

Positional Externalities as an Argument for Tax Progressivity:  
A Critical Analysis

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## DEDICATION

*This dissertation is dedicated to my father Chris.*

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## **ABSTRACT**

### **POSITIONAL EXTERNALITIES AS AN ARGUMENT FOR TAX PROGRESSIVITY: A CRITICAL ANALYSIS**

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In the last forty years, social science research has demonstrated that individuals care significantly about relative (“positional”) economic well-being and that gains in private income and/or consumption thereby cast a negative externality on other individuals whose own income and/or consumption declines in relative terms. To resolve the externality, a progressive income or consumption tax has been advocated. In this dissertation I present three papers that critically analyze tax progressivity as a response to positional externalities.

In “Income Variation and Tax Progressivity,” I develop two empirical models to determine how progressive taxation penalizes taxpayers with varying (“lumpy”) income and how income varies over the average individual’s life cycle. I conclude that progressivity results in significant differences in tax burden between people with differently patterned but otherwise equal income, and such differences in burdens may have important implications for the efficiency and equity of progressive tax policy.

In the second paper, “Adaptation, Growth, and Tax Progressivity,” I attempt to measure the welfare effects of progressivity given the well-known effects of adaptation. I construct a theoretical utility model using the life-cycle income model developed in the first paper and combining the utility effects of absolute consumption, positional consumption, consumption growth, and leisure. I postulate that utility from consumption growth, a result of adaptation, is negatively affected by tax progressivity at every level of income. I conclude that the overall effect on utility balances the negative effect with the expected positive effects of increased leisure but depends critically on the relative weight of utility components and other exogenous variables.

In the third paper, “Alternatives to Taxing Positional Externalities,” I discuss ways in which individuals and institutions, especially in the private realm, can act to mitigate the problems associated with positionality. I examine the possibility of diminishing positional externalities through direct behavioral modification as an alternative to Pigovian taxation. Four non-tax approaches are suggested: reducing envy and upward positional comparisons; reducing vanity and the exhibitions of positional superiority; tailoring reference groups to reduce the salience and occurrence of positional comparisons; and excluding the reference group to referents exogenous to social welfare. Building on the conclusions of the second paper, I also summarize the specific problems of tax progressivity in reducing positional comparisons and addressing positional externalities.

## INTRODUCTION

### 1. General Overview

#### *Progressive Taxes*

Progressive taxation, a system of individual taxation in which tax rates increase as the tax base increases, is a policy that prevails in most countries that have an individual income tax. In the United States, federal individual income tax rates have been consistently progressive since 1913, when income taxes were made constitutional by amendment.<sup>1</sup> The degree of progressivity, however, has varied in the United States and around the world. Change in the degree of income tax progressivity is a recurring and almost constant issue of policy debate.

The justification of the existence and degree of progressivity ultimately rests on ethical issues. Because changes in progressivity leave some people better off and others worse off, at least in money terms, economic analysis of the effects is limited due to the difficulty in making interpersonal utility comparisons. Nevertheless, invoking the idea of the diminishing marginal utility of wealth, economists sometimes attempt to show that the utility

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<sup>1</sup> An income tax existed from 1862 to 1872, but was deemed unconstitutional by the U.S. Supreme Court in 1895 (*Pollock v. Farmers' Loan & Trust Co.*). From 1867 to 1872 this early income tax had a single bracket with a nominal exempt amount (*U.S. Federal Individual Income Tax Rates History, 1862-2013*, 2013).

gains and losses are lopsided enough to suggest that a change in the degree of progressivity is socially beneficial, even if not universally so. Models of optimal taxation have also used progressivity in determining how to balance the economic costs and benefits of varying tax rates.

An innovative perspective in behavioral economics has in recent years resuscitated efforts to justify a high degree of progressivity apart from ethical considerations of fairness or promotion of economic equality. The idea is that personal utility is at least partially concerned with one's economic status relative to other individuals in society, and that higher income or consumption by an individual thereby reduces the utility of other members of society. In other words, general economic activity such as work or consumption has private benefits with attenuating social costs; a negative externality exists.

#### *Positional Externalities*

Beginning in the 1970s, surveys of self-reported happiness became widely available to social sciences researchers. Economists found these surveys useful in determining whether traditional measures of societal economic health, such as Gross Domestic Product (GDP), were well-correlated with the reported well-being of a society's citizens. In a groundbreaking article, researcher Richard Easterlin (1974) found that people in richer countries were not much happier than those in poorer countries, but richer members of any particular country were generally happier than the poorer members of that country.

The result, he suggested, meant that people contextualize their income against other citizens of their own country. People may consider themselves better off when they have more money, income, and consumption. But they may also consider themselves better off

just by having more than their own countrymen. People care about their economic position relative to society. This apparently widespread concern became known as positionality.

Researchers quickly became aware that the positionality research suggests a paradox: If everyone chases higher relative consumption, each does so at the expense of everyone else. Each increases his own consumption at a cost to others, imposing a negative externality on all other position-seeking individuals as their relative position decreases.

Scores of studies since Easterlin's have, with a few exceptions, confirmed the hypothesis that people care about their relative position, not only their absolute levels of income and consumption. The degree of the externality is debatable, but the evidence that it exists is strong.

#### *Positional Externalities as an Argument for Tax Progressivity*

In the policy literature, the existence of positionality has resulted in the claim that higher income and consumption has hidden social costs, and like any other negative externality an appropriate policy prescription is to curtail positionality with a Pigovian tax. Properly targeted, a tax on positional economic activity would diminish the externality with offsetting gains and losses in relative income or consumption, and the proceeds could be used to fund redistributive transfers or public goods.

These calls for corrective taxation justified by positional externalities lead to two questions. First: What is the correct level of taxation? My research will not address this question. It should be noted, however, that existing tax rates may already be above the optimal level, depending on people's proclivity for positionality. A large literature has developed numerous optimal taxation models that incorporate positional externalities.

A second question is: Generally, what kind of tax is effective at targeting positionality with little or no collateral negative economic effects? More specifically, is it most appropriate to tax income or consumption? And should the tax be progressive, proportional, or regressive with respect to the tax base?

Whether to tax income or consumption appears to be a point of ambivalence in the positionality research. More often research uses an income tax, apparently due to the greater availability of income data. Naturally it is more methodologically consistent to suggest a tax on what is observed (income) rather than what is not (consumption).

Sidestepping the income versus consumption question, the present research is more concerned with whether a corrective tax should be progressive. Progressive rates can be theoretically applied to either an income or a consumption tax. Even though progressivity in consumption taxation is more complicated and not in use on any large scale,<sup>2</sup> the arguments for and against progressivity would appear to hold whether the tax base is income or consumption.

There are two reasons given for using a progressive tax to correct for positional externalities. First, it is theorized that, on an individual basis, higher levels of per-period consumption are more positional than lower levels. Everyone spends some minimum amount on basic subsistence goods like food and clothing, which are not positional. Beyond this minimum amount, spending is increasingly positional. A progressive tax roughly

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<sup>2</sup> In the United States, the idea of a progressive consumption tax reached its apogee with the Unlimited Savings Allowance (USA) tax proposal developed most thoroughly by Seidman (1997). A modified version was proposed as a bill in the United States Senate in 1995. It died in the Senate Finance Committee.



matches the tax rate with the amount of consumption that is positional consumption. Robert Frank argues for a progressive consumption tax using this argument (Frank, 1995, 1999, 2007, 2011a).

The second reason for using progressive taxes specifically for positional externalities is that higher income people have a greater externality per dollar of income. This is claimed to follow from the idea that positionality is upward-looking. If positional comparisons are only made between oneself and those who are richer (or more consumptive) than oneself, those with the most income or consumption will cast a negative externality on everyone in society, while those at the bottom will not cast a negative externality on anyone. Employing this line of reasoning, Bowles and Park (2005) also argue for a progressive consumption tax.

The two other research studies, which also grapple directly with the application of progressive taxes to positional externalities, are less supportive of progressivity. In an optimal tax model, Ireland (2001) asserts that while greater status-seeking supports *higher* taxes, “unless the rich are more concerned with status-seeking than the poor,” *progressive* taxes do not aid in counteracting social comparison externalities (p. 193). He concludes that “status seeking justifies income taxation and higher MRT [marginal rate of tax], but not an increasing MRT” (p. 211). In a study using game theory to analyze positionality, Hopkins and Kornienko (2004) similarly assert that “the presence of relative concerns does not provide an additional rationale for progressive taxation” beyond other justifications (p. 1100).

## 2. Research Objective

The central question addressed by this dissertation is the following: Given that positional economic activity causes negative externalities, is the use of progressivity in taxation a beneficial policy response? Plenty of existing research argues that positional externalities can be reduced by standard Pigovian taxation, and as indicated some existing research argues that a progressive tax is the most appropriate arrangement of taxation so directed. In opposition, this dissertation intends to show that there are economically substantive reasons why progressivity in taxation is neither the best nor even a positive response to positional externalities, on balance.

The research presented approaches the central question from two angles. First, tax progressivity has some adverse effects that bear on the ultimate goal to be achieved by reducing positional externalities. The harm of positional externalities is the negative effect on individual utility experienced by those who compare themselves economically with earners and consumers. But taxing income or consumption progressively, while reducing these negative effects, may also reduce other positive effects on individual utility in a way that offset the correction of the positional externality. In addition, progressive taxes exacerbate the externality itself; people are more incensed by positional differences because progressive taxes incite positional comparisons, encourage positional jockeying, and create or reinforce more inequitable positional referencing.

Taxes and subsidies are common policy tools for addressing externalities, and in the absence of negotiated solutions among externality parties they can be quite effective in raising social welfare. The second angle of my approach is to explore solutions other than taxes and subsidies that may have better outcomes. My research examines the possibility of

addressing the externality by reducing the salience and incidence of people's reaction to positional differences. Rather than taxing the economic activity that cause positional differences (and beneficial welfare effects besides), the alternative offered directly reduces the importance of positional differences in people's lives.

### **3. Research Significance**

Creating a greater awareness of economic problems involved in addressing positional externalities with a progressive consumption tax can be an important contribution to economic research, specifically the policy response to positionality and inequality. There is ample evidence that positionality and status concerns exist, and progressive taxes have been a natural and common policy response. Such concerns are central to the theoretical justification for tax progressivity. But policy responses to positionality should not be considered in isolation. If progressive taxes have negative effects, these must also be weighed when determining an appropriate policy. Given that a majority of national tax systems use a progressive structure, such a reassessment may have significant implications for fiscal policies the world over.

Also, positionality research fits into the broader concern of how society grapples with economic inequality. If the proposed research shows that one of the most preferred policy tools, progressive taxation, addresses inequality only by damaging other societal interests or by feeding a vicious spiral of positional comparisons and inequitous taxation, more benign policy solutions might be considered. The proposed research intends to draw an outline of possible alternatives.

The research presented differs from existing research that analyzes progressive taxation as a cure for positionality. Unlike the works of Frank or the study by Bowles and Park (2005), it argues that progressivity creates more problems than it solves. Unlike the studies of Ireland (2001) or Hopkins and Kornienko (2004), my dissertation is not centered on the creation of an optimal taxation model. Rather, it investigates problems with progressivity apart from rate structures and looks for alternatives to taxation in approaching positional externalities.

#### **4. Dissertation Topics**

The choice of individual paper topics for three-paper dissertations can vary in the degree that they are related and in the importance with which they serve a common research goal. Often, the topics are not components of a central dissertation plan. Rather, different research ideas in early research investigations form themselves into cohesive research studies of acceptable size, and the connections among these studies become clear and well-formed after the individual papers have matured. In short, the dissertation may be formed by a bottom-up coordination of ideas instead of a top-down idea broken into constituent parts. My dissertation originated in this way.

##### *“Income Variation and Tax Progressivity”*

The first paper is an empirical study that uses panel data to determine how much income varies, both in annual increments and over individuals’ lifetimes, and how this variation can cause some taxpayers to pay more tax for the same overall income due to the application of progressive taxes on an annual basis.

Annual income data for a fairly large United States sample of individuals and families over a fifteen year period are used to determine the effect that occurs due to “lumpiness,” the variation of income that occurs because it is assessed in annual increments rather than the entire period. Average individual income data for age brackets in the United States, collected annually, are used to determine the typical life-cycle income trajectory of men and women using an OLS regression model; this model is then used to determine the effect of overpayment of taxes from progressive annual assessments occurring from life-cycle income patterns. In both, two tax models are used: (1) a generic progressive tax that follows a parabolic curve; and (2) the specific federal income tax rate structure in the United States in the year 2013.

The excessive assessment of progressive taxes is quantified and then discussed from two perspectives. First, the efficient selection of occupations and investment of human capital may be adversely influenced by the excessive taxation paid when such occupations have inherently variable income or when investments have larger risks and payoffs. Second, the application of a progressive tax may be inequitable between people who have different degrees of annual income variation but the same overall lifetime income.

The paper does not prescribe a policy solution to the income variation problem; solutions have been proposed in previous research and have in rare situations become law. But unlike previous research, this paper determines the magnitude of the problem and discusses the complete ramifications.

*“Adaptation, Growth, and Tax Progressivity”*

The second paper integrates the life-cycle income model from the first paper into a theoretical utility model, the most important component of which is the inclusion of the desire for consumption growth. The model is used to gauge changes in individual welfare resulting from changes in tax rates and tax progressivity.

Just as people derive some amount of utility from positional consumption, research of a similar magnitude has shown that people also derive some amount of utility from income or consumption *growth*, constituting an adaptation effect. The paper postulates that progressive tax structures result in lesser utility derived from consumption growth at every consumption level (even for those who pay less in taxes under a progressive system) and that these utility losses should be weighed against any utility gains from diminished positionality.

Researchers in the field of happiness economics have created theoretical utility models in search of optimal taxation before, including models that consider utility derived from consumption growth and others that consider utility derived from relative consumption (positionality). The difference in this study is that it combines these two utility components in the same model. It also specifically inspects the effect of changes in tax progressivity on the utility outcomes. The model uses life-cycle income patterns estimated in the first paper to determine expectations of consumption growth. The model also accommodates differences in individual worker productivity and differences in private and public efficiency in the provision of goods and services.

The model is used to examine three questions: (1) How is work effort affected by the progressivity of taxes? (2) How does the consideration of consumption growth affect the

optimal tax rate in both proportional and progressive tax systems? (3) How do different degrees of progressivity affect individuals with differing productivity growth rates?

*“Alternatives to Taxing Positional Externalities”*

The third paper employs economic principles and moral philosophy to suggest alternatives to using taxes, specifically progressive taxes, to address positional externalities.

Two conditions are necessary for positional externalities to exist. First, a person needs to work and/or consume in a way that is conspicuous to others. Second, those others must suffer a utility loss when faced with this person’s change in income or consumption. An externality tax focuses solely on reducing the first condition by taxing income or consumption. This paper looks at the possibility of reducing the second.

The paper explains the concept of how externalities are reciprocal in nature and the considerations of mitigation and least-cost avoidance are important when considering the menu of policy options. A simplified utility model is used to illustrate how reducing people’s envy and positional comparisons may be just as effective, and possibly more so, at reducing positional externalities and raising utility than taxation alone.

After arguing that it is possible to change the basic structure of people’s utility functions, four general approaches are offered to reduce the salience and incidence of positional comparisons: (1) Reducing envy and positional desire in general through moral education and disapprobation; (2) Reducing vanity and especially the conspicuous exhibition of positional superiority using these same moral methods; (3) Tailoring positional reference group selection so that positional comparisons are less stark and more rare; and (4)

Excluding reference groups to those persons whose utility is extraneous to social welfare, such as foreigners, ancestors, or the individual's past self.

The third paper also shows how progressive taxes in particular fail to address positional externalities. Citing results from the second paper, it shows that progressivity makes taxation ineffective at raising utility levels, especially in light of adaptation effects. Also, for many of the same reasons that the four alternative approaches succeed in reducing positionality, progressive taxes fail: They incite relative economic comparison, encourage and reward envy, and introduce or reinforce a national reference group resulting in more frequent and more inequitable comparisons.

#### *Topic Interaction with the Research Objective*

From one perspective, the third paper, "Alternatives to Taxing Positional Externalities," is the most wide-ranging of the three, and it most directly answers the central dissertation question. It provides a summary critique of progressive taxation with respect to positional externalities and offers alternatives. The principal conclusions of the second paper, "Adaptation, Growth, and Tax Progressivity," are used as one of the arguments in this critique. In turn, the first paper, "Income Variation and Tax Progressivity," provides the empirical foundations for the theoretical models developed in "Adaptation, Growth, and Tax Progressivity." In simple terms, the first paper is used to fill a role in the more expansive second paper, which is used to fill a role in the most expansive third paper. From the limited view of how the three dissertation topics coordinate to answer the central research question, this perspective is clearly accurate.



In fact, the first paper exposes a specific problem with progressive taxation and does not appear to be directly relevant to the question of positional externalities at all. The second paper is directly relevant to the central question but is not exclusively so: Progressive taxes are shown to be a problem for overall utility, while the problem of positional externalities is concerned only with a part of utility. Only the third paper addresses the central question with determined focus. Nevertheless, I believe all three papers are important to an examination of using progressive taxation to remedy positional externalities.

From a different perspective, all three papers are equally consequential. Even if the first two papers play smaller roles in the examination of progressive taxes with respect to positional externalities, they have their own implications outside of this examination. The lumpiness of income in general, and the life-cycle pattern of income in particular, cause significant problems for progressive taxes in their equitable application and efficient allocation of human capital and occupational choice, irrespective of their rationale. Similarly, consideration of how people care for income and consumption growth may not only raise concerns for using tax progressivity to reduce positionality but also provide a more comprehensive theoretical approach for assessing the impact of any income or consumption taxes on work effort, individual well-being, and social welfare.

## **5. General Outline**

There are five chapters in this dissertation. Chapter 1 is this Introduction, which gives a brief overview of the main ideas being discussed, states a clear objective for the dissertation as a whole, explains why the research presented has importance, and succinctly outlines the three papers and how they together intend to address the central question.

Chapter 2 is the first paper, entitled “Income Variation and Tax Progressivity.” Chapter 3 is the second paper, “Adaptation, Growth, and Tax Progressivity.” Chapter 4 is the third paper, “Alternatives to Taxing Positional Externalities.” Chapter 5 summarizes the conclusions of the three papers and offers a more general conclusion with respect to the central question.

The dissertation is structured with the intent that each of the three papers can be read in isolation. Each paper has its own abstract, introduction, conclusion, and (where applicable) appendices. All references have been pooled, however, and are located after the dissertation conclusion. Because each paper has its own introduction and conclusion, the dissertation introduction (the present chapter) and the dissertation conclusion are not intended to introduce the reader to all of the discussion topics or conclusions found in each of the three research papers; rather, they are more general and focus on the connections between the papers and the papers’ significance in responding to the dissertation’s central question.

## INCOME VARIATION AND TAX PROGRESSIVITY

### Abstract

Progressive income taxes have been known to adversely affect taxpayers with volatile income streams (“lumpy income”). Two empirical models are developed: one that determines the extent of progressive tax effects on lumpy income generally; and one that estimates the age-to-income life cycle relation as a special case. The lumpy income model shows that more volatile incomes suffer a greater disadvantage (a “lumpy income penalty”) the more progressive the tax system. It also shows that individual taxpayers (as opposed to families) and lower income taxpayers disproportionately suffer a greater lumpy income penalty and that tax deductions and exemptions exacerbate the lumpy income penalty. The life-cycle income model shows that in the U.S. age and income are strongly correlated: income rises sharply early in working life, levels off in middle age, and decreases gently into retirement. However, a generational effect is captured, and the decrease in income that accompanies old age is happening later and evaporating with later generations. Women have different age-income patterns and generational effects than men. Approximately 40% of the lumpy tax penalty is due to life-cycle income patterns.

## 1. Introduction

### *Progressive Taxation's Lumpy Income Problem*

Progressive taxation is a widespread method for collecting taxes from economic activity (work, consumption, etc.) while simultaneously apportioning the tax burden to those constituents who have the most money income. It is controversial from both ethical and economic efficiency perspectives.

There are a number of enduring objections to using a progressive tax rate structure. One objection that has not been adequately explored is that progressive taxes economically disadvantage those activities that result in uneven tax assessments. Some work projects, for example, take many years to complete and thus may realize income only at the end; income may in these cases be “lumpy,” with several lean years followed by one or more fat years. If taxes are assessed annually (as is most often the case), a progressive tax structure will take more from such projects than it would if either the tax structure were flat or if the same income were spread more evenly over all time periods. Put simply, progressive tax systems tax lumpy income more than the same total income in steady installments.<sup>3</sup> Because people can discern which occupations or work projects are more susceptible to lumpy income, progressive tax systems may steer people away from such occupations and projects despite their economic value.

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<sup>3</sup> Conversely, regressive tax systems tax lumpy income less than the same total income in steady installments. All the conclusions in this paper with regard to progressive tax effects on lumpy income can be applied with opposite effect to regressive taxes.

Unlike wealth, income is a flow variable. Measuring and taxing income must be done within some time interval. Income does not generally remain the same for an individual every day, week, month, or year of their life. Some people are paid for their labor by salary at regular intervals, but those intervals vary from one week to one month or more. Other people work seasonal jobs and get more or all of their income at certain times of year. Still others invest their labor in artistic or entrepreneurial projects that last months or years before they pay income. Depending on the length of the time interval measured, income may be lumpy, with some periods having higher income than others.

Partially in response to lumpy income, governments generally assess an income tax annually,<sup>4</sup> which irons out salary pay periods and seasonal inconsistencies. But because for some people income is paid for work or projects lasting more than one year, an annual time interval may still be typified by income that is quite lumpy. Unpredictable unemployment may also cause lumpiness in a person's annual income figures.

Not only is there lumpy income due to long-project occupations and unemployment, but investment and change in one's own human capital can cause income to vary greatly over an individual's entire lifetime. People generally have rising annual income throughout their life as they progressively gain more work experience. Investment in formal education, usually at the beginning of one's working life, also is characterized by low-income years during formal education followed by high-income years when mature skills are applied.

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<sup>4</sup> Income tax withholding is here ignored as an advance on the annual tax assessment, which generally is the final determination of tax obligation. Also ignored are payroll taxes that are usually proportional and thus not germane to a discussion of progressive tax rates.

Child-rearing also may create a variation of annual income, due both to withdrawal from the workforce and a decrease in recent work experience, especially for women.

Income variation, whether from medium-term lumpiness or life-cycle income patterns, presents a problem for progressive income tax systems. As will be shown, progressive tax structures necessarily tax income that varies over multiple assessment periods more than income that is constant, given the same amount of total income. For example, a person who has two job opportunities, one that pays \$30,000 in year one and \$70,000 in year two or another that pays \$50,000 in both years, will be taxed more by an annual progressive tax when choosing the first opportunity.<sup>5</sup> In effect, progressive income tax systems discourage long-term investment or interruptions in working life, even if those plans are expected to pay income as well or better than their alternatives.

Additionally, an income tax does not achieve as much inter-personal income redistribution as is commonly supposed. If much of the variation and inequality of income that exists for any given period can be explained as inter-generational inequality (*i.e.*, inequality due to differing age and thus experience), progressivity is simply taking more from people when they are old and less from them when they are young (a reverse pension system); it is not only redistributing between differently-abled people but also redistributing from the same person at different periods in the life-cycle. The person-to-person redistributive nature of progressive taxes is weaker, for better or worse.

