.5164
robust p-value	0.7701	0.2349	0.6511	0.1261	0.6684	0.7414
GOVEX	-1.9535	1.1836	1.8600	**2.6715**	-1.7369	-0.4116
robust p-value	0.1659	0.2706	0.2192	0.0680	0.2559	0.7632
LOG LABOREFF	**2.2034**	0.1915	0.1643	0.5375	**2.1166**	0.9895
robust p-value	0.0002	0.7395	0.7503	0.3076	0.0155	0.1414
UNEMPL	**-0.0558**	**-0.0334**	-0.0160	-0.0203	**-0.0491**	**-0.0406**
robust p-value	0.0404	0.0225	0.3332	0.1345	0.0548	0.0329
INFLATION	-1.8963	-2.9171	-1.3881	-3.1878	-1.3509	-2.4096
robust p-value	0.6037	0.1538	0.4452	0.2210	0.7104	0.4534

Table C.4 Continued

Part (b): Control variable for labor effort (LABOREFF) excluded.

Regression (4): $POV = \beta_0 + \beta_1 TAX + \beta_2 TIME + \beta_3 GDPPCAP + \beta_4 ECOGROWTH + \beta_5 DEFICIT + \beta_6 GOVEX + \beta_7 UNEMPL + \beta_8 INFLATION + \varepsilon$

	TX-PROGRESS	TRF-PROGRESS	ALL-PROGRESS	BURDEN	INCOME	RES-BURDEN
Adjusted R-square	0.0539	0.6570	0.7185	0.6443	0.2214	0.4711
F-statistic	1.33	12.01	15.68	11.42	2.63	6.12
p-value	0.2599	<.0001	<.0001	<.0001	0.0211	<.0001
TAX variable	-0.3951	**-4.1813**	**-4.5225**	**-5.4593**	**1.5822**	**-4.0053**
robust p–value	0.8404	<.0001	<.0001	<.0001	0.0025	<.0001
TIME	0.2239	0.1491	0.1355	0.1731	0.2372	0.2038
robust p-value	0.4261	0.2917	0.2438	0.1976	0.3668	0.3222
LOG GDPPCAP	-0.2828	-0.1642	-0.1219	-0.2970	-0.4239	**-0.4316**
robust p-value	0.4050	0.4381	0.5400	0.1245	0.1772	0.0911
ECOGROWTH	-0.3562	-0.1516	0.0809	0.0120	-0.5208	-0.4299
robust p-value	0.5800	0.7076	0.8312	0.9777	0.4232	0.4641
DEFICIT	0.9285	-0.1531	-0.2442	**3.3856**	0.1982	1.1146
robust p-value	0.6692	0.9145	0.8292	0.0189	0.9219	0.4753
GOVEX	**-3.0976**	**1.9157**	**2.4914**	**3.9207**	**-2.6866**	0.0866
robust p-value	0.0457	0.0547	0.0492	0.0034	0.0432	0.9349
UNEMPL	-0.0048	-0.0067	0.0003	-0.0034	-0.0104	-0.0090
robust p-value	0.8493	0.7519	0.9850	0.8236	0.6859	0.6714
INFLATION	3.4965	-0.9567	-0.3897	-1.4836	1.5015	-0.4042
robust p-value	0.3208	0.5962	0.8213	0.2959	0.5922	0.8373

Table C.5
Tax system variables (TAX) and poverty
(reduced sample: without USA data)

Part (a): Control variable for labor effort (LABOREFF) included.

Regression (3): $POV = \beta_0 + \beta_1 TAX + \beta_2 GDPPCAP + \beta_3 ECOGROWTH + \beta_4 DEFICIT + \beta_5 GOVEX + \beta_6 LABOREFF + \beta_7 UNEMPL + \beta_8 INFLATION + \varepsilon$