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<sup>5</sup> This holds true only if the progressive tax rates differ between the \$30,000 and \$70,000 income levels; in other words, to the extent that the system is progressive with respect to the income levels involved.

### *Research Objective*

The objective of this paper is to show empirically that lumpy income in general and life-cycle income variation in particular are disadvantaged by progressive income taxes relative to proportional income taxes. Economists have been aware of these disadvantages for some time; the objective here is to quantify and evaluate them. This objective will be achieved in three parts. First, the paper will show that lumpy income exists if measured in annual increments and measures how often it occurs and how significant it is. Second, the paper will show that income over the typical person's life-cycle exhibits its own lumpy pattern. Third, the paper will show that progressive income taxes contribute to economic inefficiencies when seen through the evidence of lumpy and life-cycle income patterns.

As part of the overall objective to show that progressive taxation is relatively inefficient in its treatment of lumpy and life-cycle income patterns compared to proportional taxation, it is important to establish the preponderance of lumpy income. If progressive taxation were assessed on lifetime income, the lumpiness of income coupled with the progressivity of taxes would pose no problem in human decision-making. Yet most national and local income tax systems make assessments based on annual income levels. Therefore, longitudinal individual income data will be used to test for annual income variability and show how many people experience it and to what degree. A statistic quantifying the comparison between taxing the same total income all at once or in annual installments will show the extent to which lumpiness and progressivity together create economic distortions.

The research will also use time-series aggregate income data to show that income follows a life-cycle pattern, and determine the general pattern and its significance. Although other life-cycle patterns of income variation have been mentioned above (education and

child-rearing), these have been established by other research and will only be covered incidentally as they influence the general trend of men and women separately.

The quantitative research establishing lumpy and life-cycle income patterns will be joined with theoretical research showing that progressive taxation inefficiently discourages economic activity that leads to lumpy or growing income. It will be proven formally that progressive systems tax varying income more than steady income, and the direct implications of these inefficiencies will be discussed. The implications of life-cycle income patterns in light of these inefficiencies will be discussed from the perspective of using taxation for redistributive goals. Finally, a short discussion of alternatives or corrective measures will be provided.

#### *Research Significance*

The existence of lumpy and life-cycle income patterns is a largely ignored problem for progressive income tax systems. Defining the inefficiencies that progressive taxation creates in light of these income patterns can be an important contribution to economic research. Progressive taxation is a controversial public finance policy that may benefit from new evidence of its side-effects. If progressive taxes have yet un-quantified negative effects, these must also be weighed when determining an appropriate policy. Given that a majority of national tax systems use a progressive structure, such a reassessment may have significant implications for current policy.

Establishing the existence and nature of lumpy and especially life-cycle income patterns can also be an important contribution apart from the effects of progressive taxation. The study of economic inequality has recognized that static inequality is partially due to age



effects, but the importance of the notion has long been ignored, possibly due to lack of evidence. Happiness research often concerns itself with the influences of adaptation and of economic growth (of both the individual and society), to which evidence of lumpy and life-cycle patterns can respectively contribute.

### *Paper Structure*

To achieve the research objectives, the paper is organized into six sections, the first being this introduction. Section 2 reviews the existing literature on lumpy and life-cycle income patterns and how taxation interferes with these, especially progressive taxation. Section 3 examines the empirical research methods and theoretical bases for the study. Section 4 presents the research findings, both empirical and qualitative. Section 5 analyzes the findings and discusses the implications for progressive taxation and its critics. Section 6 concludes.

## **2. Literature Review**

### *Lumpy Income and Taxation*

The excess tax that people with lumpy income pay in progressive income tax systems has been known since the emergence of progressive systems in the nineteenth century. Originally, the problem was raised by farmers who had volatile income due to crop failures. In Australia, the Warren Tax Commission in 1920 successfully recommended a special consideration allowing farmers to calculate their tax from an average income over the prior five years (McKerchar & Coleman, 2003). Enacted in 1921, this system was modified over

the years (1936, 1978) and in 1987 it was extended to include “artists, composers, inventors, performers, sportspersons and writers” (p. 208). As of 2012 it was still in effect.

The lumpy income problem was addressed by a well-known 1939 economic journal article by William Vickrey. His article addressed problems with the Australian system and with a similar system enacted for the Wisconsin state income tax in 1928 and abandoned in 1932.<sup>6</sup> His idea was to use a tax averaging technique in which income taxes would consider the accumulated income and taxes paid in prior periods when determining the tax of the current period; the averaging was generalized to any number of prior periods (Vickrey, 1939).

Vickrey’s economic theory and laws attempting to ameliorate the lumpy income problem became known as “income averaging.” A tax averaging law existed in Canada between 1971 and 1982; it was abandoned due to its complexity and because it had minimal gains for the average taxpayer; an attempt to reinstate a similar law failed in 2012 (Davies, 1977). Tax averaging existed in the United States between 1964 and 1986. However, the provision only allowed for the reduction of taxes for those who had rising incomes or income surges; it did not permit someone with a falling income to recover taxes paid at higher rates in former years. It was eliminated when the 1986 Tax Reform law flattened rates and simplified the income tax. The various experiences with income averaging suggest that

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<sup>6</sup> The Wisconsin system, assessing tax on income over the past three years, was withdrawn because it required heavy tax payments (in comparison to annual assessments) in years of reduced income that were common in the early 1930s. The Australian system corrected for this in its first major revision (1936) by limiting tax averaging to primary production (farming, livestock, mining) only. Both systems suffered somewhat from transitional issues and tax evasion schemes.

the problem of lumpiness is recognized by economists and policymakers, but that income averaging struggles with practical and technical considerations that leave the problem unresolved.

### *Life-Cycle Income and Taxation*

A more recent and sustained body of economic literature has researched the variation of income over the life cycle. Whereas the lumpy income concern was connected directly to progressive income taxation, the study of life-cycle income patterns served a broader range of issues. By far the greatest of these is how life-cycle patterns affect the measurement of economic inequality.

In 1975, Morton Paglin authored a seminal article questioning the estimation of Lorenz curves and Gini coefficients derived from snapshots of generalized income data (Paglin, 1975). He showed that incomes over the life of individuals and families vary significantly and that Lorenz curves and Gini coefficients conflate inequality among people with inequality over the life-cycle. He used U.S. census cross-section income data segmented by age groups to produce an “Age-Gini” that captured the portion of observed inequality that was due simply to age differences. The “Paglin-Gini,” an apparently more correct measure of inequality, was computed by subtracting the Age-Gini from the generalized Gini calculation. His empirical analysis suggested that “estimates of inequality” of American income and wealth (at the time), were “overstated by 50%” (p. 608).

Technical problems with Paglin’s method and disagreements over what the Gini coefficient is intended to represent resulted in a flurry of comments and criticisms of Paglin’s article. Though his original premise remained undisputed, the controversy over his

methodology resulted in most researchers ignoring the age-income correlation in Gini calculations. Nevertheless, a few researchers continued to use his method (B. T. Hirsch, Seaks, & Formby, 2001; Needleman, 1979).

Paglin had certainly raised an issue with static inequality measurement. Yet in addition to the practical difficulties in using his specific Gini method, trouble with the persistent general lack of longitudinal data contributed to an ignorance of the importance of life cycles in inequality research. Creedy (1991) produced an extensive review of the difficulties presented in breaking free of annual income data and adopting longer time periods in measuring inequality. He found that “the measurement of inequality using a longer time perspective raises very difficult conceptual and technical problems. These are exacerbated by the fact that so few longitudinal data exist” (p. 56). Researchers simply had to make assumptions, approximations, and find innovative technical solutions.

Despite the difficulties in integrating life-cycle patterns with inequality research, some research using a life-cycle approach began to materialize. Lillard (1977) found that inequality of lifetime wealth was less than both inequality of earnings and (importantly) inequality of earnings within narrow age groups; however, the subjects in the data sample were admittedly somewhat more homogeneous than the overall society. Echoing earlier findings by Kohen, Parnes, and Shea (1965), Shorrocks (1978) determined that “the extent to which inequality declines [among studies] will be directly related to the frequency and magnitude of relative income variations” (p. 377). Bjorklund (1993) accessed longitudinal Swedish wage data to show that differences in lifetime income are 35-40% lower than differences in annual income. Aaronson (2002) chained together two-year earnings histories of individuals with similar characteristics to estimate lifetime earnings inequality among men.

Another policy area where life-cycle income has been a factor is the proposition of making taxes dependent on age. Because individuals have no control over their chronological age, varying tax rates with age appears to be a way to (loosely) match tax levies with ability to pay while avoiding any labor supply side-effects of progressive taxation.

Age-dependent taxation is a relatively new idea. Although early on Mirrlees (1971) hinted at the importance of lifetime income in his seminal article on optimal income taxation, the idea appears to have originated with an unpublished paper by Michael Kremer (2002), who determined that marginal income taxes not conditioned on age are unlikely to be optimal. Weinzierl (2011) showed that making taxes age-dependent results in higher optimal tax rates on older workers and significant welfare gains which are capable of being Pareto-improving. His article provides a thorough review of the age-dependent taxation literature.

In “Should Taxes Be Based on Lifetime Income? Vickrey Taxation Revisited,” Jeffrey Liebman (2003) tied together lumpy income and age-dependent taxation in a discussion of lifetime income taxation. Liebman showed how differing variation levels of the same lifetime income results in differing lifetime taxes; this is essentially the lumpy income complaint. Using longitudinal U.S. Social Security wage data and surveys of a Univ. of Michigan Tax Panel, he illustrated the difference of tax payments if income were averaged over long periods. Liebman then developed a distributional-neutral Vickrey tax proposal and examined the welfare implications of his proposal using the wage data sets. He also showed how welfare gains can be made by reducing taxes on younger taxpayers while increasing them on older ones, a common refrain of age-dependent tax studies.

Liebman’s study in many respects is similar to the research I present here on the lumpy income problem. He showed empirically that people pay more lifetime taxes when

assessed annually than when averaged, and he showed that this affects some taxpayers more than others. However, because the determination of the magnitude of the lumpy penalty appears to be subordinate to his revamped Vickrey model, Liebman did not construct a useful statistic to quantify the lumpy penalty. He did not compare how different tax regimes have different sized and differently distributed lumpy income penalties on taxpayers; progressivity in particular was not addressed. His study also placed greater emphasis on assessing the impact of annualized assessment of specific features of U.S. federal taxes such as Social Security contributions and the Earned Income Tax Credit (EITC). As my paper is intended to be more theoretical, references to specific tax systems is present yet limited.

#### *The Progressive Consumption Tax*

Insofar as discussions of lumpy income or life-cycle income are connected to taxation, they invariably refer to progressive income taxation. As the literature concerned with progressive consumption taxation is new and relatively small, little analysis of how lumpy income and life-cycle income patterns affect consumption taxes with progressive rates yet exists. Nevertheless, Weisbach (2006) notes that with a progressive consumption tax lumpy consumption will create higher taxes than smoothed consumption. Durable goods would need to be amortized, and various consumption smoothing methods (renting, borrowing) would be employed. Weisbach suggests a Vickrey averaging system for consumption taxation, though notes multiple system problems that remain unresolved.

### 3. Research Methodology

#### *Research Approach*

I intend to show that lumpy and life-cycle income patterns continue to pose a significant problem for progressive income taxation, and are not entirely solved by progressive consumption taxation. This entails quantifying the tax consequences of both lumpy income and lifetime income in relation to annual income taxed progressively and examining how various tax alternatives may mitigate or avoid these tax consequences.

For the lumpy income case, my approach shall be to apply two progressive tax schemes against a longitudinal sample of U.S. multi-year income figures and assess the differences between the sum of taxes assessed annually and a tax assessed after the entire multi-year period (a “lifetime” tax). The first tax scheme shall be a generic (*i.e.*, theoretical) progressive tax, used to show the general properties of progressivity in relation to lumpiness. The second tax scheme shall be an explicit (*i.e.*, applied) progressive tax, used to illustrate how progressivity affects lumpy income with a real-world tax system.

The critical analysis shows how a single tax on lifetime income differs from taxing lifetime income in annual installments, due to the variation in annual income. The annual and lifetime tax liability is calculated for each individual/family and then aggregated and analyzed for the entire sample.

For the generic progressive scheme, the annual tax of the individual/family (hereafter, the “taxpayer”) is determined using the following generic progressive income tax formula:

$$t_i^n = r\bar{y}^n \left( \frac{y_i^n}{\bar{y}^n} \right)^p \quad (1)$$

In (1):  $r$  is the tax rate (immaterial for annual to lifetime comparison, but for simplicity it is set to 10%);  $y_i^n$  is the income of the taxpayer  $i$  in year  $n$ ;  $\bar{y}^n$  is the average income of all taxpayers in the sample for year  $n$ ;  $p$  is the progressivity factor (such that  $p > 1$  is progressive,  $p = 1$  is proportional, and  $0 < p < 1$  is regressive; the tax being more progressive as  $p$  increases); and  $t_i^n$  is the tax for taxpayer  $i$  in year  $n$ . The lifetime tax is determined using an aggregate version of the same model:

$$T_i = r\bar{Y} \left( \frac{Y_i}{\bar{Y}} \right)^p \quad (2)$$

In (2):  $Y_i$  is the sum of taxpayer  $i$ 's annual incomes;  $\bar{Y}$  is the sum of the annual average incomes of all taxpayers in the sample for the years applicable to the current taxpayer; and  $T_i$  is the lifetime tax for taxpayer  $i$ . As will be seen in equation (5) below, the intent is to compare the total taxes an individual pays annually per equation (1) (summed across all years) with the tax an individual pays if assessed once in their lifetime per equation (2).

For the explicit progressive scheme, the taxpayer's annual tax is calculated using a traditional U.S. income tax schedule of brackets. Specifically, the U.S. 2013 federal income tax brackets shall be used; the brackets shall be converted to constant dollars using the CPI-U (1982-84=100) price index to make them align with the PSID income data similarly indexed.

$$t_i^n = b(y_i^n) \quad (3)$$

In (3): Function  $b$  is the tax calculated through the tax schedule (brackets); the other variables are per equation (1). Note that with regard to the tax schedule function, I used different income brackets for individuals (Single) and families (Married filing jointly).



The lifetime tax for the explicit scheme shall be calculated by summing the annual incomes of the taxpayer, dividing this by the number of income years for this taxpayer, then applying the brackets. The resulting tax is multiplied by the number of income years to arrive at the lifetime tax:

$$T_i = n * b\left(\frac{Y_i}{n}\right) \quad (4)$$

In (4):  $n$  is the number of years for taxpayer  $i$ ; function  $b$  is per equation (3); and other variables are per equation (2).

For both schemes, a comparison at the taxpayer level between a single lifetime tax payment and the sum of annual tax payments is perhaps best represented by ratio of the former over the latter. Note that the analysis shall not prescribe the system for collecting the lifetime tax payment, such as the system presented by Vickrey (1939), thus allowing for simplicity to ignore the consideration of interest.<sup>7</sup> I will call the lifetime to annual tax payment ratio the individual's lifetime adjustment factor (LAF, or  $A$ ):

$$A_i = \frac{T_i}{\sum_n t_i^n} \quad (5)$$

If the taxpayer has the same income for all years, or the tax system is proportional,  $A_i$  will equal unity. The adjustment factor  $A_i$  will be less than one if both (a) the taxpayer's

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<sup>7</sup> A lower lifetime tax collected in installments (such as in Vickrey's system) would afford a taxpayer interest benefits and drawbacks that roughly equalize depending on the flow of income. If a lifetime tax is lower than the sum of annual taxes (as will be shown in the research), there would be an added interest benefit of invested lower tax payments over the life of the taxpayer. In this way, the present research may understate the lumpy tax penalty. However, as any reform would probably demand revenue neutrality, the overall effect on social welfare would be nil.

annual income stream is varied or lumpy, and (b) the tax system is progressive. As lumpiness and/or progressivity increases, the factor  $A_i$  shall approach zero.<sup>8</sup> If the tax system is monotonically progressive, the adjustment factor shall always be less than or equal to one, indicating that progressive taxes always make people with lumpy incomes worse off. A proof of this is provided in Appendix A.

Since it is proven that any income lumpiness combined with a progressive tax will result in single lifetime tax payments being lower than the sum of annual tax payments (*i.e.*, the adjustment factor will be less than or equal to one for all taxpayers), it is necessary to create a revenue-neutral adjustment factor (RNAF), such that total tax liabilities in both annual and lifetime payment systems would be equal. This can be calculated as follows:

$$RNAF = \frac{\sum T_i}{\sum_i \sum_n t_i^n} \quad (6)$$

The RNAF statistic serves as a quick reference for how much lumpy income is adversely affected by progressive tax rates assessed on an annual basis for the sample as a whole. It measures the portion of total revenue the government was to retain if they taxed individuals on their *average* annual income (over their lifetime) rather than on annual income as it actually occurs (with variations of high and low income years). Similar to the taxpayer LAF, if income is flat for each taxpayer, or the tax system is wholly proportional, RNAF will equal unity. As income becomes lumpy or tax rates become progressive, the RNAF sinks

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<sup>8</sup> The converse is also true: regressive tax systems would have a taxpayer lifetime discount rate that exceeds one to the degree that taxpayer's annual income is lumpy and the tax system is regressive.

below one towards zero.<sup>9</sup> The LAF and RNAF statistics both essentially measure the same thing: The size of penalty that lumpy income suffers under progressive taxation. The difference is simply that the lifetime adjustment factor (LAF) measures this on an individual (or single data point) basis while the revenue neutral adjustment factor (RNAF) measures this on a system-wide basis.

For the life-cycle income case, my approach shall be to chain together aggregate age cohort income into an approximation of generational income. Generational income data can then be used along with generation age (birth year) to estimate coefficients of a generalized age-to-income model. The model will be used to show how life-cycle income is also affected by the lumpy tax penalty.

Longitudinal data covering the entire working life is generally unavailable or compromised by data limitations. Instead, annual income data aggregated for ten-year age

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<sup>9</sup> To equalize the revenue, the lifetime tax rate could be divided by the RNAF for each taxpayer. The result would be an adjusted taxpayer lifetime tax (V).

$$V_i = \frac{T_i}{RNAF}$$

Substituting this adjusted tax  $V_i$  for  $T_i$  in equation (5), a taxpayer lifetime normalized rate (LNR or N) is calculated:

$$N_i = \frac{V_i}{\sum_n t_i^n}$$

A normalized rate above one would indicate a taxpayer who has less lumpy income than average, and who would pay more (to be exact, the normalized rate times his total annual income payments) under a lifetime assessment of the given progressive tax under revenue neutrality. Conversely, a normalized rate below one would indicate a taxpayer who has lumpier income than normal and who would pay less.

cohorts is available. I intend to chain together the data, such that the income for the same age cohort is tracked over the cohort's lifetime. For example, people born between 1943 and 1952 would be in the 15 to 24 year age range in 1967, the 25 to 34 range in 1977, the 35 to 44 range in 1987, the 45 to 54 range in 1997, and the 55 to 64 range in 2007. In this way, annually measured age cohort income data can provide estimates of how income progresses over people's lifetimes by constructing several overlapping ten-year generation cohorts.

The underlying expectation is that there is a causal relation between work experience and income and this effectively translates into a correlation between age and income. However, it is well known that this relationship is not linear: middle-aged workers earn significantly more than young workers (due to experience), but elderly workers earn somewhat less than middle-aged workers (due to less workforce participation). Therefore, unlike experience, age should positively affect income up to some point and then have a negative effect (resembling a coat hook).

Since I am not attempting to prove causality between age and income, I will dispense with the theoretical framework of how experience and income are connected. Instead, I start with an equation of how age and income are correlated:

$$y = \alpha_1 + \alpha_2 z + \alpha_3 z^2 + \alpha_4 g + \alpha_5 z g \quad (7)$$

In (7):  $y$  is annual income,  $z$  is age, and  $g$  is birth year. The age term is coupled with a squared term since it is expected to have an age inverted parabolic relation to income. The birth year term is to account for a general income trend, and the combinatorial term is to measure different trends for young versus old.

With the income data transformed to represent specific generations rather than measurement years, the approach shall be to create an OLS regression based on equation (7)

that shows the coefficients of this age-to-income model. The coefficients are used to produce age-income curves for a sample of generations (birth years) to illustrate the results. The model-generated samples will be fed into the lumpy income tax schemes to determine the lumpy tax penalty arising from the general life cycle.

#### *Data Collection – Lumpy Income*

To estimate the prevalence of lumpy income and its response to tax progressivity, I use data from the Panel Study of Income Dynamics (PSID) longitudinal household survey in the United States (PSID, 2013). The data has four continuous (non-bracketed) comprehensive income variables with annual data for an extended period (more than ten years): (1) individual taxable income (ITI); (2) total family unit money income (FMI); (3) family taxable income (head and wife) (FTI); and (4) family (a) head (FHI) and (b) wife (FWI) total labor income.

Of the four PSID variables available, individual taxable income (ITI) and family taxable income (FTI) were used in the analysis. FTI includes income from wages, farming, proprietorship(s), professional practice, and boarders from both family head and wife. The variable ITI includes an individual's taxable income, comprising both labor and asset income; for married couples, the combined asset income was split in half. The variable FMI includes FTI plus total transfers of head and wife. Since governments generally assess taxes before transfers, this variable was not appropriate for determining tax liability. The variables FHI and FWI separate FTI between head and wife and remove (or don't add) capital income from farming, proprietorship(s), and boarders, leaving only the labor portion. As many tax systems in general and the U.S. income tax system in particular count such capital income as

taxable income at the regular income tax rates (not as capital gains income), a labor income variable also did not seem appropriate.

The ITI data (hereafter referred to as the individual sample) are available for years 1975 to 1989 and the FTI data (hereafter referred to as the family sample) for years 1968 to 1992. The individual sample indicates the age of the individual but not the sex; family sample indications of this kind were complex. All data are in current dollars. Because income tax systems generally seek to eliminate price index fluctuations, for example by indexing tax brackets, the figures were all converted to constant dollars using the annual averages of the CPI-U chain-weighted (1982-84 = 100) price index.

The PSID survey issues a sampling weight for each individual/family for each survey year; they are intended to make the sample demographically balanced. These sample weights could not be used: they are not persistent across interview waves and the tax averaging analysis depends on multi-year summation and analysis.

Other longitudinal data were considered. The U.S. Social Security Administration (SSA) provides wage data from payroll taxes. The principal difficulties are: (1) reported wages are capped at the tax liability ceiling, and this eliminates a large amount of income variation, especially in earlier years, and (2) business owners use a variety of methods to avoid reporting wage income (which has payroll taxes deducted). Because of these limitations, the SSA data set was only a second-best alternative. The U.S. Census Bureau Survey of Income and Program Participation (SIPP) data was another possibility. However, the full income data is bracketed, not continuous, and bracketing diminishes lumpiness. SIPP does have continuous data for business income only. This would not be appropriate to show the impact of progressive taxes on lumpy income generally, but could be useful in

follow-up studies showing the relative lumpiness and tax concerns of business owners specifically.

#### *Data Collection – Life-cycle Income*

Comprehensive working life annual income data at the individual level is not readily available. In addition to the problems just mentioned for SSA and SIPP data, the PSID data used in the lumpy income research is imperfect for a full account of income over the life cycle. The data for any single individual or family does not cover the full working life from age 18 to 65 (or thereabouts): family income data covers only twenty-five years and has no indication of age or sex because it aggregates within the family unit; individual income data covers only fifteen years. A possible solution is that data could be chained by considering each individual in the sample as representative of the typical individual for the age range measured. Ultimately, such an approach was rejected because it sacrifices individuality just as the aggregate approach but does not have the comprehensive and inter-generational benefits of aggregate data.

The data set used for estimating the life-cycle income pattern is the U.S. Census Bureau Current Population Survey (CPS), Annual Social and Economic Supplement (ASEC), Table P-9 (CPS, 2012). The CPS surveys 60,000 households on a monthly basis and uses sampling and weighting techniques to extrapolate nationwide aggregates based on the household questionnaire results. Mean and median income data are available for individuals, families, and households. These economic data do not include corporate self-employed persons. The data are divisible by geographic region, sex, race, 10-year age groupings, education level, occupation, and work status. For purposes of estimating life-cycle income

patterns, I used the age grouping data, which had a breakdown by sex within the age groupings.

For life-cycle analysis, the data on individuals is more appropriate than the data on families or households. Families and households do not form until after the working life has begun, so the data for early life age cohorts (*e.g.*, 15-24 year olds) is limited to those who start families and households early, and is therefore likely biased. For example, in 2011 the CPS estimated that 13,520,000 families had income where the age of the householder was between 25 and 34. This number increased with older cohorts up to 17,552,000 for householders between age 45 and 54. Yet for the youngest cohort (15 to 24) only 3,335,000 families with income were estimated. Using family data leaves a majority of people in this lowest age group out of the sample. A similar problem exists with household data.<sup>10</sup> Also, family and household data do not separate by sex, so there is no possibility of disentangling child-rearing workforce absences.

The historical data available for individuals (separately, men and women) are median income for years 1947-2011 and mean income for years 1967-2011. Whether to use median income or mean income is debatable; however, since the median income data lacks some critical data in the sample (see below), mean income data were used. The data is also provided in both current and constant dollars (through a CPI-U-GM price indexing). Since

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<sup>10</sup> In 2011, there were 6.2 million households with income where the age of the head of household was between 15 and 24. This jumps up to 19.9 million for 25 to 34 year olds and peaks at 24.2 million for 45 to 54 year olds.



the research objective is to quantify the life-cycle pattern of real income and indexed progressive tax effects, only constant dollars were used.

The age cohorts in each data year are 15+, 15-24, 25-34, 35-44, 45-54, 55-64, 65-74, 65+, and 75+. However, the 15-24 cohort was not started until 1974 (for both median and mean data), and the 65-74 and 75+ cohorts were not started until 1987 (again for both). The 65+ and 75+ age cohorts do not conform to the translation of age cohorts to generational cohorts, so they were discarded in favor of the single 65-74 cohort. The 15-24 age cohort is much more troubling, because income rises sharply from this cohort to the next and that income growth is central to understanding limitations of progressive taxation with respect to life-cycle patterns. For mean income, the missing data for the 15-24 age cohort nevertheless could be calculated by multiplying the person count by the average income for every other cohort, and subtracting the sum of these from the multiplied total income of the 15+ cohort.<sup>11</sup> For median income, no such accommodation could be made.

#### *Data Analysis – Lumpy Income*

In addition to using graduated tax rates to make systems progressive, governments may use tax deductions, exemptions, and credits to reduce tax liability for targeted economic activity and to exempt some income for basic need satisfaction. The data do not support the inclusion of all these provisions (which would anyways make the analysis hopelessly complex), but for each taxpayer a standard deduction and exemptions can easily be subtracted from income levels prior to applying the tax schemes. Whether subtracting these

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<sup>11</sup> This calculation was also performed on the years for which cohort 15-24 data exists, to ensure that the inference is valid.

amounts is appropriate is debatable. Theoretical analysis would argue against the subtraction while analysis of the practical effects of progressivity would argue for them. Therefore, I included deductions and exemptions depending on the feature or statistic being analyzed. The levels used are from the 2012 U.S. federal income tax, and they are converted to constant dollars through the CPI-U price index.<sup>12</sup> For labeling purposes, Gross Taxable Income (GTI) refers to raw taxable income levels from the PSID individual and family samples; Net Taxable Income (NTI) refers to GTI minus the applicable deduction and exemption(s).<sup>13</sup>

When calculating tax liabilities under the two tax schemes, some edits were necessary. First, since income figures included negative values (*e.g.*, from proprietor's losses) and net taxable income after subtracting deductions and exemptions could also be less than zero, annual and lifetime tax calculations under progressive schemes were given a floor of zero. The Earned Income Tax Credit (EITC) and several other refundable tax credits in U.S. federal tax law would therefore make the analysis more progressive were they considered. Second, in some rare cases the generic progressive tax formula can result in a tax liability greater than the (gross or net) taxable income. Therefore, a tax ceiling equal to the (gross or net) taxable income of the period (annual or lifetime) was applied.

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<sup>12</sup> For the individual sample, the adjustment is \$2591.46 for a standard deduction plus \$1655.05 for a single exemption, for a total adjustment (difference between GTI and NTI) of -\$4246.51. For the family sample, the adjustment is \$5182.92 for a standard deduction plus \$4965.15 for three exemptions, for a total adjustment of -\$10148.07.

<sup>13</sup> Note that the generic progressive tax uses either GTI or NTI for both the individual's income and the average income when calculating the tax.

One of the challenges in testing the lumpy income proposition is getting longitudinal income data that spans enough periods (years) so that lumps can materialize. As the life-cycle research suggests, however, income variation may take an entire working life to manifest itself completely. How many years of annual data are enough to adequately provide an indication of the lumpy income problem's severity?

To determine this, I analyzed the FMI data using successively longer sample ranges for all families. I calculated the RNAF statistics for each sample under each tax scheme. In this analysis, deductions and exemptions were not subtracted (GTI was used). Table 1 shows the results.

<b>TABLE 1: LUMPY INCOME STATISTICS FOR VARIOUS SAMPLE SPANS FOR GROSS TAXABLE INCOME (GTI)</b>				
<i>Sample Span (Years)</i>	<i>Sample Size</i>	<i>Median CV of GTI</i>	<i>RNAF</i>	
			<i>Generic Progressive Tax*</i>	<i>Explicit Progressive Tax</i>
<b>2</b>	13,212	0.169	0.988	0.989
<b>3</b>	12,010	0.232	0.984	0.984
<b>4</b>	10,954	0.262	0.981	0.981
<b>5</b>	10,103	0.281	0.979	0.978
<b>10</b>	6,729	0.347	0.972	0.968
<b>15</b>	4,556	0.362	0.969	0.963
<b>20</b>	2,810	0.376	0.963	0.956
<b>25</b>	1,575	0.394	0.956	0.948
Data sample: PSID, family. * Progressivity factor: 1.35.				

The median coefficient of variation (CV) of family income increases as the data span increases, indicating that income data gets lumpier as more years of data are included.

Though the increase is less significant with longer spans, the increase is monotonic. Also, the RNAF level decreases with longer data; single multi-year tax payments decrease as a percentage of total annual tax payments if more years are added. Since this is also monotonic through 25 years, it appears that the longest data span (of those available) would provide the best account of the relevant tax effects.

Yet as Table 1 shows, the observation pool shrinks dramatically with larger time spans. To avoid depleting the sample size while retaining lumpiness approximate to lifetime data, the final sample used a mixed pool of families: ten years was set as the minimum number of observations (*i.e.*, years) for each family, but families with more observations had all observations included. The resulting pool of families had 6729 observations, a median CV for annual GTI of 0.398, and a RNAF (from GTI) of 0.957 for generic progressive (using a 1.35 factor) and 0.950 for explicit progressive. This approach appeared to capture the best mix of sample size and lumpiness. The same rule (ten year minimum, no maximum) was applied to the individual sample. The individual pool had 8667 observations, a median CV for annual GTI of 0.651, and a RNAF (from GTI) of 0.933/0.946.

Initial analysis of the income data using the final sample shows a wide variety of lumpiness in both the individual and family samples. Table 2 lists annual income variation statistics for both data samples at various percentiles of lumpiness. It also lists the average mean income of individuals/families within those percentiles.

<b>TABLE 2: DISTRIBUTION OF VARIATION OF ANNUAL GROSS TAXABLE INCOME (GTI)</b>				
<i>CV Percentile</i>	<i>Individuals</i>		<i>Families</i>	
	<i>CV Cutoff</i>	<i>Mean GTI (\$)</i>	<i>CV Cutoff</i>	<i>Mean GTI (\$)</i>
<b>1</b>	3.873	242	1.479	3,275

<b>5</b>	2.695	1,297	1.006	8,621
<b>25</b>	1.168	2,503	0.576	13,866
<b>50</b>	0.651	5,743	0.398	17,403
<b>75</b>	0.339	8,743	0.281	19,701

Data Source: PSID.

Several insights can be taken from this table. First, as could be expected, individuals generally have more variable annual income than families. Second, the range of annual income volatility for both individuals and families is significant: there are many stable incomes and many highly volatile incomes. Third, the most volatile incomes are generally from individuals and families that do not have high incomes. Note that the median mean GTI (*i.e.*, the mean annual GTI of the middle individual or family) for individuals is \$7,666 and for families is \$19,604. The mean GTI of the most lumpy percentiles are quite lower than these (though the bottom quartile would appear to also be lower, leaving the third quartile as the most affluent). These findings would appear to indicate that lumpiness may affect those with low lifetime incomes more than those with high lifetime incomes.

#### *Data Analysis – Life-cycle Income*

The CPS age-income data arranged in its original form provides a good indication of an age-to-income relationship. Arranged as it is by ten-year age cohort by survey year, a graphical representation of the data shows the income differences between cohorts in rolling cross-section. For example, Figure 1 shows mean income of women in the basic cross-section arrangement.

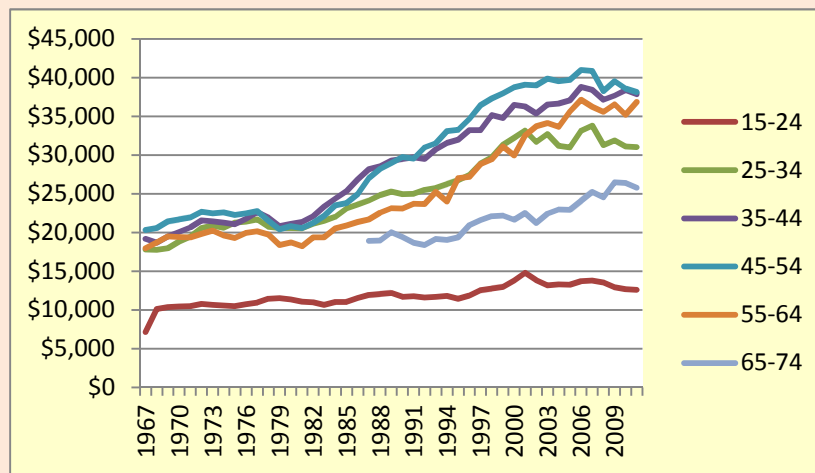


FIGURE 1: MEAN INCOME OF WOMEN, BY AGE COHORT, 1967-2011

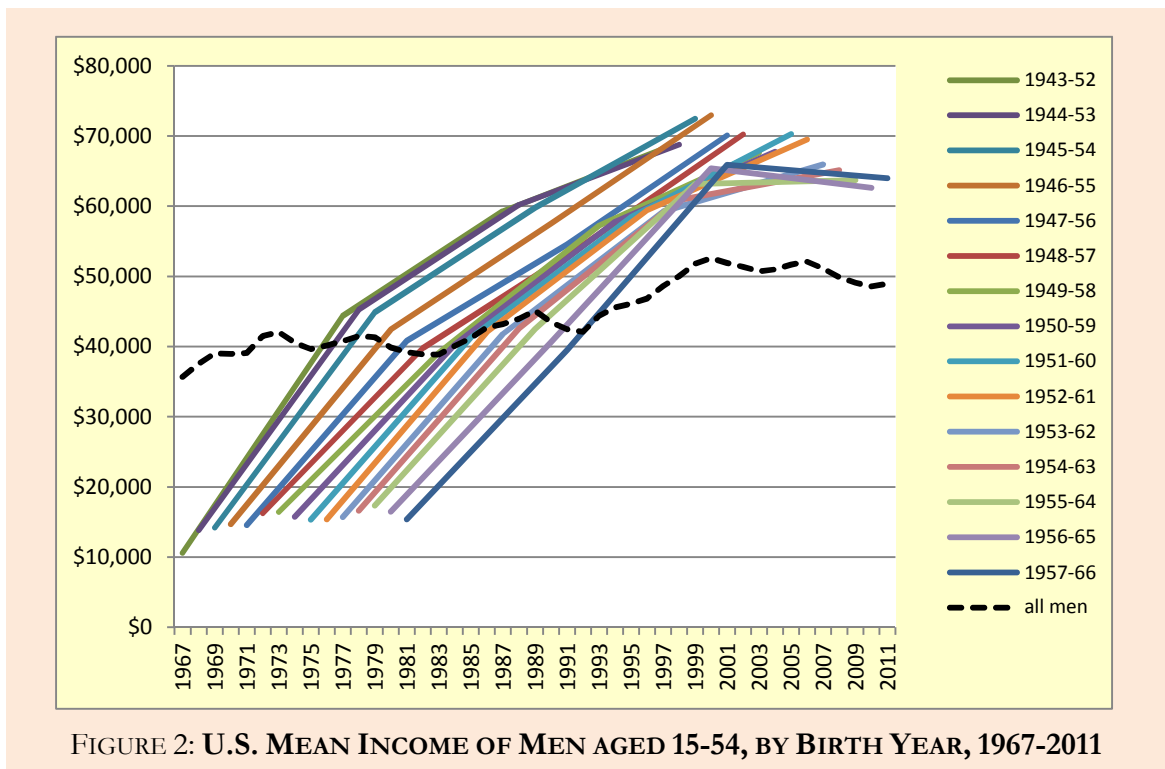
The basic idea of an age-income dependency is apparent. One can easily see that, in any given year, middle-aged workers have a higher mean income than younger workers but that, as women enter retirement years, cohorts 55-64 and 65-74 have lower income than middle-aged workers.

The problem with this basic analysis is that it does not separate age effects from generational effects. For example, though the 55-64 age cohort income line is below the 45-54 line in every year, those aged 55-64 in 1995 averaged \$3,207 more income than those same women had ten years prior when aged 45-54. In fact, the data used in the graph suggest that women aged 55-64 earned more than they did when aged 45-54 in every year from 1988 to 2006.

After re-arranging the data to track generation income over time, as opposed to age cohort income over time, a clearer view of how people's income grows and shrinks during their lifetime is possible. A technical problem however remains: there is still not enough data

to give a complete lifetime income history of any single generation. The second-best alternative is to break the life-cycle into two components and show the mean income history of a series of (overlapping) generations for each of these two life-cycle components.

The first component views the working life from age 15 to age 54. It joins four decades of data points for each generation: income from age 15-24, 25-34, 35-44, and 45-54. The results for men are in Figure 2 and for women are in Figure 3. The second component views the working life from age 35 to age 74. This second component joins the last four decades for each generation: ages 35-44, 45-54, 55-64, and 65-74. The results for this second component are shown in Figures 4 and 5.



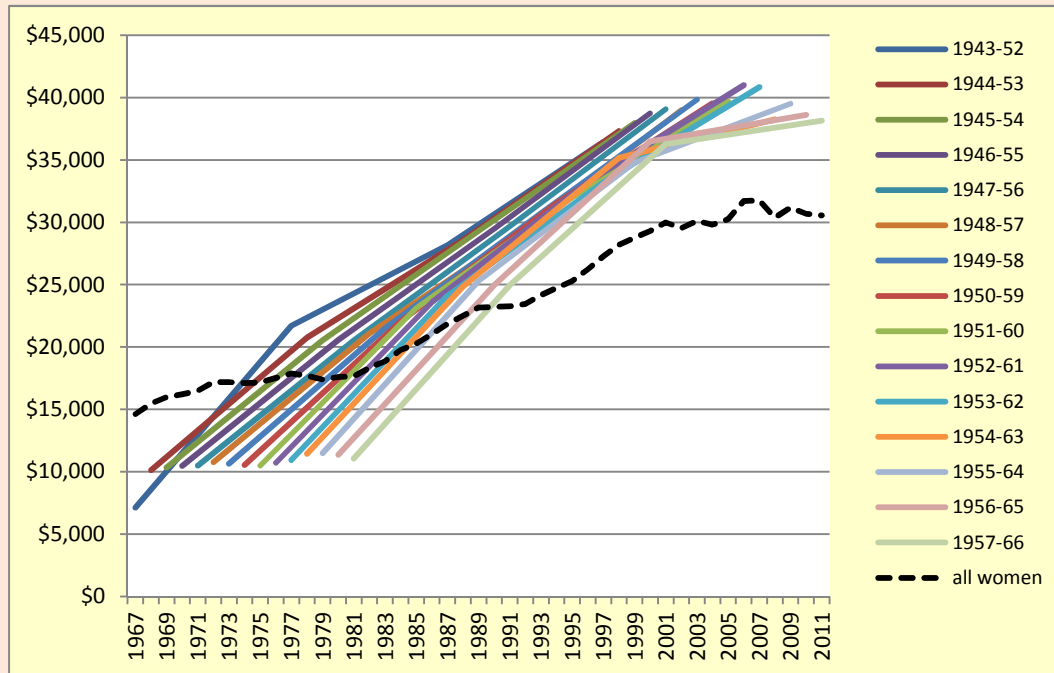


FIGURE 3: U.S. MEAN INCOME OF WOMEN AGED 15-54, BY BIRTH YEAR, 1967-2011

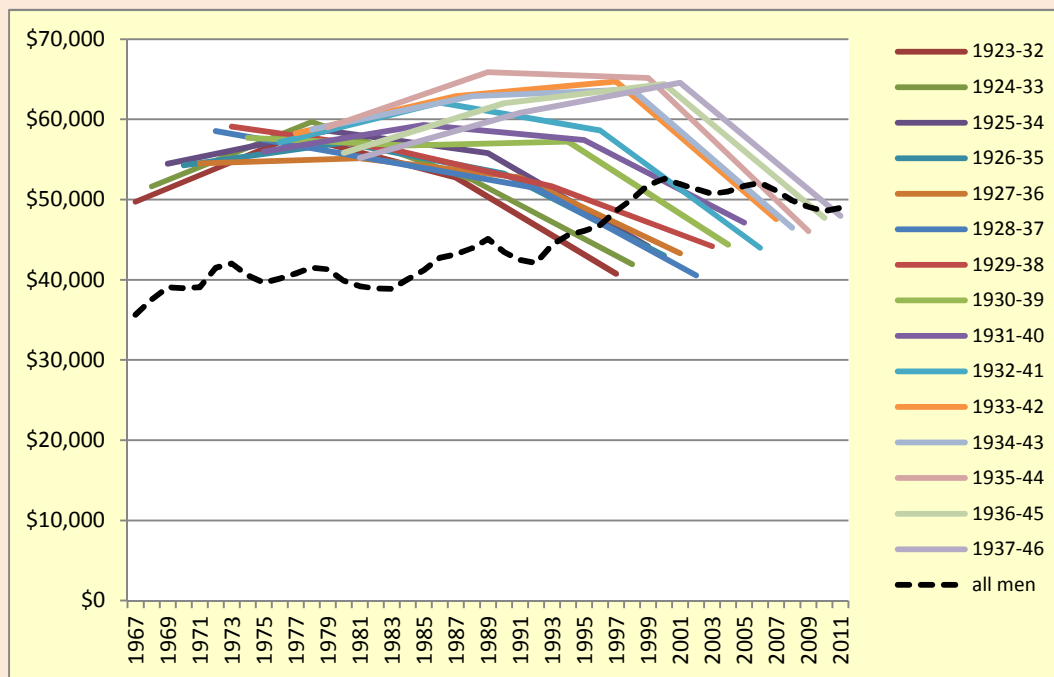


FIGURE 4: U.S. MEAN INCOME OF MEN AGED 35-74, BY BIRTH YEAR, 1967-2011



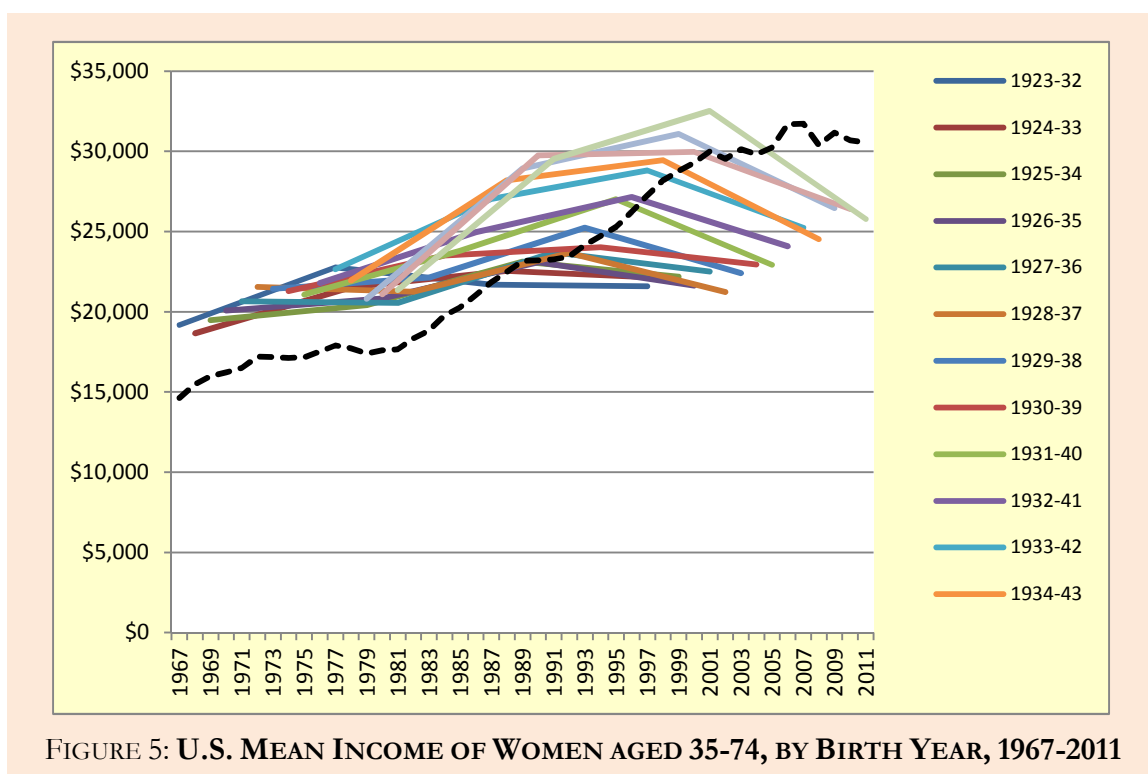


FIGURE 5: U.S. MEAN INCOME OF WOMEN AGED 35-74, BY BIRTH YEAR, 1967-2011

The data show an almost universal upward trend in real income from the first decade of working life through the fourth (15-24, 25-34, 35-44, 45-54). Also, the average income in the first decade (age 15-24) is strikingly similar among all generations (though it differs between the sexes). In middle age (35-44, 45-54, 55-64), average income appears to level off (for men) or continue to increase at a more gradual pace (for women). In the last decade (65-74), there is almost universal decline in income, though at a slope less than the incline experienced in early working life.