	TX-PROGRESS	TRF-PROGRESS	ALL-PROGRESS	BURDEN	INCOME	RES-BURDEN
Adjusted R-square	0.2176	0.2845	0.3147	0.3061	0.2602	0.3173
F-statistic	2.04	2.49	2.72	2.65	2.32	2.74
p-value	0.0884	0.0430	0.0300	0.0333	0.0566	0.0290
TAX variable	-1.2055	-2.4077	-2.9380	**-3.4839**	1.2604	**-3.4357**
robust p–value	0.6762	0.1646	0.1153	0.0520	0.1461	0.0195
LOG GDPPCAP	**-1.1318**	**-0.9998**	-0.9618	**-1.0896**	**-1.3627**	**-1.3841**
robust p-value	0.0746	0.0959	0.1096	0.0609	0.0526	0.0295
ECOGROWTH	0.9306	0.6369	0.6997	0.3698	0.7275	0.4436
robust p-value	0.4079	0.5333	0.4948	0.7197	0.4870	0.6489
DEFICIT	0.6680	-1.2998	-0.9253	0.6907	-0.4760	-0.3530
robust p-value	0.8087	0.6121	0.6878	0.7721	0.8571	0.8812
GOVEX	-1.6940	-0.5686	0.3897	1.0729	-1.9208	-0.2510
robust p-value	0.5520	0.8486	0.9067	0.7439	0.4967	0.9322
LOG LABOREFF	0.3220	-0.5776	-0.9346	-0.7594	-0.5612	-1.2611
robust p-value	0.7821	0.6802	0.4881	0.5335	0.7047	0.3332
UNEMPL	**-0.0857**	**-0.0834**	**-0.0682**	**-0.0712**	**-0.0909**	**-0.0804**
robust p-value	0.0147	0.0049	0.0261	0.0110	0.0030	0.0028
INFLATION	-3.6091	-4.9001	-3.9532	-5.3358	-4.8046	-5.4266
robust p-value	0.4651	0.1756	0.2563	0.1755	0.3094	0.1998

Table C.5 Continued

Part (b): Control variable for labor effort (LABOREFF) excluded.

Regression (4): $POV = \beta_0 + \beta_1 TAX + \beta_2 TIME + \beta_3 GDPPCAP + \beta_4 ECOGROWTH + \beta_5 DEFICIT + \beta_6 GOVEX + \beta_7 UNEMPL + \beta_8 INFLATION + \varepsilon$

	TX-PROGRESS	TRF-PROGRESS	ALL-PROGRESS	BURDEN	INCOME	RES-BURDEN
Adjusted R-square	0.1002	0.1156	0.2112	0.1702	0.0863	0.1399
F-statistic	1.56	1.65	2.34	2.03	1.47	1.81
p-value	0.1773	0.1487	0.0420	0.0750	0.2061	0.1110
TAX variable	-3.5210	**-2.1317**	**-3.0439**	**-3.2590**	1.0027	**-2.3863**
robust p–value	0.1518	0.0921	0.0525	0.0402	0.1227	0.0480
TIME	0.4060	0.2616	0.2038	0.2703	0.3902	0.3258
robust p-value	0.1173	0.3695	0.5023	0.3438	0.2010	0.2847
LOG GDPPCAP	**-0.8537**	-0.6394	-0.5491	**-0.7306**	**-0.9106**	**-0.8574**
robust p-value	0.0515	0.1495	0.2207	0.0675	0.0435	0.0413
ECOGROWTH	0.3341	0.1092	0.2301	0.2267	0.0460	0.0296
robust p-value	0.6718	0.8939	0.7634	0.7678	0.9581	0.9730
DEFICIT	1.7609	0.3796	-0.0866	2.3802	1.0500	1.2905
robust p-value	0.4828	0.8948	0.9745	0.3215	0.7053	0.6214
GOVEX	-1.5095	-0.3199	0.7131	1.4414	-1.8774	-0.5793
robust p-value	0.5030	0.9011	0.8084	0.6298	0.4061	0.8109
UNEMPL	**-0.0441**	**-0.0501**	**-0.0459**	**-0.0482**	**-0.0524**	**-0.0514**
robust p-value	0.0994	0.0664	0.0607	0.0448	0.0723	0.0571
INFLATION	-2.4736	-5.2532	-6.0593	-5.9628	-3.8625	-5.0790
robust p-value	0.5548	0.1789	0.1295	0.1120	0.3058	0.8109

APPENDIX D:

ADDITIONAL REGRESSION RESULTS:

COLLECTIVE HAPPINESS

Table D.1
Tax mix and collective happiness

Part (a): Taxes on goods and services (GOODS) and collective happiness.