The average annual income for all members of the given sex is also plotted on these graphs. This extra plot illustrates the difficulty in using non-generational (or non-

longitudinal) data when identifying income trends: the income trend of the aggregate (*i.e.*, including all age groups) is lower than the income trend that individuals actually experience.<sup>14</sup>

One concern with using this data with a life-cycle approach is that the income data measured over time does not reflect the exact same people. This concern is addressed in Appendix B.

## 4. Research Findings

### *Progressive Tax Effects on Lumpy Income*

One reason for including the generic progressive tax was to determine how much progressivity affected lumpy income tax liability as the degree of progressivity varied. Using GTI figures and various progressivity factors, I computed the generic progressive tax RNAF statistics for the FMI data. The results are in Table 3.

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<sup>14</sup> Measuring income inequality without accounting for age or generational differences is akin to starting each runner at the starting line of a track thirty seconds after the start of the previous runner, and then taking regular snapshots of the track: With the same number of runners distributed over the track, the series of snapshots may give the impression that the runners do not advance at all. To understand how ignoring the life-cycle pattern clouds the picture, consider a society where income differences were due entirely to age differences. Everyone is employed from age 20 to age 60 and during those years earns an annual income of \$1,000 times his or her age. Now, consider two statistical effects. First, if society as a whole shows no income growth year-over-year, every individual *still* earns \$1,000 more every year of his or her working life. This is due to the fact that people enter the workforce poor and unproductive and leave it rich and experienced. It is what might be called a dynamic-slope effect. Second, societal inequality measured at any particular point in time appears to be significant, yet no individual is better or worse off over their lifetime than any other. This is what might be called a staggered-cycle effect.

<b>TABLE 3: RNAF STATISTICS FOR GROSS TAXABLE INCOME (GTI) BY PROGRESSIVITY FACTOR</b>	
<i>Progressivity Factor</i>	<i>Generic Progressive RNAF</i>
<b>1.05</b>	0.995
<b>1.10</b>	0.989
<b>1.15</b>	0.983
<b>1.20</b>	0.977
<b>1.25</b>	0.970
<b>1.35</b>	0.957
<b>1.50</b>	0.935
<b>1.75</b>	0.893
<b>2.00</b>	0.847
Data source: PSID.	

As expected, the statistics show that progressive income taxes, when assessed annually, more negatively penalize lumpy income the more progressive the tax.

With a progressivity factor of 1.35 the generic scheme is roughly as progressive as the explicit scheme. Consequently, in all subsequent analyses the progressivity factor is set to 1.35. As a result, differences that appear between the schemes will be more isolated and not due to varying progressivity.

The general results can be divided between those that use unadjusted income levels (GTI) and those that adjust by subtracting deductions and exemptions (NTI).

First, I will take the case of GTI. As planned in the research approach, I computed for both data samples and both tax schemes the annual tax payments, lifetime tax payment, lifetime adjustment factors (LAF), and normalized factors (N) for all taxpayers, and the RNAF for the sample whole. The RNAF figures are provided in Table 4.

**TABLE 4: RNAF STATISTICS FOR GROSS TAXABLE INCOME (GTI)  
BY TAX SCHEME AND DATA SAMPLE**

<i>Sample</i>	<i>RNAF</i>	
	<i>Generic Progressive</i>	<i>Explicit Progressive</i>
<b>Individuals</b>	0.933	0.946
<b>Families</b>	0.957	0.950
Data source: PSID.		

As could be expected, family gross taxable income exhibits greater resistance to progressive tax effects due to its reduced volatility. The explicit tax narrows this difference, perhaps due to an incomplete elimination of the marriage penalty at upper income levels.

The RNAF figures show how tax assessment frequency affects overall tax collection for the entire sample. Note that while the implied tax penalty is small (*e.g.*, for individuals the explicit progressive tax has an RNAF figure of 0.946, implying a tax penalty of 5.4%), the RNAF figure is essentially a system-wide average of the LAF figures of all taxpayers, including those with lumpy income and those without lumpy income.

If this ratio of lifetime tax to annual taxes applied uniformly to all taxpayers, there would not be a problem insofar as affecting taxpayer activity. In other words, if the RNAF figure of 0.946 simply reflected the fact that all taxpayers had LAFs of 0.946, it would indicate that lumpiness pervades all occupations equally or that it is due to a life-cycle pattern; the LAF does not vary with taxpayer behavior. The real concern is that lumpiness is not uniform and that progressivity thereby disadvantages some taxpayers and advantages others; such dispersion may lead to (or reflect) allocative inefficiencies as economic activity that causes lumpiness is avoided due to tax treatment.

To assess the inequity of the lifetime-to-annual ratio, a percentile distribution of LAFs was calculated. The distribution statistics are shown in Table 5.

<b>TABLE 5: LAF DISTRIBUTION FOR GROSS TAXABLE INCOME (GTI) BY TAX SCHEME AND DATA SAMPLE</b>				
<i>LAF Percentile*</i>	<i>Generic Progressive Cutoff</i>		<i>Explicit Progressive Cutoff</i>	
	<i>Individual</i>	<i>Family</i>	<i>Individual</i>	<i>Family</i>
<b>Top 1%</b>	0.381	0.717	0.661	0.785
<b>Top 5%</b>	0.497	0.827	0.770	0.862
<b>Top 10%</b>	0.586	0.872	0.809	0.894
<b>Top 25%</b>	0.767	0.931	0.879	0.933
<b>Top 50%</b>	0.903	0.966	0.947	0.968
<b>Top 75%</b>	0.969	0.984	0.991	0.992
Data source: PSID.				
* Percentiles include only those taxpayers who have both annual and lifetime tax liability (for individuals, 8289 of 8667 observations; for families, all 6729 observations).				

The LAF distribution in Table 5 provides several insights. First, there is significant divergence between annual and lifetime tax assessments for taxpayers at the tail of the distribution. For example, with the explicit progressive tax, 10% of individuals would see a reduction of 19% or more (*i.e.*, pay 0.809 of the original) of their tax burden if they paid the tax on their smoothed (averaged) lifetime income rather than in annually assessed installments. Second, families are less affected than individuals; no doubt the higher adjustment factors for families result from families having less variability in their income, as reported in Section 3. Third, the generic tax consistently has a wider distribution of LAFs than the explicit tax, especially for individuals. An examination of the mean income levels for the taxpayers within the low-LAF tail percentiles of each of the four sample/schemes shows

that the tail percentiles are overwhelmingly populated by low-income taxpayers, and this is especially pronounced for the generic tax on individuals:

**TABLE 6: MEAN ANNUALIZED INCOMES OF LAF DISTRIBUTION PERCENTILES FOR GROSS TAXABLE INCOME (GTI) BY TAX SCHEME AND DATA SAMPLE**

<i>LAF Percentile*</i>	<i>Generic Progressive</i>		<i>Explicit Progressive</i>	
	<i>Individual</i>	<i>Family</i>	<i>Individual</i>	<i>Family</i>
<b>Top 1%</b>	\$345	\$4,092	\$5,330	\$26,772
<b>Top 5%</b>	1,273	10,122	7,225	22,579
<b>Top 10%</b>	1,241	11,621	6,814	21,661
<b>Top 25%</b>	2,368	14,593	7,059	21,662
<b>Top 50%</b>	5,471	17,570	8,657	22,283
<b>Top 75%</b>	8,388	19,680	11,069	22,506

Data source: PSID.

\* Percentiles include only those taxpayers who have both annual and lifetime tax liability (for individuals, 8289 of 8667 observations; for families, all 6729 observations).

Because of its bracket structure, the explicit tax behaves like a proportional tax for any variation of income within the bracket; its step-like progression somewhat insulates the tax from excessive burdens on lumpy income taxpayers.

Switching the samples' tax base from Gross Taxable Income (GTI) to Net Taxable Income (NTI) causes the progressive tax penalty for lumpiness to increase dramatically. As the NTI measure subtracts a standard deduction and one (for individuals) to three (for families) exemptions from taxable income, all income levels shift down by the same amount for the given sample. The resulting RNAF statistics for NTI are shown in Table 7.

**TABLE 7: RNAF STATISTICS FOR NET TAXABLE INCOME (NTI)  
BY TAX SCHEME AND DATA SAMPLE**

<i>Sample</i>	<i>Generic Progressive</i>	<i>Explicit Progressive</i>
<b>Individuals</b>	0.882	0.894
<b>Families</b>	0.891	0.886
Data source: PSID.		

Using NTI does not increase the tax penalty by making the systems more progressive—note that using NTI on a proportional tax would still leave lifetime taxes equal to the sum of annual taxes. Rather, using NTI makes income subject to tax lumpier. If a taxpayer’s lifetime average income is reduced while the differences between annual incomes remain the same, income will be more varied in reference to fixed breakpoints such as tax brackets.

Like the analysis for GTI, for NTI I created a distribution of LAFs among taxpayers. The results are in Table 8.

**TABLE 8: LAF DISTRIBUTION FOR NET TAXABLE INCOME (NTI)  
BY TAX SCHEME AND DATA SAMPLE**

<i>LAF Percentile*</i>	<i>Generic Progressive Cutoff</i>		<i>Explicit Progressive Cutoff</i>	
	<i>Individual</i>	<i>Family</i>	<i>Individual</i>	<i>Family</i>
<b>Top 1%</b>	0.020	0.050	0.060	0.130
<b>Top 5%</b>	0.143	0.270	0.245	0.419
<b>Top 10%</b>	0.290	0.473	0.404	0.599
<b>Top 25%</b>	0.606	0.759	0.662	0.799
<b>Top 50%</b>	0.856	0.909	0.866	0.911
<b>Top 75%</b>	0.965	0.962	0.967	0.965

Data source: PSID.

\* Percentiles include only those taxpayers who have both annual and lifetime tax liability (for individuals, 5723 of 8667 observations; for families, 5075 of 6729 observations).

The LAF distributions for NTI are strikingly more acute than those for GTI. Under the explicit progressive tax, for example, half of all individual taxpayers would see a reduction of 13.4% or more in their lifetime income tax burden if they paid taxes on their average annual income rather than their annual income assessed annually; one quarter would see a 33.8% reduction or more; and one tenth would see almost three-fifths of their tax burden reduced. Half of all families would see a reduction of 8.9% or more; one quarter would see a 20.1% reduction or more; and one tenth would see at least a 40% reduction. Put differently, one-quarter of individuals pay at least 50% more taxes than they otherwise would and one-quarter of families pay at least 25% more. Reductions under the generic tax are even greater. As with the GTI analysis, families are less affected than individuals. Unlike the GTI analysis, the differences between the generic and the specific tax are narrow. The mean income levels within the tail percentiles are shown in Table 9:

**TABLE 9: MEAN ANNUALIZED INCOMES OF LAF DISTRIBUTION PERCENTILES FOR NET TAXABLE INCOME (NTI) BY TAX SCHEME AND DATA SAMPLE**

<i>LAF Percentile*</i>	<i>Generic Progressive</i>		<i>Explicit Progressive</i>	
	<i>Individual</i>	<i>Family</i>	<i>Individual</i>	<i>Family</i>
<b>Top 1%</b>	\$96	\$176	\$95	\$172
<b>Top 5%</b>	463	955	511	1,184
<b>Top 10%</b>	917	1,896	1,009	2,872
<b>Top 25%</b>	2,466	5,967	2,625	7,667
<b>Top 50%</b>	5,413	11,079	5,566	12,758
<b>Top 75%</b>	8,752	14,100	8,396	15,490

Data source: PSID.

\* Percentiles include only those taxpayers who have both annual and lifetime tax liability (for individuals, 5723 of 8667 observations; for families, 5075 of 6729 observations).



The income statistics for the NTI adjustment factor percentiles are even more skewed against low-income taxpayers than the GTI. Nevertheless, lumpy income is distributed amongst all income groups. Table 10 ranks individuals and families by income quintile and shows the percentage of individuals and families within each quintile who have greater than average adjustment factors for their sample (*i.e.*, would benefit from a revenue-neutral lifetime tax).

**TABLE 10: TAXPAYERS WITH GREATER THAN AVERAGE LAF, FOR NET TAXABLE INCOME (NTI) AND EXPLICIT PROG. TAX, BY DATA SAMPLE AND NTI QUINTILE**

<i>Income (NTI) Quintile</i>	<i>Individual</i>		<i>Family</i>	
	<i>Median</i>	<i>Taxpayers</i>	<i>Median</i>	<i>Taxpayers</i>
	<i>Annualized Income*</i>	<i>With Lumpy Income**</i>	<i>Annualized Income*</i>	<i>With Lumpy Income**</i>
<b>Top</b>	\$25,423	10.1%	\$33,136	30.7%
<b>Second</b>	13,632	44.0%	21,694	20.1%
<b>Middle</b>	7,985	46.9%	14,558	15.2%
<b>Fourth</b>	4,300	80.2%	8,347	52.2%
<b>Bottom</b>	1,371	97.3%	2,723	88.0%

Data source: PSID.

\* Median annualized income of all taxpayers within the sample's given NTI quintile.

\*\* The percentage of taxpayers within the sample's given NTI quintile who have a greater lumpy income tax penalty (lower LAF) than the sample as a whole.

Consistent with the earlier findings, low-income taxpayers stand to gain the most from a lifetime assessment of progressive taxes. Yet every income group includes taxpayers who would benefit.

Deductions and exemptions clearly exacerbate the lumpy penalty. Whereas the GTI analysis is appropriate for discussing the lumpy penalty in theory, in practice common tax

provisions such as deductions and exemptions can make the lumpy penalty appreciably more significant. It is clear that any examination of the lumpy penalty on specific tax systems necessarily demands the inclusion of deductions, exemptions, and other liability-reducing provisions in the analysis.

### *Life-Cycle Income Patterns*

The data analysis in Section 3 showed that, when cross-sections of age cohorts are linked together in like generations, a life-cycle income pattern is apparent when viewing generational income over several decades. The research approach is now to create an age-to-income correlation model that uses these data from past experience to quantify how well age is predictive of income and what is the predictive relation.

Separate estimations of the same model are needed for men and women. Two developments in the past half century craft an expectation that women's age-income relation will be significantly different from men's, apart from simply lower general income levels: (1) the workforce participation of women has risen to the point where it is roughly at parity with men; (2) the incomes of women have risen much faster than those of men, partially because of this increased participation. Therefore, while the model used shall for simplicity be the same, estimation of coefficients shall be done separately for men and women.

The basis of the model is equation (7), described in Section 3. As the data sample to be used is aggregated, the equation remains basically the same, but the terms need adjustment and greater specification. The estimation model is thus the following:

$$Y = \beta_1 + \beta_2 A + \beta_3 A^2 + \beta_4 G + \beta_5 AG + e \quad (8)$$

In (8):  $A$  is the median age of the measured age cohort,  $G$  is the median implied year of birth of the measured age cohort,  $Y$  is the mean income for the age cohort for the measured year, and  $e$  is the error term.<sup>15</sup> Using the CPS data to arrive at  $A$ , I took the age cohort of the data point (e.g., 15-24), and found the median year (since a median here would be 19.5, for simplicity I round up). For the birth year, I took the sample year of the data point and subtracted the data point's  $A$  value (obtaining the middle birth year of the generation represented by the cohort).

A full account of the OLS regression statistics is given in Appendix C. Table 11 shows the coefficient values, standard errors, and  $t$ -statistics for both men and women samples:

<b>TABLE 11: OLS REGRESSION STATISTICS FOR AGE-INCOME MODEL, BY SEX</b>						
<i>Regressor</i>	<i>Men</i>			<i>Women</i>		
	<i>Coefficient</i>	<i>Standard Error</i>	<i>t-Statistic</i>	<i>Coefficient</i>	<i>Standard Error</i>	<i>t-Statistic</i>
<b>(constant)</b>	497314.1	74031.77	6.72	-156002.5	68928.11	-2.26
<b>Age</b>	-20054.47	1700.100	-11.80	-13626.37	1582.898	-8.61
<b>Age<sup>2</sup></b>	-45.75328	0.957167	-47.80	-18.25383	0.891181	-20.48
<b>Birth Year</b>	-287.3406	37.30080	-7.70	65.66394	34.72932	1.89
<b>Age*Birth Year</b>	12.78372	0.843524	15.16	8.103035	0.785373	10.32
Data source: U.S. Census Current Population Survey (CPS).						

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<sup>15</sup> The number of earners of each discrete age in the given age cohorts will not be known. Therefore, the word “median” here does not reflect the median age or birth years of the sample but rather the median age or birth years of the cohort’s age range and its implied birth year.

The  $R^2$  statistics for the regressions are 0.977 for men and 0.918 for women. The  $t$ -statistics indicate that the variables are all highly significant. These positive readings should be kept within the perspective of averaged aggregate data: individualized data would not be so conforming.

The combinatorial term makes reading the coefficients difficult. A more informative approach is to use the model to plot age-to-income curves using some preset generations (birth years). Examples are presented in Figures 6 and 7.

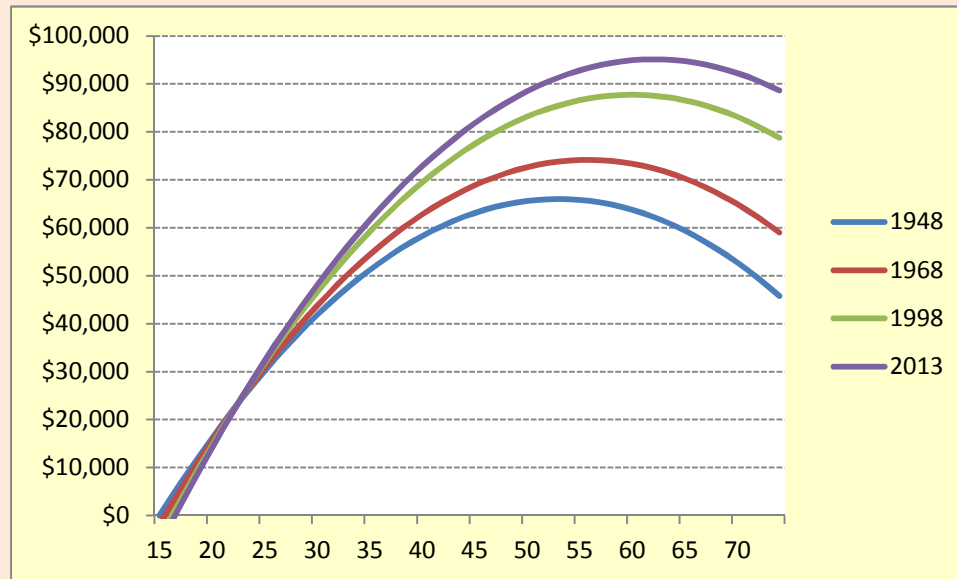


FIGURE 6: **MEN'S AVERAGE INCOME BY AGE FOR SELECTED BIRTH YEARS (CHAINED 1982-84 CONSTANT DOLLARS)**

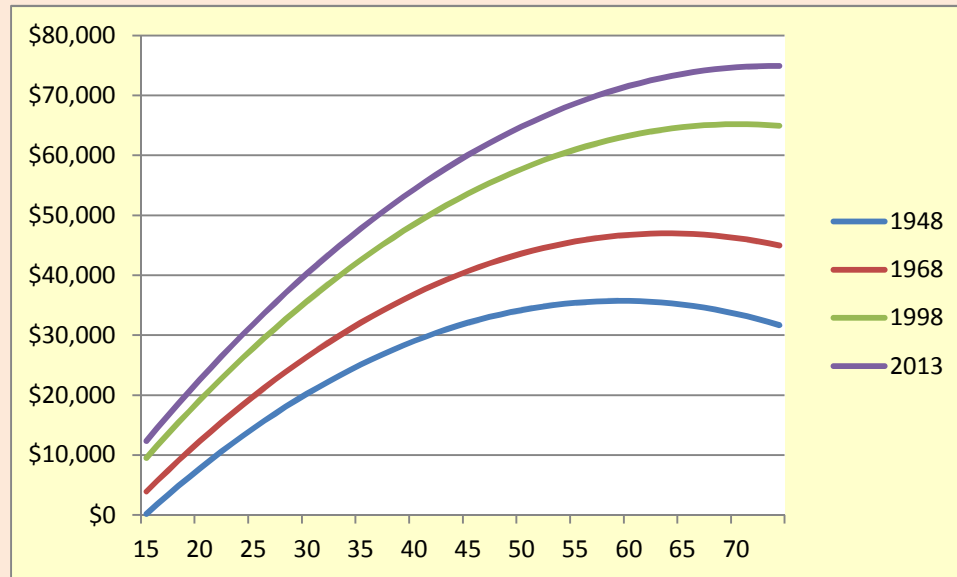


FIGURE 7: **WOMEN'S AVERAGE INCOME BY AGE FOR SELECTED BIRTH YEARS (CHAINED 1982-84 CONSTANT DOLLARS)**

Four birth years were chosen for illustrative purposes: 1948 (those entering retirement in 2013), 1968 (those at age 45 in 2013, in the middle of their working life), 1998 (those at age 15 in 2013, just beginning to enter the workforce), and 2013 (those born near the time of this research). The age-income relation for men shows, in all four generations, an expected upward slope for most of the working life followed by a partial trailing off through age 75. However, later generations show that this income abatement period starts later in life and is less severe than in previous generations. For women, the curves are lower and flatter than for men. Women also show a continued increase in income in successive generations throughout their working life. As with men, women have a trailing off during the retirement years, but also see this disappearing with later generations.

With model-generated data available, a lumpy income analysis can be performed on the life-cycle income streams to isolate the progressive tax penalty that obtains specifically from income variation in the life-cycle.<sup>16</sup> Lumpy income analysis would appear to be appropriate only for micro-level panel data where the lumps are manifested for individual taxpayers. Yet because the model-generated income figures are averages for all people of a certain age, they isolate the variation of income (in the United States) that is specifically due to age. This lumpy income analysis, however, can only be performed using the explicit tax scheme; the generic tax scheme requires an annual average income for the entire population (to determine the level of progressivity to apply to the individual), and this would demand a number of assumptions about income growth and population growth. Also, the analysis did not attempt to construct family income from the individualized age-income model, so the explicit tax scheme used tax brackets and deductions/exemptions applicable to individual filers.

The results of the lumpy income analysis on model-generated life-cycle income are presented in Table 12. The sample birth years are the same as those used to illustrate the age-income model. The analysis calculated LAFs for men and women, using both GTI and NTI, for these four sample birth years.

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<sup>16</sup> Lumpy income analysis could not be performed on the CPS data because no single generation had data points for all six decades and data for years between data points would need to have been inferred.

**TABLE 12: LAF STATISTICS FOR INCOME AVERAGES, FOR EXPLICIT PROG. TAX, BY SEX AND INCOME MEASURE FOR SELECTED BIRTH YEARS**

<i>Birth Year</i>	<i>Men</i>		<i>Women</i>	
	<i>GTI*</i>	<i>NTI*</i>	<i>GTI*</i>	<i>NTI*</i>
<b>1948</b>	0.984	0.973	0.973	0.939
<b>1968</b>	0.984	0.975	0.970	0.966
<b>1998</b>	0.969	0.967	0.989	0.981
<b>2013</b>	0.959	0.957	0.994	0.989

Data source: U.S. Census Current Population Survey (CPS).

\* GTI: Gross Taxable Income; NTI: Net Taxable Income.

The results indicate that under the explicit progressive tax an individual with an income stream that follows the (model-generated) age-dependent path for his generation (*i.e.*, birth year) would pay less taxes on lifetime income (assessed in annual increments) than on annual income. That finding is expected, as per the lumpy income research. The NTI adjustment factors are expectedly lower than the GTI, but not nearly as much divergence appears here compared with lumpy income generally. Note also the apparent increase of the lumpy penalty for males and decrease for females in newer generations.

To approximate the portion of the lumpy income tax penalty attributable to life-cycle income patterns, I compare the adjustment factors from Table 12 with earlier RNAF factors in Table 4 and Table 7. The lumpy tax penalty is the amount of tax savings if a lifetime tax were applied; hence the adjustment factors were subtracted from one. The portion of the penalty applicable to life-cycle effects is calculated as the ratio of the penalty due to life-cycle effects over the total lumpy tax penalty for the given income measure. The results are presented in Table 13.

**TABLE 13: LUMPY TAX PENALTY DUE TO LIFE-CYCLE EFFECTS, FOR INDIVIDUALS UNDER THE EXPLICIT PROGRESSIVE TAX, BY SEX AND INCOME MEASURE**

<i>Income Measure</i>	<i>Sex</i>	<i>Life-Cycle Lumpy Penalty*</i>	<i>Total Lumpy Penalty**</i>	<i>Approximate Life-Cycle Contribution to Lumpy Tax Penalty</i>
<b>GTI</b>	<b>Men</b>	0.016	0.054	39.8%
	<b>Women</b>	0.027		
<b>NTI</b>	<b>Men</b>	0.027	0.106	41.5%
	<b>Women</b>	0.061		

\* Calculated as one minus the LAF of the age-income figures from the life-cycle model for the given income measure and sex (data source: U.S. Census Current Population Survey (CPS)).

\*\* Calculated as one minus the RNAF of the given income measure and sex (data source: PSID).

The implication of the analysis of life-cycle contributions to lumpiness is that approximately 40% of the lumpy income penalty accrues from the age-income relation and is thus not generally due to occupational choice or much other intentional economic behavior. Indeed, to the extent that the goal of progressive taxation is not to level incomes among different people but to tax more heavily individuals' high-income years, this portion of the lumpy tax penalty may be considered benign. However, because human capital investments are necessarily interwoven with the growth of income over the life cycle, the lumpy income penalty attributable to age differences cannot be claimed as completely separable from intentional economic behavior.

## 5. Discussion

### *Analysis of Research Findings*

Given the finding that annual income is lumpy, taxing lifetime income, rather than annual income, would reduce taxes in varying amounts due to the different income volatilities among taxpayers. If lumpy income was experienced evenly across the labor force,



the need for a corrective policy would be less, especially if tax rates were increased to ensure revenue neutrality. But since it is uneven, there is a legitimate concern that beckons a policy response: if the activities giving rise to lumpy income can be targeted and avoided, the progressive tax creates an economic distortion.

As suggested by the history of tax policy for income averaging, one principal activity being targeted is a choice of occupation. If some occupations lend themselves to lumpy income (when measured on an annual basis), unfavorable treatment by progressive taxation of an equivalent lifetime income in a similar yet non-lumpy occupation may cause people to avoid the lumpy income occupation, apart from any risk aversion concerns.

For example, suppose annual net income were taxed at 15% for the first \$25,000 and 30% on income above this level. A college graduate with rational expectations can choose between occupation A that has a constant annual net income of \$25,000 over a forty year lifetime and occupation B (perhaps a political consultant in U.S. congressional elections) that has a net income that oscillates between \$0 in odd years and \$55,000 in even years, again over a forty year period. If the tax is assessed on lifetime income, the after-tax earnings for occupation A will be \$850,000 and for occupation B will be \$920,000. But assessed annually, the lifetime after-tax income of occupation A stays the same but for occupation B sinks to \$845,000 (giving a LAF of 0.706), below that of A. The graduate would rationally choose occupation A, though occupation B is more productive (\$1,100,000 in total income versus \$1,000,000) and generates more tax revenue even with the lower lifetime tax (\$180,000 versus \$150,000).

Given a sample of an occupation's annual income figures and a set of tax brackets, one could determine how much each occupation is generally affected by the lumpy tax

penalty by determining taxes (applied both annually and lifetime) and calculating a RNAF. Ultimately, it would be useful to have a method to determine for a given occupation or job's income the equivalent income needed to offset the lumpy tax penalty. In the absence of a formula using specific tax brackets and income levels (which can be very complex), the RNAF calculation may serve as a general guide.

It is likely that current economic activity already reflects curtailment of variable income occupations. Many countries have had progressive tax systems for some time, and people have likely avoided work that has variable payoffs, wittingly or not. In other words, the current pay levels for some occupations may already reflect an equivalent income premium. The political consultant in the above example is already being paid \$5,000 more than is necessary to cover the lumpy tax penalty (in addition to any premium for risk and income inconsistency).

The research also quantifies life-cycle income patterns and ties them to the lumpy tax penalty. People have rising incomes as they gain work experience, and their incomes decline as they approach and enter retirement. The life-cycle phenomenon is an example of lumpiness: the variation of income occurs over a greater time period than the typical tax assessment period. In a progressive tax system, this results in higher taxes when assessed on each annual increment than when assessed with cumulative or lifetime income figures.

It was found that around 40% of annual income lumpiness can be attributed to the life-cycle pattern, with the rest due to other factors such as occupation selection or unemployment. Since a life-cycle pattern appears exogenous, and occupation selection does not, it may seem that the real impact of the lumpy tax penalty is only the portion not

attributable to life-cycle variation: since everyone goes through a life cycle, that portion of the tax penalty is equally distributed and in any case unavoidable.

However, the life-cycle and occupational factors are inter-related. The estimated variation in income over the life-cycle is an average. It is certainly possible (if not probable) that occupations that are lumpy have greater life-cycle variation too. Variations at a micro level (*e.g.*, multi-year project payoffs) and at a macro level (investment in lifetime human capital) both occur in a similar risk/reward and investment/return conceptual framework. Although some of the life-cycle pattern happens as a matter of course as people unintentionally gain experience, much of it happens because people choose to forego current income today for greater earnings tomorrow. Changing the tax penalty for making risks and investments that cause any income lumps will change human behavior as it affects both their occupational choices and their lifetime earnings profile.

#### *Implications for Progressive Taxation*

The implications of the foregoing analysis for progressive taxation can be divided into three areas. First, progressivity discourages economic decisions that have income variation as a side-effect but may otherwise be more economical than the alternative(s). Much of the discussion on this point has focused on occupational choice. As the foregoing discussion suggests, it may also apply to human and capital investment more generally. One example may be the capital investment in a business that could result in a large single-year income flow when the business is sold, as opposed to investing in a business that pays regular dividends. Another example may be the educational investment to purchase and learn a lifelong skill, resulting in up-front tuition costs and greater earnings power several

years later. There is obviously a large literature discussing the merits of these kinds of investments and economic policy approaches towards them; the lumpy tax penalty should be a part of that literature.

Second, progressive taxation does not only redistribute income from the more productive citizens to the less productive, but it also redistributes earnings from one's more productive years to one's less productive. This may or may not be desirable.<sup>17</sup> Yet to the extent that the redistribution is within an individual's (or family's) earnings profile, it is not between people. If one of the principal if not the supreme goal of progressivity is inter-personal redistribution, it may be achieving this to a lesser degree than is supposed. To be effective progressive taxation depends on *inter-generational* positionality. If, instead, people generally look to their peers for positional awareness, progressive taxation will have less effect if such peers also share similar tax rates.

Third, the lumpy income problem suggests that progressive taxes simply trade one ethical concern for another. It is well known that a significant political justification advanced for progressivity is to promote economic equality of outcomes. Yet in addition to the efficiency aspects, progressivity discriminates against people who are disposed to or already engaged in activities that produce lumpy income or exaggerate life-cycle patterns. If fairness, however defined, is a concern for tax policy, the unfair treatment of such people should be part of the consideration of using progressivity.

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<sup>17</sup> It may be desirable as a way to level income and consumption over people's working lives. It may not be desirable because people may find more utility in increasing incomes than in level incomes.

### *Policy Corrections*

The lumpy tax penalty may be partially solved with a progressive consumption tax. This is a tax, assessed annually, that subtracts savings from income while retaining a progressive rate structure. In such a way it theoretically only taxes annual consumption. Such a tax may ameliorate the lumpy tax penalty because while income is lumpy, through savings consumption can be smoothed. Theoretically, the artist who earns \$50,000 and \$100,000 in alternating years can consume \$75,000 every year, and thus pay the marginal tax rate applicable to the non-lumpy \$75,000 amount.

However, such consumption smoothing is only possible to the extent that there are no borrowing constraints. Human capital investment in the early part of life, when productivity has yet to blossom, would often be negatively affected because the individual has little wealth and such investments have an uncertain payoff. The same is true of lumpy income if the lumps are larger than accumulated wealth or borrowing capacity. Even if the overall return would favor making some human capital investments, because consumption is taxed at a progressive rate and there may be limited opportunities to smooth consumption in the investment years, a progressive tax would in these circumstances bias against an otherwise economic investment.

Another problem is that lumpy income often leads to lumpy consumption. Durable goods such as furniture and automobiles and other large expenses such as vacations all introduce lumps in consumption regardless of income streams, and these lumps disadvantage all taxpayers by pushing them into higher marginal rates in the years that the expenditure is made. Also, people with lumpy income streams are more apt to make these purchases in the payoff years. Absent accumulated wealth, the only other option is financial

intermediation and borrowing. In this sense, the progressive consumption tax excessively encourages borrowing and financing for purposes of tax avoidance, and thus introduces a distortion in capital markets.

The lumpiness problem has not gone unrecognized by proponents of a progressive consumption tax. The USA tax, for example, deducted “Higher-education tuition” from taxable consumption (Seidman, 1997). Yet the deduction causes many problems while still not solving the issue: By exempting the cost (rather than smoothing the benefit), it excessively favors education as a human capital investment. By singling out tuition, it neglects other kinds of human capital investment such as internships or apprenticeships, and puts them at a competitive disadvantage to higher education. And the deduction leaves open the possibility of expenditures that are not true human capital investments.

A more straightforward correction could be the implementation of a Vickrey style tax reform. Such a reform would appear to remove the lumpy tax penalty and permit progressivity. The difficulties with this approach are mainly practical politics. Because it is actuarially confusing and is often criticized as a tax dodge, it has had trouble being implemented and has in two cases been revoked (though these were not true Vickrey tax regimes). Perhaps the movement towards electronic filing and tax software will partially alleviate these concerns.

## **6. Conclusion**

The importance of lumpy income has been known to researchers and policymakers for over a century: progressive taxes unfairly tax income more if the assessment period is short enough to result in varying income over multiple assessments. Vickrey provided a

solution whereby taxes treated income on a lifetime basis at the end of each assessment period. Although his specific solution was never implemented, in a few cases income averaging policies were implemented that attempted to ameliorate the lumpy penalty. Yet because of a lack of available data, a quantification of the lumpy penalty has been limited to government studies of how much the income averaging policies would drain from public finance.

In this paper I have attempted to show how and by how much progressive taxation penalizes lumpiness in annual income, both in general and specifically for income variation due to life-cycle income patterns. I used individual and family longitudinal data to determine the lumpiness of income over ten or more years, and using two progressive tax schemes I determined the progressive tax penalty for lumpy income by calculating the difference in tax liabilities when assessed annually versus a single multi-year assessment. I used aggregate age cohort average income data to construct an age-to-income correlation model adjusted for generational effects, and I applied one of the progressive tax schemes to this model to determine the tax penalty for life-cycle income.

The findings of the research with respect to lumpy income generally can be summarized as follows: (1) longer income measurement timeframes result in greater lumpiness in annual income; (2) lumpy income always suffers a penalty if the tax rate structure is progressive; (3) the penalty increases with the increase in progressivity (for the current U.S. federal income tax, the average penalty is about 5% for both individuals and families); (4) because individual income is lumpier than family income it suffers a higher penalty; (5) low-income taxpayers disproportionately suffer the penalty, as a percentage of tax liability; (6) deductions and exemptions exacerbate the penalty greatly by increasing the

lumpiness of taxable income (for the current U.S. federal income tax, the average penalty with these adjustments is about 11%); and (7) income varies in its lumpiness such that some taxpayers suffer a much greater penalty than others: under a tax like the U.S. federal income tax in 2013, for example, while the average lumpy income penalty is 5%, one-quarter of individual taxpayers suffer taxes over their lifetime that are at least 50% higher than if paid on an annual average of their lifetime income and one-quarter of families suffer taxes that are at least 25% higher. It is this variation of lumpiness that is most troublesome, for two reasons. First, it is likely that progressivity inhibits economic efficiency as people eschew occupations or other economic activity that leads to varying annual taxable income. Second, progressivity introduces an inequity in taxation as people with greater income variation suffer the penalty to a much greater degree than those with minimal or even average variation.

The findings of the research for life-cycle income patterns are as follows: (1) an inverted parabolic age function is highly correlated with aggregate income levels, exhibiting a steep upward trend through middle age followed by a gradual decline towards retirement; (2) the decline in income for elderly workers is getting less pronounced with later generations; (3) women have different age-to-income profiles and generational effects than men; and (4) approximately 40% of the lumpy income tax penalty is due to life-cycle income patterns.

There are a number of areas where extensions of this research may prove fruitful. The income variability of specific occupations could be used to highlight areas where the lumpy penalty is most egregious and economic activity is most impinged. The variability of consumption could be measured to determine the lumpy penalty from a progressive consumption tax. A more detailed examination of age-income data could determine how



much income differences by age are due to changes in experience, changes in labor supply, or extraneous factors.

The research provided here makes clear that, in addition to other criticisms, progressive taxation creates economic distortions when applied in its usual annual timeframe. It also redistributes from people's more productive years to their least productive and from people with variable income occupations to those with steady income; these are by-products of its effort to redistribute among differently-abled individuals.

## Appendix A: Lumpy Income Taxes under Progressive Tax Systems

If a taxpayer has variable annual income, under a progressive income tax he will pay higher total taxes if assessed annually than if assessed on a multi-year sum. This may be intuitively apparent, but can also be proven mathematically. Consider the tax scheme:

$$t = r\bar{y} \left( \frac{y}{\bar{y}} \right)^k \quad (\text{A1})$$

In (A1):  $y$  is income,  $r$  is the tax rate,  $\bar{y}$  is the average income,  $t$  is the individual's tax, and  $k$  is a progressivity parameter, such that  $k > 1$  is progressive (taxed at a higher rate, the higher the income is above average)  $k < 1$  is regressive, and  $k = 1$  is a proportional income tax. To ensure revenue neutrality, I use the following equality:

$$r_f \sum_i^n y_i = r_p \bar{y} \sum_i^n \left( \frac{y_i}{\bar{y}} \right)^k \quad (\text{A2})$$

In (A2):  $n$  is the assessment period,  $r_f$  is the tax rate for the proportional tax and  $r_p$  is the tax rate for the progressive tax. Recognizing that average income  $\bar{y}$  is simply the sum of all income divided by the number of earners, we can reduce and re-arrange to the following:

$$\frac{r_f}{r_p} = \frac{n^{k-1} \sum y^k}{(\sum y)^k} \quad (\text{A3})$$

Applying the power mean inequality to the right-hand-side of this equation, and stipulating that  $k > 1$ , the following deduction can be made:

$$n^{k-1} \sum y^k > (\sum y)^k \therefore r_f > r_p \quad (\text{A4})$$

Since the mean income will pay less under a revenue-neutral progressive tax, this means that incomes above the mean more than compensate for revenue lost below the mean. In fact, as long as the tax is progressive ( $k > 1$ ), two different incomes will always pay

more combined taxes than their average income taxed twice. This is shown by comparing the progressive tax scheme applied to two incomes and their average:

$$r_p \bar{y} \left( \frac{y_1}{\bar{y}} \right)^k + r_p \bar{y} \left( \frac{y_2}{\bar{y}} \right)^k > 2r_p \bar{y} \left( \frac{\frac{y_1+y_2}{2}}{\bar{y}} \right)^k \quad (\text{A5})$$

$$2^{k-1}(y_1^k + y_2^k) > (y_1 + y_2)^k \quad (\text{A6})$$

This last inequality again can be confirmed using the power mean inequality.

## Appendix B: Using Chained Aggregates as Longitudinal Data

It is recognized that the CPS sample is not longitudinal, and that different people are surveyed in each annual survey. However, through the sampling and weighting process, the U.S. Census Bureau attempts to have the population and income figures reflect those of the age cohort in the United States at the time of measurement. The concern is that age cohort in total does not contain the same people from one survey period to the next (ten years later). This could occur for four reasons: deaths, migrations, workforce entries/exits, and employment status changes. The first two are obvious. Workforce entries and exits occur in the data because the CPS population and income figures are for individuals who have income greater than zero in the given year. Employment status changes occur when people change from being wage/salary workers to being corporate self-employed (which is excluded), or vice versa.

Changes to the constituents of each generation cohort are thus expected and unavoidable. If the numbers of people in each generation cohort changes drastically from one decade to the next, the notion that I am measuring essentially the same people over time loses currency and the research findings become unreliable. An analysis of generational population changes is summarized in Table 14:

TABLE 14: GENERATION COHORT POPULATION CHANGES				
<i>Age Change</i>	<i>Observations</i>	<i>Population Change</i>		
		<i>Average</i>	<i>Minimum</i>	<i>Maximum</i>
<b>15-24 to 25-34</b>	35	29.3%	20.4%	37.2%
<b>25-34 to 35-44</b>	55	3.4%	0.4%	7.7%
<b>35-44 to 45-54</b>	55	-2.7%	-4.9%	0.8%
<b>45-54 to 55-64</b>	55	-10.0%	-14.5%	-3.7%
<b>55-64 to 65-74</b>	25	-17.8%	-22.3%	-10.3%
Data source: U.S. Census Current Population Survey (CPS).				

From the first age group (15-24) to the second (25-34) there is a marked increase, perhaps because many individuals in the first have no job for at least some of the teenage and college education years. The next two changes are very stable, building confidence that the generational data for these periods represent essentially the same people. The last two changes reflect people leaving the workforce for retirement and increased deaths. Overall, the population changes do not appear to suggest great changes in generation cohort constituents. Perhaps the only enduring concern is that the individuals of the 15-24 age cohort who show up later (consistently over 20%) are not tracked in the CPS data because they have no income; that would suggest that the age 15-24 income data are inflated.

## Appendix C: Age-Income Regression Statistics

**TABLE 15: OLS REGRESSION STATISTICS FOR U.S. MEN AGE-INCOME RELATION**

Dependent Variable: Y  
Method: Least Squares  
Date: 02/21/13 Time: 22:16  
Sample: 1 250  
Included observations: 250

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	497314.1	74031.77	6.717577	0.0000
AGE	-20054.47	1700.100	-11.79605	0.0000
AGE^2	-45.75328	0.957167	-47.80073	0.0000
BYEAR	-287.3406	37.30080	-7.703336	0.0000
AGE*BYEAR	12.78372	0.843524	15.15513	0.0000
R-squared	0.976988	Mean dependent var	46254.98	
Adjusted R-squared	0.976612	S.D. dependent var	16822.86	
S.E. of regression	2572.739	Akaike info criterion	18.56313	
Sum squared resid	1.62E+09	Schwarz criterion	18.63356	
Log likelihood	-2315.391	F-statistic	2600.380	
Durbin-Watson stat	0.439896	Prob(F-statistic)	0.000000	

**TABLE 16: OLS REGRESSION STATISTICS FOR U.S. WOMEN AGE-INCOME RELATION**

Dependent Variable: Y  
Method: Least Squares  
Date: 02/21/13 Time: 21:28  
Sample: 1 250  
Included observations: 250

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	-156002.5	68928.11	-2.263264	0.0245
AGE	-13626.37	1582.898	-8.608500	0.0000
AGE^2	-18.25383	0.891181	-20.48274	0.0000
BYEAR	65.66394	34.72932	1.890735	0.0598
AGE*BYEAR	8.103035	0.785373	10.31744	0.0000
R-squared	0.918394	Mean dependent var	23893.64	
Adjusted R-squared	0.917062	S.D. dependent var	8317.576	
S.E. of regression	2395.377	Akaike info criterion	18.42027	
Sum squared resid	1.41E+09	Schwarz criterion	18.49070	
Log likelihood	-2297.533	F-statistic	689.3094	
Durbin-Watson stat	0.189612	Prob(F-statistic)	0.000000	

## ADAPTATION, GROWTH, AND TAX PROGRESSIVITY

### Abstract

In recent years, economic research has found evidence that individuals are at least partially concerned with their income or consumption relative to other individuals, and this research has prompted economists to claim that taxes on these activities address a negative externality, and taxes should thus be more progressive. However, these analyses neglect to consider other research that has found evidence that through an adaptation effect individuals are also concerned with their income or consumption relative to their own past. An individual utility model is constructed combining both lines of research under a progressive tax regime. Work hours are found to be curtailed with higher tax rates and generally curtailed more under progressive structures. Optimal tax rates are found to vary greatly with individual productivity growth and with government efficiency levels. General effects of progressivity variation are assessed and explored.

### 1. Introduction

#### *Progressive Taxation's Muddled Effects on Utility*

Since the 1970s, an emerging body of economic research called happiness economics has challenged the age-old idea that income and consumption affect people's utility in a direct and linear way. One of the most publicized avenues of this research theorizes that

people may care less than previously supposed about absolute levels of consumption (and by extension income) and more about their consumption relative to other people. They care about positional consumption, or what is often called their “positionality.”

One implication of the relative income and consumption research was that there is a negative externality that accompanies consumption and possibly even work. When one’s consumption increases, everyone else’s relative consumption decreases. If people care significantly about relative consumption and income, then consuming more (and working more to feed consumption) may have private benefits but offsetting social costs. Everybody may be working harder to consume more simply because everyone else is working harder to consume more.

Recognizing this negative externality, economists have suggested a tax. The tax would diminish the amount of private consumption commensurate with the externality; the result would be a level of consumption that satisfied people’s desires for absolute consumption while removing people’s indulgence in positional consumption, which has no social benefit.

Optimal tax theory has been used to determine what level of tax is appropriate to reduce the positional externality. Also, because it is believed that utility gains from low-end consumption are mostly from absolute consumption while utility gains from high-end consumption are mostly from relative consumption, progressivity of the applicable tax has been suggested as a way to address the externality of conspicuous consumption while leaving inconspicuous consumption unchanged. The result has been a call for progressive income and consumption taxes that may have little or no economic efficiency effects because they reduce work and consumption that is inefficiently excessive and not socially optimal.



Another avenue of happiness research theorizes that what matters to people is not the level of consumption (or income) but the change or growth in that level over time. Because of an adaptation effect, people require increases in consumption or income to raise (or simply maintain) their utility. People may be less concerned with how much they consume today, or how much they consume relative to other people, and more concerned with how much they consume relative to their own past consumption.