Regression (5): $HAPPY = \beta_0 + \beta_1 GOODS + \beta_2 GDPPCAP + \beta_3 ECOGROWTH + \beta_4 DEFICIT + \beta_5 GOVEX + \beta_6 LABOREFF + \beta_7 UNEMPL + \beta_8 INFLATION + \varepsilon$

Regression (6): $HAPPY = \beta_0 + \beta_1 GOODS + \beta_2 TIME + \beta_3 GDPPCAP + \beta_4 ECOGROWTH + \beta_5 DEFICIT + \beta_6 GOVEX + \beta_7 UNEMPL + \beta_8 INFLATION + \varepsilon$

	Regression (5)		Regression (6)	
VARIABLE	**PARAMETER ESTIMATE**	**ROBUST P-VALUE**	**PARAMETER ESTIMATE**	**ROBUST P-VALUE**
GOODS	0.0334	0.9381	0.0646	0.8213
TIME			0.0188	0.6800
LOG GDPPCAP	0.1161	0.5338	0.0409	0.6370
ECOGROWTH	**0.4701**	0.0114	**0.5433**	0.0001
DEFICIT	0.2891	0.5656	0.4704	0.1078
GOVEX	0.2022	0.6461	0.1326	0.7287
LOG LABOREFF	**-0.3574**	0.0520		
UNEMPL	**-0.0081**	0.0879	**-0.0105**	0.0237
INFLATION	1.5245	0.3295	-0.2705	0.6354
Adjusted R-square	0.1682		0.2804	
F-statistic	1.51		2.27	
p-value	0.2521		0.0712	

Table D.1 Continued

Part (b): Payroll taxes (PAYROLL) and collective happiness.

Regression (5): $HAPPY = \beta_0 + \beta_1 PAYROLL + \beta_2 GDPPCAP + \beta_3 ECOGROWTH + \beta_4 DEFICIT + \beta_5 GOVEX + \beta_6 LABOREFF + \beta_7 UNEMPL + \beta_8 INFLATION + \varepsilon$

Regression (6): $HAPPY = \beta_0 + \beta_1 PAYROLL + \beta_2 TIME + \beta_3 GDPPCAP + \beta_4 ECOGROWTH + \beta_5 DEFICIT + \beta_6 GOVEX + \beta_7 UNEMPL + \beta_8 INFLATION + \varepsilon$

	Regression (5)		Regression (6)	
VARIABLE	**PARAMETER ESTIMATE**	**ROBUST P-VALUE**	**PARAMETER ESTIMATE**	**ROBUST P-VALUE**
PAYROLL	**-0.4012**	0.0017	-0.1700	0.3466
TIME			0.0129	0.7443
LOG GDPPCAP	0.0787	0.3076	0.0232	0.7445
ECOGROWTH	**0.3136**	0.0379	**0.4255**	0.0067
DEFICIT	0.0314	0.9507	0.3007	0.3743
GOVEX	0.0170	0.9588	0.1095	0.7192
LOG LABOREFF	**-0.5469**	0.0001		
UNEMPL	**-0.0068**	0.0940	**-0.0097**	0.0333
INFLATION	0.8126	0.5993	-0.5876	0.3611
Adjusted R-square	0.5590		0.3391	
F-statistic	4.17		2.67	
p-value	0.0134		0.0399	

Table D.1 Continued

Part (c): Property taxes (PROPERTY) and collective happiness.

Regression (5): $HAPPY = \beta_0 + \beta_1 PROPERTY + \beta_2 GDPPCAP + \beta_3 ECOGROWTH + \beta_4 DEFICIT + \beta_5 GOVEX + \beta_6 LABOREFF + \beta_7 UNEMPL + \beta_8 INFLATION + \varepsilon$

Regression (6): $HAPPY = \beta_0 + \beta_1 PROPERTY + \beta_2 TIME + \beta_3 GDPPCAP + \beta_4 ECOGROWTH + \beta_5 DEFICIT + \beta_6 GOVEX + \beta_7 UNEMPL + \beta_8 INFLATION + \varepsilon$

	Regression (5)		Regression (6)	
VARIABLE	**PARAMETER ESTIMATE**	**ROBUST P-VALUE**	**PARAMETER ESTIMATE**	**ROBUST P-VALUE**
PROPERTY	-0.5414	0.5937	**-0.8735**	0.0165
TIME			0.0246	0.5238
LOG GDP	0.0870	0.5562	0.0069	0.9162
ECOGROWTH	**0.4645**	0.0205	**0.5820**	<.0001
DEFICIT	0.1975	0.7095	0.3457	0.2114
GOVEX	0.1226	0.8064	-0.0178	0.9545
LOG LABOREFF	-0.2383	0.5066		
UNEMPL	-0.0111	0.2082	**-0.0148**	0.0011
INFLATION	1.3957	0.3888	-0.1956	0.6518
Adjusted R-square	0.2042		0.4216	
F-statistic	1.64		3.37	
p-value	0.2116		0.0154	