These two avenues of research, one professing that utility is derived from positional income/consumption and the other professing that utility is derived from income/consumption growth, are often in tension. Both are supported by a large body of theoretical and empirical research. Yet in a sense they are competing for the answer to the same question: what drives people's decision-making through their implicit utility functions? The research camps are often at odds with each other, claiming that their own is a more correct explanation for happiness and utility than the other. As a result, whereas the volume of research for positionality and adaptation are each quite large, research of their combination is rather limited.

If it is accepted that adaptation is a determinant of utility alongside positionality, leisure, and consumption generally, the optimal tax calculations and calls for progressivity in the corrective tax may need to be reconsidered. Although their utility from positional consumption may be largely unaffected by a positional externality tax because of the reduction in positional consumption of others, the tax may diminish their utility from income/consumption growth considerably.

Progressive taxes in particular would appear to have a severe negative impact on utility from consumption growth. As they grow older and more experienced, people increase

their incomes and their consumption. Therefore, income and consumption needs to grow to maintain utility levels. As the life cycle of the individual progresses and income and consumption reach higher levels, progressive taxes take a greater percentage of income or consumption; the rate of consumption growth necessarily diminishes during the life cycle, creating despair and unhappiness as utility diminishes commensurately.

### *Research Objective*

The overall objective of this paper is to examine the impact of a positional externality tax on the total utility of the individual and how this impact is affected by the progressivity of the tax. This objective will be achieved through the development of a theoretical utility model that incorporates both a positional consumption component and a consumption adaptation (growth) component. The model shall be analyzed to quantify tax and progressivity impacts on utility in terms of the underlying variables.

The analysis shall answer three lines of questioning that together seek the overall objective. First, given individuals of differing levels of productivity growth, what are the optimal hours worked? What is the difference between the individual optimum and the social optimum? How does a progressive tax effect work effort?

Second, how does changing the tax rate affect individuals of varying productivity growth? What is the optimal tax rate for the individual and what factors influence it?

Third, how do different degrees of tax progressivity affect individuals of varying productivity growth? How do other factors influence these effects?

The answers to these questions will be produced by analyzing the theoretical model and as such will be framed in terms of the underlying model assumptions and variables. No

quantitative analysis shall be performed. However, the implications of the model shall be discussed in light of what other research suggests as reasonable estimates of the variables. The discussion shall illuminate the boundaries of positional externality taxation and suggest areas for future theoretical and quantitative research.

### *Research Significance*

The happiness economics research has in recent years produced an abundance of theoretical studies and empirical evidence showing how and why people care about positionality and growth rather than simply absolute levels of income and consumption. Yet these studies have been largely independent of one another; not much research has accepted both positionality and growth as drivers of personal utility and attempted to analyze how these utility components react in combination when faced with economic policy prescriptions that obtain in theoretical isolation with one or the other.

As government debt crises in recent years have brought greater scrutiny to public finance, income and consumption tax policies (both the magnitude and the structure) in many countries have experienced re-evaluation and would appear to continue to do so in the near future. Economic research in these areas should give clear and comprehensive signals about the consequences of these policies.

In particular, a tax policy response to positional externalities has received plenty of attention, but only with the expectation of a positional utility component. Examining how the integration of a growth component to utility would alter the mechanics and prescriptions of the positionality tax response can be an important contribution to economic research. The existence of a positional externality has been used to justify less work, greater public

goods provision, and higher and more progressive taxes. If an expectation of a growth component in utility functions is coupled with the expectation of a positional component, these prescriptions become fundamentally mitigated and possibly reversed.

### *Paper Structure*

To achieve the research objectives, the paper is organized into six sections, the first being this introduction. Section 2 reviews the existing literature on the effects of relative income and income growth on utility and how progressive taxation alters these effects. Section 3 examines the underlying economic theory of the paper and produces the utility model and its extensions. Section 4 presents the research findings. Section 5 analyzes the findings and discusses the implications for positional externality research in general and the progressive tax solution in particular. Section 6 concludes and suggests further research.

## **2. Literature Review**

### *Positionality and Utility*

The influence of positionality in economics originated with the concept of interdependent utility. The idea of interdependent preferences can be dated back at least to Jean-Jacques Rousseau but more recently to Thorstein Veblen, who introduced the idea of conspicuous consumption as “the utility of consumption as an evidence of wealth” (Paglin, 1975, p. 45) and the indirect use of goods or money to show one’s social status. In the late 1940s, economist James Duesenberry used the idea of interdependent utility to formalize a relative-income hypothesis of behavior and suggested that poverty was relative. The notion of interdependent utility served as the theoretical basis for empirical studies of positional

income and consumption. These blossomed in the 1960s and 1970s with the availability of social survey data on self-reported happiness. Such surveys ask people to express their feeling of happiness or well-being on an ordinal scale.<sup>18</sup> The reported happiness of respondents was then correlated with respondents' demographic and economic status. While psychologists and sociologists were the early pioneers in this effort, economists joined the happiness research bandwagon to test the validation of the motivations implicit in theories of utility and economic growth. Since 1960 the number of economic journal articles associated with happiness, life satisfaction, and well-being has grown at an exponential rate (Clark, Frijters, & Shields, 2006, p. 1).

Before reviewing the applicable happiness literature, however, it should be noted that translating the empirical findings of happiness surveys into validations of utility theory is controversial. In the relevant research, it is often assumed that reported happiness is the emotional equivalent to utility. Many studies go so far as to use happiness survey evidence to build representative utility models. The bridge between the two entails many assumptions.<sup>19</sup>

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<sup>18</sup> For example, the General Social Survey (GSS) asks, "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?" (Stevenson & Wolfers, 2008, p. 26). The German socio-economic panel (GSOEP) asks, "In conclusion, we would like to ask you about your satisfaction with your life in general, please answer according to the following scale: 0 means completely dissatisfied and 10 means completely satisfied: How satisfied are you with your life, all things considered?" (Di Tella et al., 2010, p. 838).

<sup>19</sup> Among the assumptions made in bridging reported happiness to utility functions we often find any of the following: (1) There is a single dimension of happiness in life, or if there are multiple dimensions, people can and do reduce them all to a single dimension. (2) The dimension the researcher is studying has a

In a seminal essay, Richard Easterlin (1974) compared the aggregate reported well-being of individuals with the Gross Domestic Product (GDP) growth of their societies. He suggested a paradox: If greater wealth results in greater happiness, why do not people (or whole societies) report greater happiness over time as the real income of their society increases? His evidence showed that differences in reported happiness within countries were correlated with income, as could be expected. Yet he also found that international comparisons showed reported happiness varied little between countries, even if the income (GDP) of countries diverged. Furthermore, over time GDP showed steady increases while reported happiness remained flat. He suggested that reported happiness may be less responsive to absolute income than to relative income (Easterlin, 1974, 1995). His explanation implied a positional income or consumption component within individual utility functions. Hundreds of books and articles since Easterlin's study have addressed the nature and the magnitude of income's relation to reported happiness. These have sometimes used economic measures other than income, such as wealth or consumption, though the general idea is the same.

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similar weight among all respondents. (3) The scale of possibilities is the same for all respondents. (4) There is a single reference for possibilities for each respondent. (5) The response is a snapshot of a current level, rather than a function of levels over time. (6) The respondents all have the same or at least similar definitions of the term they are scaling ("happiness" or "well-being" or "life satisfaction"). (7) The definition of the term does not change over time. (8) The scale of possibilities for each respondent does not change (or changes uniformly) with greater life experience. (9) The scaling distribution is similar for all respondents. (10) The term that respondents report on drives all preferences, with no exceptions for short- and long-term goals, strategic thinking, or irrational behavior.

In his book *Social Limits to Growth*, Fred Hirsch (1976) popularized the notion that economic growth is largely wasted on individual positional consumption. Robert Frank (1985a) explored the ramifications of the social comparison effect in his book *Choosing the Right Pond*. He argued that income, utility, and well-being depend on social reference points. In his view, the quest for status had become endemic in some, but not all, consumption in affluent countries. He said that positional consumption has a likeness to both the prisoner's dilemma and the arms race escalation models of game theory. He prescribed redistributive taxation to correct for the negative externality imposed by people who spent conspicuously.

More recent research attempted to confirm the importance of positionality for reported happiness. Luttmer (2005) found that “controlling for an individual’s own income, higher earnings of neighbors are associated with lower levels of self-reported happiness” (p. 963). Hopkins and Kornienko (2004) determined that richer economies have higher amounts of conspicuous consumption and thereby have lower levels of utility at all levels of income. Ferrer-i-Carbonell (2005) found that “the income of the [positional] reference group is about as important as the own income for individual [reported] happiness, [and] that individuals are happier the larger their income is in comparison with the income of the reference group” (p. 997). She also found that the comparison effect is asymmetric: lower-income people had stronger negative effects while higher-income people had more modest positive effects. Ball and Chernova (2008) found that both absolute income and social comparison income were both positively correlated with reported happiness.

Not all studies of social comparison credited such a prominent role to positionality. Hagerty (2000) showed in two samples that the range and skew of income distributions negatively affect reported happiness; however, this effect is smaller than the absolute income

effect. McBride (2001) found “micro-level evidence in support of the hypothesis that relative-income does matter in individual assessments of subjective well-being” but that “relative-income effects may be smaller at low income levels” (p. 251). Yet other studies found no evidence for the positionality hypothesis. Senik (2004) found that, in volatile environments such as post-Communist Russia, “income distribution [variables] do not influence satisfaction through social comparisons” (p. 2099). In her research the reference group’s income exerted a *positive* influence on individual satisfaction. Other studies in support of competing claims (*i.e.*, other non-interdependent income measures) have found social comparisons to be small or non-existent (Davis, 1984; Hagerty & Veenhoven, 2003; Stevenson & Wolfers, 2008).

Some of the happiness research indicated that while relative income may have a place alongside absolute income in people’s decisions, higher income by itself nevertheless remains a significant contributor to self-reported happiness. Blanchflower and Oswald (2004) found that, “absolute income alone ... does not capture all pecuniary effects” (p. 1378), but nevertheless “higher income is associated with higher happiness” (p. 1381). Lelkes (2006) found that “money buys satisfaction, but not to the same extent for everyone” (p. 192), particularly less so for religious people. The correlation of reported happiness with absolute income also finds evidence in aggregate country data (Alesina, Di Tella, & MacCulloch, 2004).

### *Growth and Utility*

A body of research related to the positionality angle that has received roughly commensurate attention suggests that one’s personal income and consumption history is



used as a reference point, and that the rate of change in income or consumption may be an important component of personal utility.<sup>20</sup>

Hedonic adaptation (also referred to as habituation) is the idea that over time people become accustomed to a change in fortune, including such financially quantifiable measures as income and consumption. The new level becomes the new normal, and there is no lasting effect on one's sense of well-being as the individual adapts to the new reality. This notion has been around since at least the time of Adam Smith (1790), who spoke of “[t]he never-failing certainty with which all men, sooner or later, accommodate themselves to whatever becomes their permanent situation,” and suggested that the Stoics were correct that “between one permanent situation and another, there was, with regard to real happiness, no essential difference” (p. 149). In other words, the reference point for income or consumption is ever shifting. Such change has been likened to a “hedonic treadmill” (P. C. D. Brickman & Campbell, 1971)—at each successively higher level of income (or income growth) one must maintain that level to maintain a stable level of happiness.

At first glance, adaptation appears to make changes in fortune less significant for human happiness and for economic measures such as utility. What adaptation really shows, however, is that to some degree continual change is required to sustain prolonged effects on happiness and utility. The value of a pay raise is not in the increased salary one will enjoy

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<sup>20</sup> Unlike positionality, the determination as to whether to use income or consumption in adaptation or growth research is ambiguous. Since adaptation is a dynamic time-sensitive phenomenon, people may use income rather than consumption as a guide, since income influences future consumption expectations more accurately. Positionality, on the other hand, is dependent on the visibility of consumption; income serves only as a proxy.

from this point forward. After some time the worker will get accustomed to earning the higher salary. The value is rather in the raise itself—the one-time increase. A raise makes the worker happier but will not continue to make the worker happy if not followed by further pay raises. In a more general sense, the “activity [must be] maintained over time to produce a sustained increase in the chronic level of happiness” (Lyubomirsky, Sheldon, & Schkade, 2005, p. 121).

Growth rates are a more appropriate measure of income or consumption than the amount of change. Adaptation theory suggests that utility depends on the difference between current experience and a neutral level of experience, typically some function of past experience (Keely, 2003). A change in income, for example, may be large or small and will influence the effect on utility commensurately. What makes an income change large is relative to the amount of income that is accustomed by the individual through their past experience. The income growth rate indicates the magnitude of the change relative to an individual’s baseline income, *i.e.* their immediate past experience. Growth rates are therefore generally more useful than absolute levels of change because they contextualize the magnitude of the change for the individual’s circumstance.

Like positionality, growth and adaptation are thought of as introducing the perspective of relativity and context. A person views her utility from income, for example, by comparing such income to her past or to past generations. Just as one looks to other people for a standard to measure one’s income or consumption, one also looks to one’s own past as a standard. People may care not only about their absolute level of consumption and the level of others’ consumption, but also whether one’s consumption is growing. Friedrich Nietzsche

(1999) wrote, “What is happiness? The feeling that power is growing, that resistance is overcome” (p. §2).

It is not difficult to see why this is so. Consider two options: (1) Upon college graduation you receive a \$50,000 new car, and every five years you get to trade it in for the same new car, also valued at \$50,000; (2) Upon college graduation you receive a \$10,000 used car, and every five years you get to trade it in for a new car worth \$10,000 more than the purchase price of your last. After forty years, the second option finishes with a \$90,000 car and in both situations the same amount in total is spent on cars (\$450,000). Think of the two options as two possible experiences for an individual. Which would make the individual happier in the long run? In the second case, the individual would always have something better to look forward to.

The connection between income or consumption growth to utility may be an alternative response to the Easterlin paradox. Maybe the level of economic output is less important to reported happiness than the slope. If economic growth was generally steady over a twenty year period, average reported happiness, the slope of economic growth, would be constant, as Easterlin found. The absence of a change in happiness levels during periods of economic growth does not necessarily indicate that growth (or income) has no effect on happiness; rather, the question may be how high (low) happiness levels may have been in the absence of growth.

In fact, many researchers who have followed in Easterlin’s footsteps have concluded that income (or consumption) growth is a significant component of reported happiness and utility. Studies of the effect of income growth on reported happiness blossomed alongside the studies of positionality in the 1970s. Some of this attention was in response to the

Easterlin paradox. Some was also due to a seminal article on adaptation by Brickman, Coates, & Janoff-Bulman (1978): In a survey of lottery winners and paraplegics, they showed that habituation and contrast over time dull the effect of drastic life changes on reported happiness.

Other research has bolstered the claim that adaptation and growth are significant factors in reported happiness. Davis (1984) found that recent financial change (along with race and marital status) was a better predictor of reported happiness than social comparison, income generally, or other considerations. Clark (1999) showed that “one important measure of well-being, overall job satisfaction, is strongly positively correlated with the change in the worker’s pay between waves, but is unrelated to the current level of pay” (p. 179). Frijters, Geishecker, Shields, & Haisken-De New (2006) found in a Russian longitudinal survey that while 10% of life satisfaction can be explained by real household income, 30% can be explained by year-over-year income growth.

Cross-country surveys also found support for an income growth effect. Stevenson and Wolfers (2008) found positive effects from income and from income growth in a large multinational survey: they find economic growth to be associated with *rising* happiness. Easterlin and Angelescu (2009) attempted to find a relationship between GDP growth per capita and a change in reported happiness. They found that while in the short-term positive macroeconomic conditions resulted in a growth in average reported happiness levels, in the long-term the relationship was nonexistent.

As with positionality, some studies find an asymmetric effect. Burchardt (2005) showed that “over a longer period, adaptation to changes in income is asymmetric: people adapt to rising incomes but less so falling incomes” (p. 57). Other researchers have found

adaptation to be a salient phenomenon in non-economic areas, such as marital status, disability, and health conditions (Lucas, Clark, Georgellis, & Diener, 2003; Lucas, 2005; Oswald & Powdthavee, 2006; Wu, 2001).

As with positionality, adaptation studies were more apt to use income than consumption, principally because income data are more available. But income growth may also be more responsive to income directly. Income growth may cause higher reported happiness because it raises the expectations of a higher level of sustainable consumption. If this is the case, it is an intermediate factor, though presumably more measurable than expectations of future annualized consumption.

#### *Positional Externalities and Taxation*

If utility is affected by positional income or consumption, an increase in personal income or consumption has an externality on other members of the community. This externality could be positive or negative, depending on whether people are jealous or altruistic in their concern for other people's consumption (Oswald, 1983). With the exception of Senik's 2004 paper, however, all research points toward a negative externality: Higher consumption by others decreases the reported happiness of the individual, keeping his own consumption constant. The degree of the externality is debatable, but the evidence is strong that it exists.

If a true negative externality exists, economic theory suggests that a corrective Pigovian tax might be justified. Arguments for a corrective tax emerged with the happiness economics literature. Most of this research was focused on the optimal level of taxation.

Those studies that focused on tax design and structure suggested an income tax rather than a consumption tax.

There are abundant examples of calls for a corrective income tax. Hirsch (1976) suggested a payroll tax on wage differentials. Boskin and Sheshinski (1978) used a negative proportional income tax to show that “*Extreme* concern for relative status can yield substantial optimal redistributive taxation with either a utilitarian or a maximin social objective” (p. 599). Similarly, Beath and FitzRoy (2007) concluded that “the optimal tax increases with the weighting of relative income so as to counteract the rising externality imposed by individual earnings” (p. 24). Layard (2005) sees an income rather than a consumption externality and promotes the use of income taxation to correct for an oversupply of labor over leisure. Ljungqvist and Uhlig (2000) also claim that conspicuous consumption leads to an oversupply of labor, which demands an income tax.

The tendency to suggest an income tax apparently was driven by the fact that empirical studies often used longitudinal surveys, and income data for survey respondents are generally available, while consumption data are not. Consumption is assumed to be where most status-seeking and social comparison occurs, and testing for social comparison income is simply a second-best option.

The assumption that consumption, not income, is the source of positional externalities has support in the literature. Weinzierl (2005) found that income in happiness regressions is a noisy substitute for consumption. Wealth, perhaps as a proxy for future consumption, has also been found to be a better predictor of reported happiness than income. Mullis (1992) found that “permanent income, annuitized net worth, and household economic demands, performs better as a predictor of psychological well-being than

conventional measures of economic well-being, particularly current reported income” (p. 119). Headey and Wooden (2004) found that wealth “is at least as important to well-being ... as income” (p. S24). Headey, Muffels, and Wooden (2008) showed that wealth and consumption predict reported happiness better than income. Nevertheless, most economic happiness research continues to use income.

The substitution of income for consumption as a determinant of reported happiness and thus utility raises a concern. If utility is affected by positional consumption and not work, then the externality solution should focus on consumption. There are plenty of economic activities (*e.g.*, saving, investment, bequests, and charity) that occur between when a dollar is earned and when it is spent. A tax on income instead of consumption would undoubtedly create distortions in the scale and nature of these activities.

Expenditure-specific consumption taxes, an obvious way to selectively inhibit conspicuous consumption, have received some attention. Oswald (1983) suggested taxing the consumption of positional commodities. However, in arguing for a progressive consumption tax, Frank (2007) dismissed luxury and sumptuary taxes as ineffective, as people quickly switch to non-targeted substitutes.

Ireland (1994) created a model where an individual’s utility balances conspicuous (“visible”) and non-conspicuous consumption. He showed that, if the proceeds of a tax on visible consumption goods are rebated back to the taxpayers in proportion to their incomes, the tax is Pareto-efficient. He thereby makes a case for a tax on conspicuous consumption (apart from general consumption) that is non-redistributive and avoids ethical concerns since it increases all consumers’ utility. The welfare gains, however, are minimal. Ireland (1998) later showed that a small Pareto-efficient income tax that funds public or non-positional

goods may exist if the income distribution is not too wide: The poor gain from a redistributive effect while the rich gain more in the reduced consumption of positional goods than they lose in redistribution.

One of the more intriguing tax responses to positionality is the progressive consumption tax. Appreciating the benefits of taxing consumption instead of income, the progressive consumption tax is implemented as an income tax that exempts net savings, effectively making it a tax on consumption. The purpose of taxing consumption indirectly is to exploit certain features available to income taxes, specifically progressivity. The idea originated with work by Irving Fisher in the 1940s and was resuscitated in the 1970s in work by William Andrews (1974) and Michael Graetz (1979). It reached its apogee with the Unlimited Savings Allowance (USA) tax proposal<sup>21</sup> developed most thoroughly by Seidman (1997). The progressive consumption tax attempts to avoid some of the problems inherent in applying income taxes while maintaining a progressive rate structure to target high-income consumption.

Robert Frank was the first to suggest implementing a progressive consumption tax as an explicit response to positionality. Indeed, in four of his books, Frank's central theme is the existence of positional externalities and his primary cure is a progressive consumption tax (Frank, 1995, 1999, 2007, 2011a). The exact tax structure Frank prescribes has varied somewhat over the years, but the most specific formulation is found in his book *Falling Behind*. Essentially, he calls for an income tax with personal exemptions and progressive

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<sup>21</sup> A modified version was proposed as a bill in the United States Senate in 1995. It died in the Senate Finance Committee.



marginal rates on taxable consumption that increase from 20% to 200%. Taxable consumption is set to earned income minus net savings minus the resultant tax. Borrowing and loan repayments would be subtracted from and added to net savings, respectively; however, mortgage loans would not be counted and instead imputed rents would be added to the consumption total (Frank, 2007).

The reasoning behind using a progressive tax for purposes of reducing positional externalities is grounded in two propositions. First, higher levels of per-period consumption are more positional than lower levels. Some amount of consumption is assumed to be spent on basic human need satisfaction, while consumption at higher levels is increasingly employed in status-seeking and positionality. Beyond a minimum subsistence level (which can be accommodated outside of tax rates), consumption has a conspicuous component and this component is more prevalent with higher per-period consumption.

Second, it has been suggested that positionality is principally upward-looking: Those in each income or consumption class cast negative externalities only on those beneath them, so that the degree of the negative externality is greatest from the richest members of society, even if they themselves value positionality in no greater degree than anyone else. Bowles and Park (2005) argue for a progressive consumption tax on these grounds.

The case for progressivity depends critically on these assumptions. Ireland (2001) asserts that while greater status-seeking supports *higher* taxes, “unless the rich are more concerned with status-seeking than the poor,” *progressive* taxes do not aid in counteracting social comparison externalities (p. 193). He concludes that “status seeking justifies income taxation and higher MRT [marginal rate of tax], but not an increasing MRT” (p. 211). In an article using game theory to analyze positionality, Hopkins and Kornienko (2004) similarly

assert that “the presence of relative concerns does not provide an additional rationale for progressive taxation” beyond other justifications (p. 1100).

Frank defends the use of a consumption tax over an income tax on the grounds that it encourages savings and investment. Yet there are a number of other reasons to prefer consumption as a tax base, especially in regard to correcting for positional externalities. The particular problems with taxing income may be aggravated by progressivity, even when the tax base is changed to consumption.