Table D.2
Tax system variables (TAX) and collective happiness (years 1990–2000)
(TIME variable and LABOREFF variable excluded)

Regression (5c): $HAPPY = \beta_0 + \beta_1 TAX + \beta_2 GDPPCAP + \beta_3 ECOGROWTH + \beta_4 DEFICIT + \beta_5 GOVEX + \beta_6 UNEMPL + \beta_7 INFLATION + \varepsilon$

	TX-PROGRESS	TRF-PROGRESS	ALL-PROGRESS	BURDEN	INCOME	RES-BURDEN
Adjusted R-square	-0.0398	0.1345	0.1771	0.2463	0.1519	-0.1031
F-statistic	0.90	1.42	1.58	1.89	1.49	0.75
p-value	0.5390	0.2824	0.2308	0.1593	0.2606	0.6397
TAX variable	0.6496	**0.4620**	**0.4577**	**0.6824**	0.3890	-0.0116
robust p–value	0.4040	0.0103	0.0114	0.0020	0.1483	0.9813
LOG GDPPCAP	-0.0796	0.0966	0.0443	0.0796	-0.1319	-0.0089
robust p-value	0.5318	0.3987	0.6711	0.5109	0.2534	0.9240
ECOGROWTH	**0.5331**	**0.4194**	**0.4607**	**0.4334**	**0.4053**	**0.4745**
robust p-value	0.0344	0.0407	0.0136	0.0240	0.0984	0.0411
DEFICIT	0.5364	0.4290	0.4582	-0.0331	0.2936	0.4982
robust p-value	0.3491	0.3901	0.3280	0.9437	0.6488	0.4344
GOVEX	0.4671	-0.0560	-0.0208	-0.2486	0.3870	0.4289
robust p-value	0.3802	0.9037	0.9655	0.5378	0.4361	0.5488
UNEMPL	**-0.0123**	**-0.0113**	**-0.0130**	**-0.0127**	**-0.0111**	**-0.0099**
robust p-value	0.0098	0.0039	0.0023	0.0006	0.0149	0.0302
INFLATION	0.1991	1.9975	1.7696	2.1191	-0.7609	0.4722
robust p-value	0.8855	0.1995	0.2258	0.1794	0.6266	0.7472

Table D.3
Tax system variables (TAX) and collective happiness
(additional TIME dummy variables added)

Part (a): Control variable for labor effort (LABOREFF) included.

Regression (5b): $HAPPY = \beta_0 + \beta_1 TAX + \beta_2 TIME95 + \beta_3 GDPPCAP + \beta_4 ECOGROWTH + \beta_5 DEFICIT + \beta_6 GOVEX + \beta_7 LABOREFF + \beta_8 UNEMPL + \beta_9 INFLATION + \varepsilon$

	TX-PROGRESS	TRF-PROGRESS	ALL-PROGRESS	BURDEN	INCOME	RES-BURDEN
Adjusted R-square	0.1245	0.1097	0.1416	0.2267	0.8624	0.4057
F-statistic	1.32	1.27	1.37	1.65	14.93	2.52
p-value	0.3285	0.3468	0.3078	0.2137	<.0001	0.0756
TAX variable	0.4542	0.1875	0.3178	**0.5696**	**0.6847**	**-0.8547**
robust p–value	0.6305	0.6291	0.4676	<.0001	<.0001	0.0121
TIME95	-0.0095	-0.0131	-0.0198	-0.0240	0.0003	0.0124
robust p-value	0.8183	0.7261	0.5165	0.7717	0.9857	0.7108
LOG GDPPCAP	0.0535	0.1458	0.1266	0.1616	**-0.1335**	-0.0522
robust p-value	0.7701	0.2281	0.3605	0.2603	0.0421	0.6426
ECOGROWTH	**0.5154**	**0.4451**	**0.4503**	**0.4224**	**0.3840**	**0.4657**
robust p-value	0.0338	0.0731	0.0305	0.0513	0.0014	0.0017
DEFICIT	0.3633	0.3088	0.3417	-0.0619	0.0345	0.4753
robust p-value	0.5329	0.5659	0.5005	0.9149	0.9070	0.4154
GOVEX	0.2980	0.0946	0.0334	-0.1986	0.1640	0.5515
robust p-value	0.5151	0.8861	0.9608	0.7077	0.3625	0.1871
LOG LABOREFF	-0.3135	-0.2431	-0.1444	-0.1163	**-0.5918**	**-0.6685**
robust p-value	0.1095	0.4132	0.6769	0.5462	<.0001	0.0031
UNEMPL	**-0.0101**	-0.0094	-0.0116	**-0.0120**	**-0.0090**	-0.0054
robust p-value	0.0942	0.1021	0.1206	0.0181	0.0024	0.2588
INFLATION	1.0881	1.6748	1.6118	1.9663	-0.0427	0.2254
robust p-value	0.3833	0.2642	0.2753	0.2168	0.9622	0.8705