### **3. Research Methodology**

#### *Research Approach*

My general research approach is to show that some of the conclusions advanced in the positional externality literature regarding the structure and level of corrective taxation are significantly altered when the underlying utility model includes a consumption growth component. To do this, I construct a Cobb-Douglas utility model that includes common components of personal utility functions: leisure and consumption. I also add in a positional consumption component and a consumption growth component. I introduce a progressive tax function. The model is parameterized with Cobb-Douglas weights for the various utility components. I then analyze the model for optimal levels of work and taxation that maximize personal utility.

#### *Theoretical Foundation*

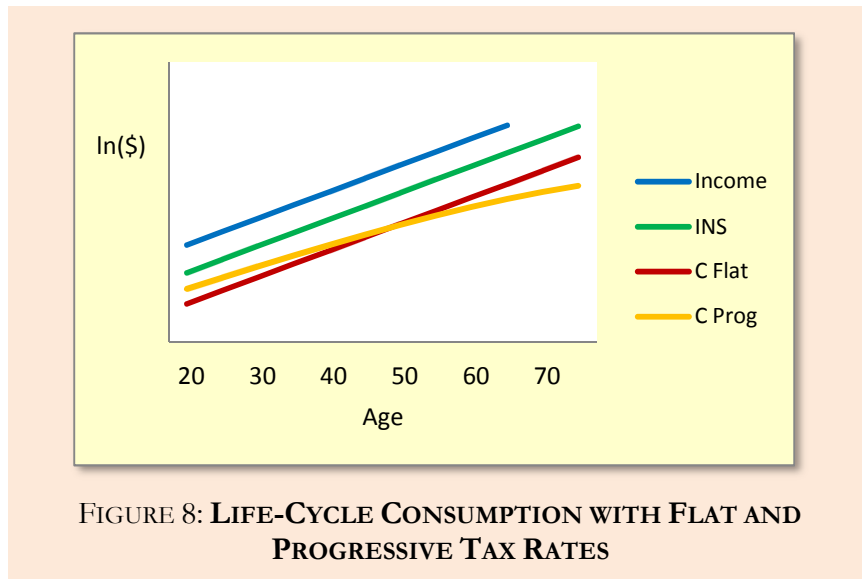
The basis for a positional externality tax is that people’s utility is affected by positional consumption. If evidence shows that people’s utility is affected by personal

consumption growth, and this is negatively affected by efforts to offset the positional component, the excess revenue from taxing an externality is no longer free: There is a loss to individuals' utility from diminished consumption growth. A policy of progressive taxation attempts to raise public revenue with little or no net utility loss from positional consumption comparisons, but it flattens the trajectories of lifetime disposable income and thereby diminishes lifetime utility from income or consumption growth.

Figure 8 illustrates the point.<sup>22</sup> It shows the after-tax consumption of an individual over his life cycle under a flat and a progressive tax. The data series in the graph show the lifetime income of an individual, income net of savings (INS) and thus available for consumption and subject to consumption tax, and the consumption the individual retains with both a proportional (flat) consumption tax and a progressive consumption tax. The two taxes are shown as generating equal revenue over the life of the individual. Since it has been shown that income generally increases during the average person's life cycle (see Chapter 2, pp. 55-57, 68), the slopes of the income and consumption curves are positive. It is also assumed here that the individual will save a constant percentage of pretax income and use these savings to continue consumption in retirement.

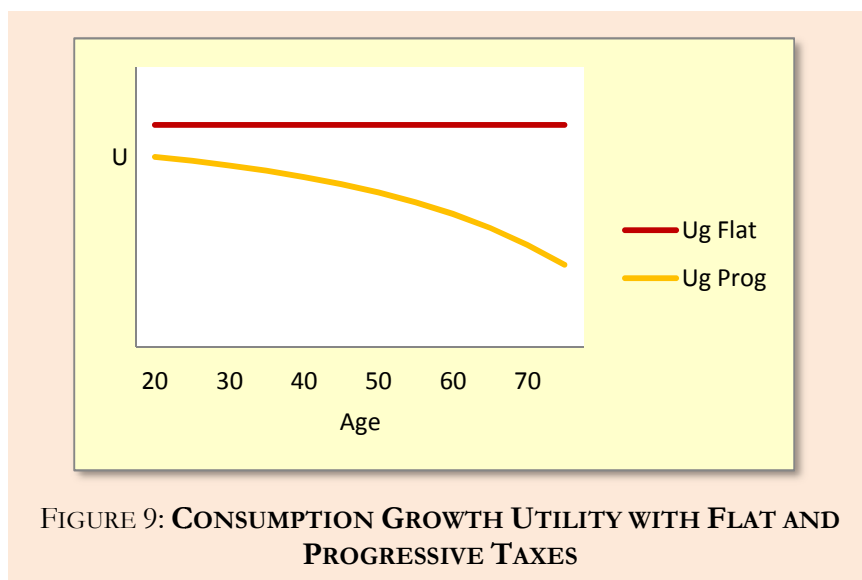
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<sup>22</sup> Note that the formal model is developed later in the paper. The variables and figure illustrations provided here are merely to introduce the general idea.



The graph shows that under the proportional tax after-tax consumption increases at a constant slope on a logarithmic scale. The progressive tax, in contrast, has a concave decreasing slope as consumption at a young age is taxed at a lower rate than at an older age.

How does the difference in tax structure affect the portion of utility derived from consumption growth? This is illustrated in Figure 9. If we measure the amount of utility



from after-tax consumption growth ( $U_g$ ) alone by taking the first derivative (*i.e.*, the slope) of such consumption, a proportional consumption tax provides higher utility than a progressive consumption tax *throughout* the individual's lifetime, even when the individual is young or poor.

If it is accepted that people generally have life-cycle patterns of consumption, the negative effects of a progressive tax hold true even for individuals who have relatively flat income and consumption curves. Even if people start in the work force with similar income levels, they often have widely varying productivity growth rates. Yet if we took a person with lower productivity growth, the slope of the income line may be less, but the principle remains the same: The utility derived from increasing his income would still be less at every age with a progressive tax than with a proportional tax. Because he would not reach the same income levels as someone with a higher productivity growth rate, he would be less affected by the concavity of progressivity. But he would still be better off in terms of utility (with regard to growth) if the taxes he faced did not squelch his income with greater proportion as he became more productive. Those who have lesser productivity gains, whatever the reason, will still be worse off with a progressive tax, insofar as it affects their utility or happiness by making it more difficult to sustain growth in their personal consumption. What's more, the progressive tax offers a bleak future of diminishing utility as one's happiest years are ever in the past.

If a progressive consumption tax is applied, rather than a progressive income tax, one could argue that the individual could simply save more in low-consumption years so that his actual consumption net of taxes follows a non-diminishing slope—essentially to try to emulate the flat consumption tax scenario by manipulating the savings adjustment. This is a

valid argument, but there are two reasons it does not apply here. First, when assessing utility from adaptation and growth it can reasonably be supposed that an individual considers income rather than consumption as a gauge: Income growth precedes and portends consumption growth. Second and more importantly, to the extent that an individual uses savings to avoid progressivity, the progressivity of the tax does not obtain and individuals pay taxes at the same flat rate and the ostensible goal of the policy is nullified. The use of a progressive consumption tax to counteract high-end consumption is ultimately subverted by people who will use the tax's consumption (savings) provision to completely offset its progressive provision. This paper intends to show the effects of progressivity that persist absent the foresight and ability of individuals to game the system.

Depending on the weight people give in their utility functions to absolute consumption levels, positionality, and consumption growth, utility may be maximized with a progressive tax, a flat tax, or even a regressive tax. The optimal tax may differ among individuals with different wage and productivity levels. The main idea is that a proportional consumption tax has no effect on consumption growth while a progressive consumption tax inhibits it. More generally, a tax regime should consider effects on other possible inputs to utility such as consumption growth, instead of simply targeting an input such as positionality in isolation.

#### *Consumption, Utility, and Tax Model*

The consumption model begins with a theory of income. From Chapter 2 (p. 54), we know that average income is correlated with age in an increasing concave function with adjustments for generational effects:

$$\bar{J}_{a,s} = \tau_{1,s} + \tau_{2,s}a - \tau_{3,s}a^2 + \tau_{4,s}y + \tau_{5,s}ay \quad (1)$$

In (1):  $\tau$  is the set of life-cycle model coefficients,  $a$  is age in years,  $y$  is generation (birth) year, and  $\bar{J}_{a,s}$  is average annual income for the given age and sex. As I am not interested here in differences between the sexes, I assume an equality of numbers and combine them by taking an average of their coefficients. For simplicity, I also dispose of the generational effects.<sup>23</sup> These changes result in the following:

$$\bar{J}_a = \tau_{1*} + \tau_{2*}a - \tau_{3*}a^2 \quad (2)$$

In (2):  $\tau_{x*}$  is a summary of  $(\sum_s^2 \tau_{x,s})/2$ . Equation (2) shows how income is a function of age, a proxy for work experience. Next I individualize the function by introducing effort (hours worked) and productivity. If it is supposed that productivity only affects the wage premium above the starting work age (when experience is nil), and the starting work age is set to 20, the wage is computed as follows:

$$w = \tau_{1*} + 20\tau_{2*} - 400\tau_{3*} + p(\tau_{2*}(a - 20) - \tau_{3*}(a - 20)^2) \quad (3)$$

$$j_{i,a} = h_{i,a}w_{i,a} \quad (4)$$

In (3 and 4):  $w$  is the wage rate,  $p$  is an individual productivity multiplier,  $h$  is hours worked (as a fraction of available time), and  $j_{i,a}$  is gross annual income for individual  $i$  at age  $a$ . Here and elsewhere, the wage rate is normalized to unity for an average wage.

Consumption is related to income simply by applying a savings discount, and accumulated savings are expected to fund continuing consumption in retirement on the

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<sup>23</sup> Coefficients were calculated with a generational birth year of 1971. As this would place half the sample above the current age in 2013 and half below, it seemed most appropriate for current analysis.

discounted income curve. The savings rate would be affected by the length of retirement, the interest rate, and a separate tax on savings. For simplicity it is assumed that all individuals calculate the same savings rate to extend their working life consumption habits:

$$c = \sigma(j - t) \quad (5)$$

In (5):  $\sigma$  is the consumption rate (one minus the universal savings rate),  $t$  is the tax amount, and  $c$  is consumption. As previously indicated, individuals are myopic in that they do not adjust savings rates to accommodate changes in interest rates or taxes.

The tax amount is a function of the tax rate, income, and progressivity. To allow for continuous variation in the level of progressivity, a tax with a variable progressivity parameter is used:

$$t = r\bar{j}\left(\frac{j}{\bar{j}}\right)^k = rh\bar{w}\left(\frac{w}{\bar{w}}\right)^k = rhw^k \quad (6)$$

In (6):  $r$  is the tax rate,  $\bar{j}$  is overall average income,  $t$  is the tax amount in units of income, and  $k$  is a progressivity parameter, such that  $k > 1$  makes the tax progressive,  $k = 1$  makes the tax proportional, and  $0 < k < 1$  makes the tax regressive. The average wage term is eliminated, being set to unity as previously stated.

The basic utility model would start with the following formulation, derived partially by combining utility components from existing research (for example, see (Clark et al., 2006) and (Layard, 2002)):

$$u = f_0(f_1(c), f_2(v, \hat{v}), f_3(c, c_{n-1}), f_4(l)) \quad (7)$$

In (7):  $f$  are utility sub-functions,  $c$  is total (visible and non-visible) consumption,  $v$  is visible (positional) consumption,  $\hat{v}$  is average visible consumption for the positional



reference group,  $c_{n-1}$  is total consumption in the prior period,  $l$  is a measure of leisure, and  $u$  is an individual's utility.

From equation (7), a Cobb-Douglas utility function is used to combine the utility components. The Cobb-Douglas design is used principally to capture the concept of diminishing returns. One of the more persistent arguments for tax progressivity is that people have a diminishing marginal utility of income, so progressive rates should yield higher social utility if people have differing incomes. The model presented here has diminishing returns to utility components and would thus support this argument. The overall function takes shape with exponent-weighted components:

$$u_{i,n} = (c_{i,n})^\alpha \left(\frac{v_{i,n}}{\bar{v}}\right)^\beta \left(\frac{c_{i,n}}{c_{i,n-1}}\right)^\gamma (1 - h_{i,n})^\delta \quad (8)$$

In (8):  $u_{i,n}$  is the  $i$  individual's utility for period  $n$ , and  $\alpha + \beta + \gamma + \delta = 1$ .

Hereafter, the terms on the right-hand side of equation (8) and subsequent revisions shall be referred to as the absolute component (weighted by the parameter  $\alpha$ ), the positional component ( $\beta$ ), the growth component ( $\gamma$ ), and the leisure component ( $\delta$ ).

Since non-visible consumption is unobserved and visible consumption is not easily quantified, the distinction between visible and non-visible consumption must be estimated. It may be such that visible consumption is typically high-end (luxuries) and non-visible consumption is low-end (necessities). However, it is not clear that this obtains empirically. Rather, it is likely that the split is proportional to consumption as a whole. I therefore use a scalar ( $\rho$ ) to indicate the fraction of consumption characterized as visible in the positional component:

$$u_{i,n} = (c_{i,n})^\alpha \left( \frac{\rho c_{i,n}}{\rho \hat{c}} \right)^\beta \left( \frac{c_{i,n}}{c_{i,n-1}} \right)^\gamma (1 - h_{i,n})^\delta \quad (9)$$

This positional parameter cancels out. To prepare for analysis of changes to work effort and differences in productivity, the model is now adjusted for individualized effort and wage differences. The adjustment combines the effects of (4) and (5) above, replacing consumption with the product of effort and wage:

$$u_{i,n} = (h_{i,n} w_{i,n})^\alpha \left( \frac{h_{i,n} w_{i,n}}{\hat{h} \hat{w}} \right)^\beta \left( \frac{h_{i,n} w_{i,n}}{h_{i,n-1} w_{i,n-1}} \right)^\gamma (1 - h_{i,n})^\delta \quad (10)$$

Equation (10) serves as the basic utility model for individuals in a system without a tax.

Introducing taxes involves two changes. First, the tax itself is applied to wages. Second, the proceeds of the tax are reflected in the model as increased consumption from government spending of the tax proceeds.

The tax portion is an adjustment to the wage rate, per equation (6). The tax is subtracted from the wage. If the tax is proportional, a simplification can be made:

$$w - \frac{t}{h} = w - r w^k = w(1 - r) \mid^{k=1} \quad (11)$$

The inclusion of government spending, capturing the taxes of all individuals, is somewhat more complex. The individual utility model is based on a wage derived from the individual's age and personal productivity level. I assume that the age distribution is uniform and that exits (retirements) occur at the same rate as entrants (those coming of workforce age). Thereby the analysis is reduced to one single individual living in all periods. To allow for productivity differences, the analysis is simply changed to include two such individuals:

one low-productivity and one high-productivity. The total population for the model is two times the number of discrete working ages.

Tax revenues can either be rebated as in-kind non-positional consumption (*e.g.*, food stamps) or used for public goods. In either case the consumption of government expenditure is expected to be non-visible and non-positional; the positional component is unaffected. Under a progressive tax, the individualized amount of government spending is computed as follows:

$$T = \sum_p^2 \sum_n^N r h \bar{w} \left( \frac{w_{n,p}}{\bar{w}} \right)^k = r \bar{h} \sum_p^2 \sum_n^N (w_{n,p})^k \quad (12a)$$

$$g = \frac{T}{P} = \frac{r \bar{h} \sum_p^2 \sum_n^N (w_{n,p})^k}{P} \quad (12b)$$

Note that for a proportional tax, equations (12a) and (12b) simplify as:

$$T = \sum_p^2 \sum_n^N r h w_{n,p} = 2N r \bar{h} \bar{w} = P r \bar{h} \quad (12c)$$

$$g = \frac{T}{P} = r \bar{h} \quad (12d)$$

In (12):  $g$  is the individual's portion of government spending on non-visible consumption,  $N$  is the number of discrete periods (ages) for a single individual, and  $P$  is the total population.

The government spending amount should be further adjusted to account for frictional and composition effects. Governments must expend resources to administer and deliver the non-positional goods to individuals, and due to collective action problems these goods may be delivered with less than perfect efficiency. These costs may be considered a 'frictional' effect. More importantly, the composition of an individual's consumption is most likely not as conducive to their utility if the consumption is not chosen directly, *i.e.* if it is

provided by a government under an indirect system of public choice. Considering these two effects together, I accompanied the government spending variable with a government efficiency parameter ( $\mu$ ) to permit an account of these factors.<sup>24</sup>

After applying taxes, government spending, and government efficiency to the utility components, the model is adjusted thus:

$$u_{i,n} = (h_{i,n}(w_{i,n} - rw_{i,n}^k) + \mu g)^\alpha \left( \frac{h_{i,n}(w_{i,n} - rw_{i,n}^k)}{\hat{h}(\hat{w} - r\hat{w}^k)} \right)^\beta \left( \frac{h_{i,n}(w_{i,n} - rw_{i,n}^k)}{h_{i,n-1}(w_{i,n-1} - rw_{i,n-1}^k)} \right)^\gamma (1 - h_{i,n})^\delta \quad (13)$$

For a proportional tax, the model is simplified somewhat. Notably, in the positional and growth components, taxes cancel out and have no remaining effect:

$$u_{i,n} = (h_{i,n}(w_{i,n}(1 - r)) + \mu g)^\alpha \left( \frac{h_{i,n}w_{i,n}}{\hat{h}\hat{w}} \right)^\beta \left( \frac{h_{i,n}w_{i,n}}{h_{i,n-1}w_{i,n-1}} \right)^\gamma (1 - h_{i,n})^\delta \quad (14)$$

### *Design Considerations*

Four important considerations are addressed before using the developed model. First, the bifurcation of productivity levels is elaborated. Second, the reference group for positional comparisons is defined. Third, a simplification of the progressive tax revenue stream is needed to obtain useful derivatives of the impact of progressive taxes. Fourth, the variables in the utility components are appropriately scaled.

One of the principal goals of a progressive tax system is to redistribute income (or wealth) among people of different skill or ability. As previously stated, the model includes

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<sup>24</sup> In certain cases (such as inadequate public goods provision), government provision of non-positional goods and services may improve the composition of absolute consumption, net of frictional costs (see for example (Frank, 2011a)). The government efficiency parameter could obviously be set to a value greater than one if necessary.

two individuals: one low-productivity and one high-productivity. Already the wages had been normalized so that the total average is one. To keep the average wage at unity and to keep the population of each skill level the same, the wage at each working age is multiplied by the two productivity factors such that the factors themselves add to two and thereby average to unity. But what is an appropriate difference in productivity growth between the low and the high?

The difference could be arbitrary (*e.g.*, .5 and 1.5), as the difference is to a large extent expositional. However, if the impact of progressivity is to be assessed with examples that give the reader some perspective of a real world effect, the factors will be chosen to emulate income differences in the United States in recent times.

One relatively simple way to do this is to choose factors that, when combined with the income differences due to age, result in a Gini coefficient that is roughly equal to recent U.S. figures. The Gini coefficient of the U.S. for the working age population (18-65) before taxes and transfers was calculated by the OECD in the late 2000s as 0.453 (OECD).

Through my own Gini calculation applied to the productivity-adjusted life-cycle income model, it was determined that a ratio between skill levels of 12, when applied to the age and sex income profiles, yields a Gini of 0.452. This ratio implies an unskilled worker receives 15.4% of the average wage increase from age (experience) and a skilled worker receives 184.6% of the average. The Mid Productivity plot in Figure 10 shows the life-cycle model average wage (as a percentage of the overall average) for each age. When this is split into the two productivity levels, the life-cycle wages for these two individuals are shown as the High and Low curves in the graph.

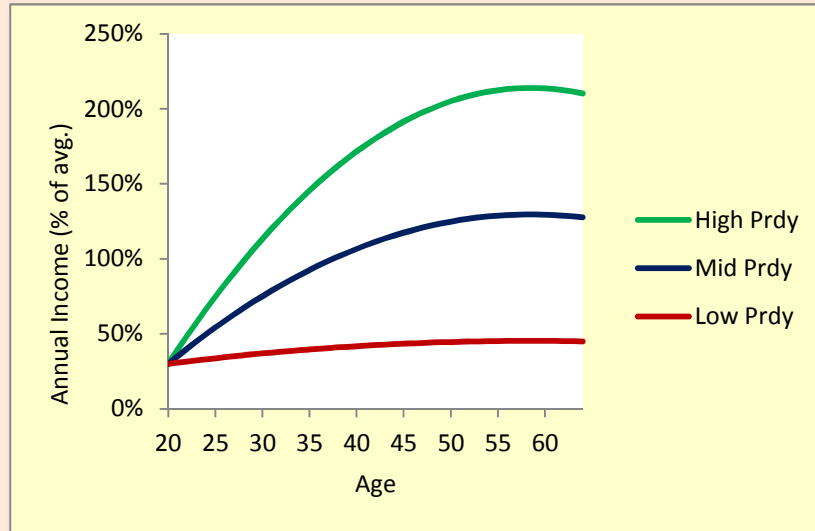


FIGURE 10: IMPLIED WORKING LIFE WAGES BY PRODUCTIVITY CLASS

A second design consideration involved the selection of a reference group for positional consumption comparisons. Referring to equations (8), (10), and (13), how are  $[\hat{h}, \hat{v}, \hat{w}]$  defined and how are  $[\hat{h}, \hat{w}]$  calculated?

It is important to note that in a multiplicative utility function all variables are essentially relative. Although the absolute component appears to take total consumption unrelated to any other consumption, it is implicitly relative. If I were to divide absolute consumption in component  $A$  by average total consumption (or any other constant) the result for utility would be the same. For positionality to have significant meaning apart from general consumption, either the definition of that consumption must be different (*i.e.*, visible as opposed to visible plus non-visible) or the reference group to which the comparison is made must be limited.

Reference group selection is not a straightforward topic and a significant literature has evolved around it. Yet in the present paper it is only necessary to show that work effort and relative consumption will be rewarded by a comparison to other endogenous actors, netting the overall effect to zero. Since the model involves only two people, the choice of a reference group comes down to comparisons across two dimensions: age or productivity. Of these, productivity appears more intuitive: people compare themselves to people of various abilities of the same age more than they compare themselves to people of like ability of different ages. In summary, the reference group used is all other people of the same age—differences in productivity account for positional variability.

The third design consideration is how the model estimates government expenditure under a progressive tax regime. Variation of the progressivity parameter can make the model hopelessly complex due to the summation of tax revenues from heterogeneous individuals differing in age and productivity.

The formula in equation (12b) is very impractical. The summand portion in a sense is an inequality measurement—for any given value of  $k$  it will be larger the greater the variation in incomes. Using the life-cycle income model from Chapter 2 (p. 54), however, a simplified formula can be obtained. Using income estimates by age from the life-cycle model, a parabolic curve was constructed that fit the normalized summand for a vector of  $k$  values:

$$\phi k(k-1) + 1 \cong \frac{\sum_p^2 \sum_n^N (w_{n,p,s})^k}{P} \quad (15)$$

$$g = \frac{T}{P} = r\bar{h}(\phi k(k-1) + 1) \quad (16)$$

In (15) and (16):  $\phi$  is an inequality parameter. The parabolic curve in equation (15) indicates the response of revenue to changes in progressivity with a constant tax rate.