Table D.3 Continued

Part (b): Control variable for labor effort (LABOREFF) excluded.

Regression (6b): $HAPPY = \beta_0 + \beta_1 TAX + \beta_2 TIME85 + \beta_3 TIME90 + \beta_4 TIME95 + \beta_5 GDPPCAP$
$\beta_6 ECOGROWTH + \beta_7 DEFICIT + \beta_8 GOVEX + \beta_9 UNEMPL + \beta_{10} INFLATION + \varepsilon$

	TX-PROGRESS	TRF-PROGRESS	ALL-PROGRESS	BURDEN	INCOME	RES-BURDEN
Adjusted R-square	0.3343	0.3233	0.3905	0.4045	0.4564	0.2627
F-statistic	2.31	2.24	2.67	2.77	3.18	1.93
p-value	0.0659	0.0724	0.0391	0.0339	0.0192	0.1169
TAX variable	0.7247	0.2718	**0.3688**	**0.4978**	**0.3491**	-0.1228
robust p–value	0.2243	0.1380	0.0255	0.0084	0.0546	0.7083
TIME85	0.0116	0.0174	0.0353	0.0383	-0.0313	-0.0178
robust p-value	0.8619	0.8534	0.6911	0.6766	0.6005	0.8399
TIME90	0.0538	0.0279	0.0408	0.0454	0.0173	0.0224
robust p-value	0.3960	0.6514	0.4966	0.4786	0.7825	0.7700
TIME95	0.0097	-0.0070	0.0051	0.0116	-0.0300	-0.0187
robust p-value	0.9158	0.9423	0.9573	0.9059	0.7014	0.8585
LOG GDPPCAP	0.0004	0.0837	0.0735	0.0809	-0.0315	0.0309
robust p-value	0.9955	0.2534	0.3277	0.2604	0.6577	0.6524
ECOGROWTH	**0.5122**	**0.5300**	**0.5070**	**0.4979**	**0.3598**	**0.5233**
robust p-value	<.0001	0.0028	0.0022	0.0037	0.0073	0.0001
DEFICIT	0.4962	0.5013	0.4541	0.0732	0.2551	0.5713
robust p-value	0.1191	0.1872	0.2185	0.8532	0.5064	0.1302
GOVEX	0.4516	-0.0506	-0.0726	-0.2736	0.3274	0.3470
robust p-value	0.2393	0.9082	0.8517	0.5108	0.3328	0.4792
UNEMPL	**-0.0134**	**-0.0122**	**-0.0138**	**-0.0135**	**-0.0112**	**-0.0106**
robust p-value	0.0015	0.0070	0.0011	0.0010	0.0154	0.0408
INFLATION	-0.5595	0.2547	0.4546	0.6151	**-1.4610**	-0.7553
robust p-value	0.3644	0.8137	0.6380	0.5376	0.0921	0.5110

Table D.4
Tax system variables (TAX) and collective happiness
(reduced sample: without USA data)

Part (a): Control variable for labor effort (LABOREFF) included.

Regression (5): $HAPPY = \beta_0 + \beta_1 TAX + \beta_2 GDPPCAP + \beta_3 ECOGROWTH + \beta_4 DEFICIT + \beta_5 GOVEX + \beta_6 LABOREFF + \beta_7 UNEMPL + \beta_8 INFLATION + \varepsilon$

	TX-PROGRESS	TRF-PROGRESS	ALL-PROGRESS	BURDEN	INCOME	RES-BURDEN
Adjusted R-square	0.0905	0.1017	0.1262	0.2387	0.8677	0.3538
F-statistic	1.20	1.23	1.29	1.63	14.12	2.09
p-value	0.4019	0.3899	0.3642	0.2533	0.0006	0.1580
TAX variable	0.3075	0.2495	0.3354	0.6271	**0.6929**	**-0.7873**
robust p–value	0.7489	0.6671	0.5685	0.1830	<.0001	0.0203
LOG GDPPCAP	0.1032	0.1570	0.0989	0.1225	-0.1914	0.0085
robust p-value	0.6607	0.4875	0.7025	0.5928	0.1160	0.9624
ECOGROWTH	**0.5825**	**0.5583**	**0.5850**	**0.5776**	**0.4404**	**0.4790**
robust p-value	0.0397	0.0421	0.0206	0.0293	0.0007	0.0085
DEFICIT	0.5406	0.6024	0.6574	0.2682	0.1857	0.5239
robust p-value	0.4054	0.2894	0.2502	0.6798	0.5973	0.4252
GOVEX	0.1779	0.0035	0.0296	-0.2027	0.3069	0.4457
robust p-value	0.8021	0.9965	0.9697	0.7674	0.2858	0.4822
LOG LABOREFF	-0.3181	-0.2508	-0.2134	-0.2046	**-0.6617**	**-0.5807**
robust p-value	0.2857	0.5108	0.6236	0.4931	0.0004	0.0267
UNEMPL	-0.0095	-0.0092	-0.0108	**-0.0110**	**-0.0083**	-0.0064
robust p-value	0.2007	0.1824	0.2276	0.0768	0.0122	0.2644
INFLATION	1.4508	1.9879	1.7947	2.2557	-0.4182	0.2807
robust p-value	0.4409	0.3010	0.3466	0.2754	0.6814	0.8795

Table D.4 Continued

Part (b): Control variable for labor effort (LABOREFF) excluded.

Regression (6): $HAPPY = \beta_0 + \beta_1 TAX + \beta_2 TIME + \beta_3 GDPPCAP + \beta_4 ECOGROWTH + \beta_5 DEFICIT + \beta_6 GOVEX + \beta_7 UNEMPL + \beta_8 INFLATION + \varepsilon$

	TX-PROGRESS	TRF-PROGRESS	ALL-PROGRESS	BURDEN	INCOME	RES-BURDEN
Adjusted R-square	0.3674	0.4290	0.4720	0.5147	0.5894	0.3536
F-statistic	2.45	2.88	3.23	3.65	4.59	2.37
p-value	0.0783	0.0484	0.0331	0.0218	0.0093	0.0864
TAX variable	0.5821	**0.5854**	**0.5832**	**0.7880**	**0.4898**	-0.3048
robust p–value	0.3502	0.0773	0.0270	0.0087	0.0275	0.5865
TIME	0.0096	0.0661	**0.0590**	**0.0734**	-0.0506	-0.0147
robust p-value	0.7744	0.1740	0.0661	0.0651	0.1780	0.8335
LOG GDPPCAP	0.0789	0.0348	0.0155	0.0166	**0.0860**	0.1123
robust p-value	0.2694	0.6843	0.8378	0.8300	0.0913	0.1875
ECOGROWTH	**0.5864**	**0.7056**	**0.6863**	**0.6651**	0.2285	**0.4842**
robust p-value	<.0001	<.0001	<.0001	<.0001	0.2462	0.0370
DEFICIT	**0.5527**	**1.1013**	**0.9855**	0.4355	-0.2680	0.4546
robust p-value	0.0413	0.0022	0.0027	0.1189	0.5749	0.2809
GOVEX	-0.0799	-0.2291	-0.1643	-0.4260	-0.4683	-0.1723
robust p-value	0.8761	0.5874	0.7008	0.2559	0.2373	0.7269
UNEMPL	**-0.0128**	**-0.0114**	**-0.0135**	**-0.0129**	**-0.0125**	**-0.0106**
robust p-value	0.0052	0.0150	0.0038	0.0030	0.0150	0.0499
INFLATION	0.3436	0.5223	0.7009	0.5555	-0.3291	-0.0755
robust p-value	0.7121	0.5592	0.4442	0.5107	0.6967	0.9417