Greater progressivity in the variable progressive tax model (given in equation (6)) generally generates more revenue for the same tax rate as the greater revenue from above-average wage earners more than compensates for the lesser revenue in below-average ones. In fact, it does so at an increasing rate. However, the curve (and the data it fits) has a minimum where the progressivity factor is 0.5; below that level revenue increases.

If the underlying character (*i.e.*, life-cycle income coefficients) are unaffected by changes to the population, this modification can hold with changes to the parameter ( $\phi$ ). For example, the dual-wage productivity model with a 12 differential ratio (as mentioned above) has a  $\phi$  value of approximately 0.25. With a greater variation in wages, the steepness of the curve increases and the inequality parameter reflects this with a higher value.

Now the government expenditure term in (13) can be expanded for completeness:

$$u_{i,n} = \left( h_{i,n}(w_{i,n} - rw_{i,n}^k) + \mu \bar{h} r (\phi k(k-1) + 1) \right)^\alpha \left( \frac{h_{i,n}(w_{i,n} - rw_{i,n}^k)}{\bar{h}_n(\bar{w}_n - r\bar{w}_n^k)} \right)^\beta \left( \frac{h_{i,n}(w_{i,n} - rw_{i,n}^k)}{h_{i,n-1}(w_{i,n-1} - rw_{i,n-1}^k)} \right)^\gamma (1 - h_{i,n})^\delta \quad (17)$$

Note that in (17) I also replaced the positional hours and wage variables with averages applicable to the period. Equation (17) shall serve as the model under a progressive tax.

The final design consideration is the proper relative scaling of utility component values. It is important here to normalize these values to avoid incongruent scaling, rendering the component weights meaningless.

The component values in Cobb-Douglas functions cannot be negative. Additionally, if any values are zero the function output is zero, making other component values meaningless.



A more obscure limitation is that if the component weights (exponents) are to have relative meaning, the component values must have the same relative variation as one another. This is not to say that their scales must be of the same magnitude; that is rendered unnecessary by the multiplicative nature of Cobb-Douglas functions. Rather, the range of component values should be similar *apart from magnitude* and the distribution pattern of values within ranges should be similar.

The value ranges, in other words, should all have approximately the same max-to-min ratio. If  $X$  is a Cobb-Douglas function component, the max-to-min ratio is:

$$\theta = \frac{\max(X)}{\min(X)} \quad (18)$$

It is not important what the value of  $\theta$  is (at least not for purposes of normalizing component weights), only that all components have a similar  $\theta$  value. If they do not, there are two types of corrections that can be made.

The first option is to add a scalar value ( $\eta$ ) to those components that do not conform. This value can be computed as follows:

$$\eta_B = \min(B) \left( \frac{\theta_B - 1}{\theta_A - 1} - 1 \right) \quad (19)$$

In (19):  $A$  is the component to use as a standard and  $B$  is the component being adjusted. For example, given a Cobb-Douglas utility function with component  $A$  values ranging from 200 to 250 and component  $B$  values ranging from .1 to .8, a correction would be to add 2.7 to the  $B$  values, giving the  $B$  range (2.8 to 3.5) the same  $\theta$  value (1.25) as the  $A$  range.

The second option is to alter the component weights themselves. Practically, this means creating two sets of weights: the given or “unadjusted” weights, which reflect the expected balance of the significance of the components to utility as determined by empirics or previous research; and the “adjusted” weights, which take the unadjusted weights and adjust them for proper scaling.

The adjustment formula varies with the number of components in the model. For the four component model used here, the adjustment starts with the recognition that the ratio of the existing scale under the adjusted weights for any two components should be the same as the ratio of the corrected scale under the unadjusted weights for those same components. Taking the  $A$  component as a start:

$$\frac{\theta_A^{\alpha^*}}{\theta_D^{1-\alpha^*-\beta^*-\gamma^*}} = \frac{\theta_{D*}^{\alpha}}{\theta_{D*}^{1-\alpha-\beta-\gamma}} \quad (20)$$

In (20):  $\theta_A$  and  $\theta_D$  refer to the max-to-min ratios of the  $A$  and  $D$  components,  $\theta_{D*}$  refers to the target max-to-min ratio of component  $D$  (which is substituted for the equivalent ratio for component  $A$ ), and exponents with an asterisk refer to the adjusted component weights while those without are unadjusted. From here a calculation of the new a component weight is simplified:

$$\alpha^* = \frac{(2\alpha+\beta+\gamma-\beta^*-\gamma^*) \ln(\theta_D)}{\ln(\theta_A \theta_D)} \quad (21)$$

Equation (21) is reproduced for  $\beta^*$  and  $\gamma^*$ . Then the three equations are solved simultaneously, arriving at the following solution for  $\alpha^*$ :

$$\alpha^* = \frac{(2\beta+2\gamma)(\ln(\theta_D))^3 - (\alpha+2\beta+\gamma)(\ln(\theta_D))^2 \ln(\theta_C \theta_D) - (\alpha+\beta+2\gamma)(\ln(\theta_D))^2 \ln(\theta_B \theta_D) + (2\alpha+\beta+\gamma) \ln(\theta_D) \ln(\theta_B \theta_D) \ln(\theta_C \theta_D)}{2(\ln(\theta_D))^3 - \ln(\theta_A \theta_B \theta_C \theta_D^3) (\ln(\theta_D))^2 + \ln(\theta_A \theta_D) \ln(\theta_B \theta_D) \ln(\theta_C \theta_D)} \quad (22)$$

Similar solutions are obtained for  $\beta^*$  and  $\gamma^*$ .

This second option was chosen to adjust for model component scaling. For the present paper, the approximate expected values of the various components in the utility functions (10) and (17) were computed as follows:

TABLE 17: UTILITY FUNCTION COMPONENT RANGES AND MAX-TO-MIN RATIOS				
<i>Component</i>	<i>Typical</i>	<i>Minimum*</i>	<i>Maximum*</i>	<i>Max-to-min (<math>\theta</math>)</i>
<b>Absolute (A)</b>	1.00	0.31	2.13	7.09
<b>Positional (B)</b>	1.00	0.35	1.65	4.70
<b>Growth (C)</b>	1.03	0.99	1.32	1.33
<b>Leisure (D)</b>	0.65	0.20	1.00	5.00
* Minimum and maximum values for the components were determined as follows: for component A, the lowest and highest wage overall; for B, the lowest wage-to-average for any age and the highest wage-to-average for any age; for C, the lowest and highest annual wage growth overall; for D, (one minus) the lowest and highest optimal work hours dependent on parameter combinations.				

Note that the adjusted weights must be recalculated based on the max-to-min ratios in Table 17 if any of the unadjusted weights change.

In addition to adjusting for the scale range of each component, the distribution of values within each range should, if at all possible, conform to similar distribution patterns. In practice distribution conformity is more difficult, but its consideration may influence how to determine the max-to-min ratios above.

## 4. Research Findings

### *Work Effort and the Positional Externality*

The first question, as stated in the research objective, is: *Given individuals of differing levels of productivity growth, what are the optimal hours worked? What is the difference between the individual optimum and the social optimum? How does a progressive tax effect work effort?*

To find optimal work effort, following Layard (2002) I differentiate the basic pre-tax equation (10) with respect to work effort. Before doing so, however, I remove the hours-worked variables from the growth component:

$$u_{i,n} = (h_{i,n} w_{i,n})^\alpha \left( \frac{h_{i,n} w_{i,n}}{\bar{h}_n \bar{w}_n} \right)^\beta \left( \frac{w_{i,n}}{w_{i,n-1}} \right)^\gamma (1 - h_{i,n})^\delta \quad (23)$$

As Layard mentions in the same research, if the individual chooses hours worked in each period holding the prior period's hours constant, he creates an externality on himself: work hours today create a cost for oneself in the next period. Layard points out, though, that through foresight the individual may recognize this problem and avoid extra work effort spurred by a desire to transcend adaptation. Therefore, whereas the individual may still vary work effort in different periods (due to changes in one's wage, for example), he will not vary work effort that creates a self-externality. Hours worked are removed from the growth fraction for the sole purpose of choosing how much to work.

The individual optimizes the fraction of available hours to work  $h$  by taking the positional reference group's effort level  $\bar{h}_n$  as a constant. Therefore, differentiation shows that optimal utility is reached when  $h = (\alpha + \beta)/(1 - \gamma)$ . However, the social optimum assumes that all positionality will net to zero, so uses a constant for the positional term. Thus, the social optimum is reached when  $h = (\alpha)/(1 - \beta - \gamma)$ , unambiguously lower than the individual optimum.

Depending on the relative importance of positionality (as measured by  $\beta$ ), the positional externality reflected by extra work effort can be significant. If it is assumed that a week has 112 available work hours (7 days, 16 hours per day) and the fraction  $h$  is applied to

this total, these optimums can be given perspective. Table 18 applies the metric and indicates the positional externality from work effort implied by a sampling of component weights.

TABLE 18: <b>POSITIONAL EXTERNALITY UNDER VARIOUS UTILITY WEIGHTINGS</b>						
<i>Unadjusted* component weights</i>				<i>Optimal weekly hours</i>		
<i>Absolute</i>	<i>Positional</i>	<i>Growth</i>	<i>Leisure</i>	<i>Individual</i>	<i>Social</i>	<i>Externality</i>
$\alpha$	$\beta$	$\gamma$	$\delta$			
.2	.2	.2	.4	56.0	37.3	50%
0	.25	.25	.5	37.3	0.0	$\infty$
.25	0	.25	.5	37.3	37.3	0%
.25	.25	0	.5	56.0	37.3	50%

\*See Section 3.

As shown, unless the individual cares nothing about their consumption relative to others, an externality exists and can be quite substantial. Note that the supposition of a growth component to utility, if the relative weights of other components are unchanged, does nothing to increase or decrease the externality.

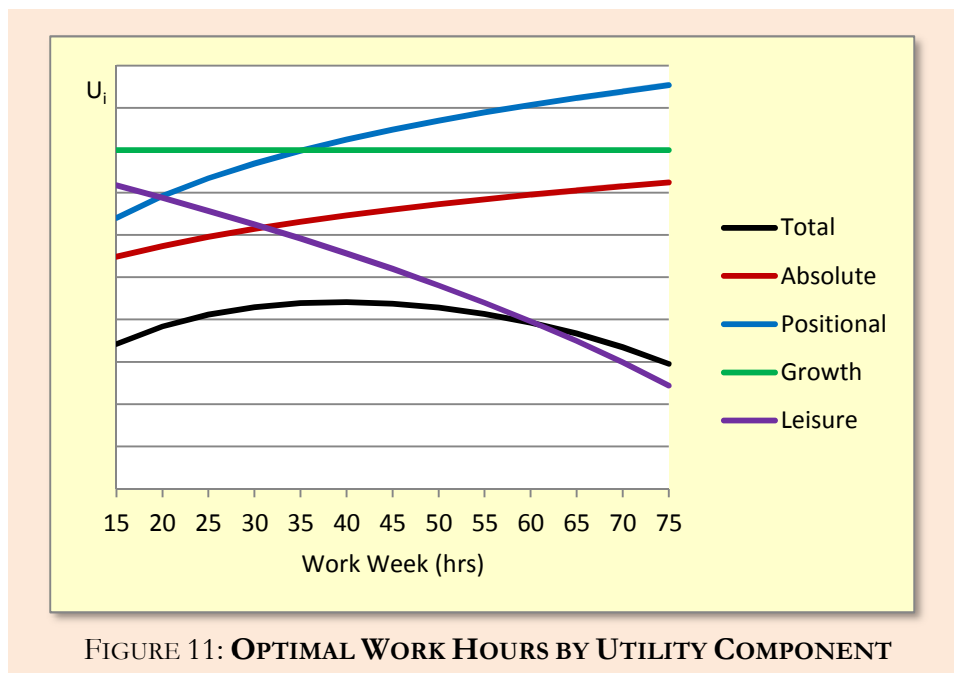
If the individual earns wages that are taxed, the hours worked will be affected. Optimal hours are calculated using equation (17). Here again the hours-worked variables are removed from the growth component. From equation (17), I determine the optimal hours. The quadratic solution has the following maximum:

$$h = \frac{-((1-\alpha-\gamma)(x)-(\alpha+\beta)(w-rw^k))+\sqrt{((1-\alpha-\gamma)(x)-(\alpha+\beta)(w-rw^k))^2-4(1-\gamma)(w-rw^k)((-b)(x))}}{2(1-\gamma)(w-rw^k)} \quad (24)$$

In (24): for brevity,  $x \equiv \mu \bar{h} r(\phi k(k-1) + 1)$ . There are many factors at work here. Work effort with a tax responds in similar ways to the component weights as without a tax (increasing with absolute and positionality, decreasing with growth and leisure). Work effort

increases as wages increase (whether from age or productivity) and diminishes as tax rates increase. It also diminishes as progressivity increases if wages are above average, and vice versa.

To understand the optimal choice of hours worked, it may be useful to visualize how the various utility components contribute to utility with changes in work hours. In Figure 11, an individual with an even set of component weights (*i.e.*,  $[\alpha, \beta, \gamma] = [.2, .2, .2]$ ) with an average wage works under an efficient government ( $\mu = 1$ ) and a flat 20% tax. His optimal work effort is 39.5 hours per week. As the graph shows, increased work effort contributes to his utility through absolute consumption and especially positional consumption; more effort detracts from his utility through sharply diminished leisure. Growth utility, as previously explained, has no effect.



### *Utility Component Weights*

An equal balancing of component weights with double weighting for leisure (*i.e.*,  $[\alpha, \beta, \gamma] = [.2, .2, .2]$ ) appears to be an appropriate weighting for exploring other variables in the model. This weighting presumes a roughly equal use of social context (positionality) and personal history (adaptation) by individuals as a relative standard of their own consumption. That is roughly in line with the salience of these factors in studies reviewed in the literature. It also makes appropriate space for absolute consumption. As shall be seen, this particular configuration results in work hours that closely approximate current norms when a commensurate level of taxation is applied. The proper weighting may be determined by further research, but the  $[\alpha, \beta, \gamma] = [.2, .2, .2]$  weighting was used for most of this paper.

Since the life-cycle income model captures a great deal of income variation without inter-personal comparisons, it may be useful here to examine how a typical life cycle interacts with utility, given the weighting configuration. Figure 12 shows the expected life-cycle utility patterns of differently productive individuals where all individuals share the same aforementioned weight configuration, and the government is efficient and collects a 20% flat tax. All appear to experience some utility decline in the first decade of work. From there, the more productive bounce back up in middle age while the less productive slump.

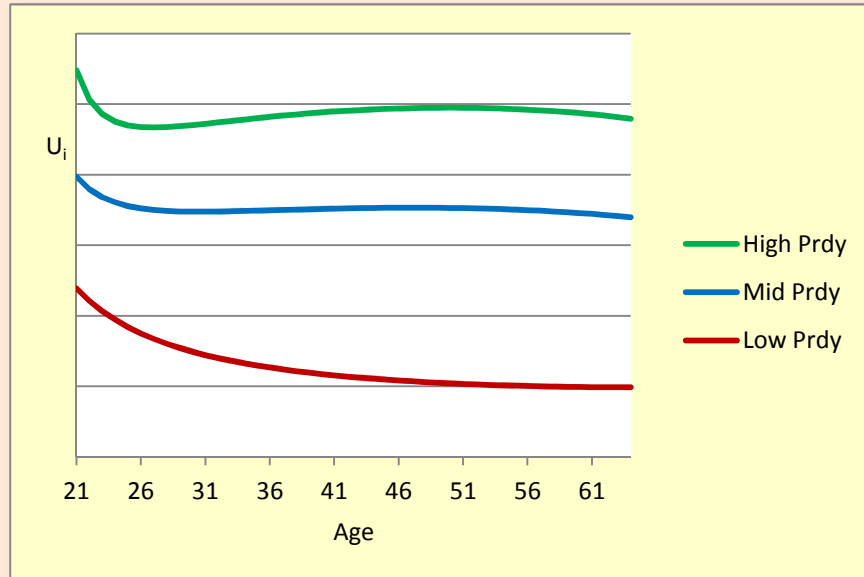


FIGURE 12: LIFE-CYCLE UTILITY PATTERN BY PRODUCTIVITY CLASS

These life-cycle patterns in the model are given more clarity if the separate utility component impacts are analyzed. Taking the mid-productivity worker, a breakdown of the life-cycle patterns of each component is displayed in Figure 13. The initial lip in the life cycle is due to an overpowering effect of consumption growth that quickly wears off. Because productivity in the model is implicitly tied to wage growth and the productivity rate of the more productive is twelve times that of the less productive, the lip is much more pronounced in the highly productive individuals. Leisure has a slight downward trend; this is due to greater work effort in the higher wage years as people age. Absolute consumption balances the decline of growth with a more gradual curve upwards as individuals consume more as they gain experience and income. Positionality is constant since the individual compares himself to differently productive individuals of the same age, and the productivity differences are level. For the highly-productive worker the principal difference is that the



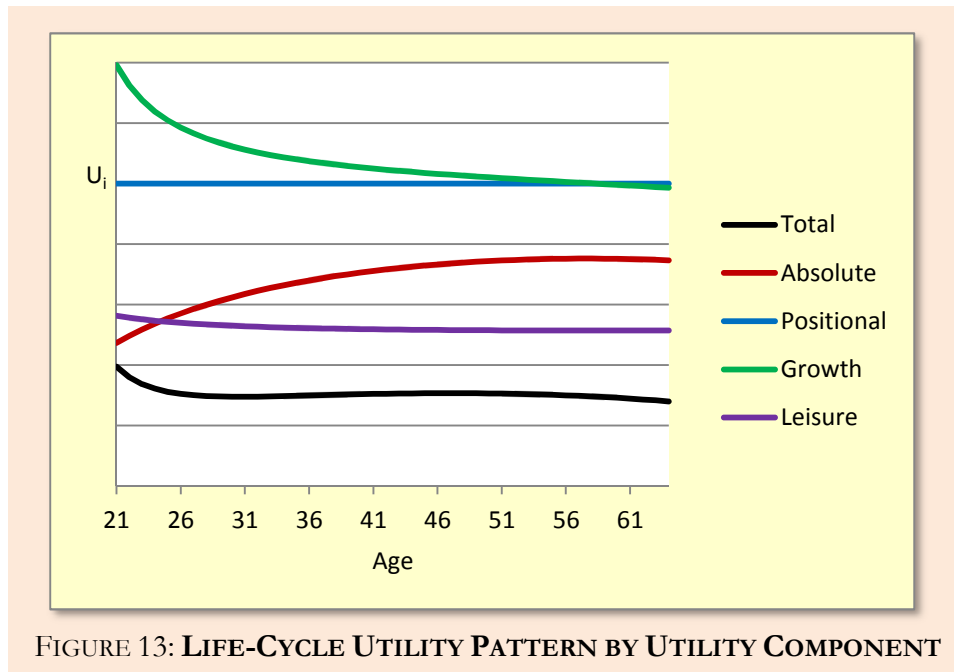


FIGURE 13: LIFE-CYCLE UTILITY PATTERN BY UTILITY COMPONENT

positional component increases throughout life, as the disparities with the lesser productive widen; conversely, for the lesser productive utility from the positional component sinks with age.

As the effects of tax rates and progressivity were assessed, for illustrative purposes I needed to show these effects on a “representative” individual (in some cases, for each productivity class). It was necessary to choose an age at which the average wage was close to the societal average, the disparity of wages between productivity classes was about average, and the wage growth was also about average. The age chosen in these cases was 34. At 34, the average wage is 89.8% of the overall societal average. Low productivity workers had a wage equal to 43.6% of society’s, while high productivity workers had a wage equal to 156.4%; the lifetime average split is 44.9% to 155.1%. Low productivity workers at this age had annual wage growth of 1.3% and high productivity workers had annual wage growth of

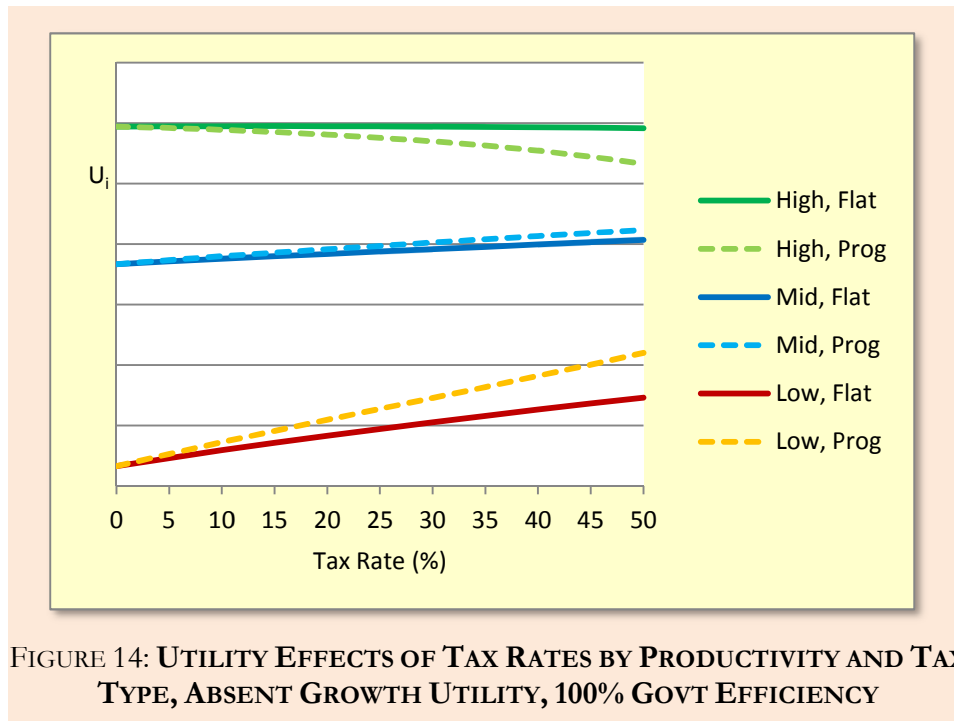
4.6%; for low workers this was above their lifetime average of 0.9% and for high workers this was below their lifetime average of 4.7%.

### *The Effect of Tax Rates*

The second questions pursuant to the research objective are: *How does changing the tax rate affect individuals of varying productivity growth? What is the optimal tax rate for the individual and what factors influence it?*

The standard economic response to an externality is to apply a tax to bring the individual optimum of work effort in line with the social optimum. In previous research, the externality tax appeared to be a clever way to justify taxes apart from their uses; if the proceeds were spent on anything at all of value, the outcome was beneficial for society.

Using the constructed model, it is not difficult to see why this is so. Temporarily removing the growth component from the model (*i.e.*, using a weighting of  $[\alpha, \beta, \gamma] = [0.2, 0.2, 0]$ ), and applying a flat tax ( $k = 1$ ) to an individual of the representative age (34), the utility of the two productivity levels and an average (“Mid”) are plotted as continuous lines in Figure 14 for various tax rates. The results show that low- and even mid-productivity individuals stand to gain as tax rates increase, and high-productivity individuals would be comparatively indifferent. Though in each class there is some loss of utility from diminished consumption, in all but the most productive workers this is more than offset by the greater utility of leisure resulting from less work—the productivity losses are muted by government spending. Clearly, it is reasoned, closing the externality through taxation would have a payoff.



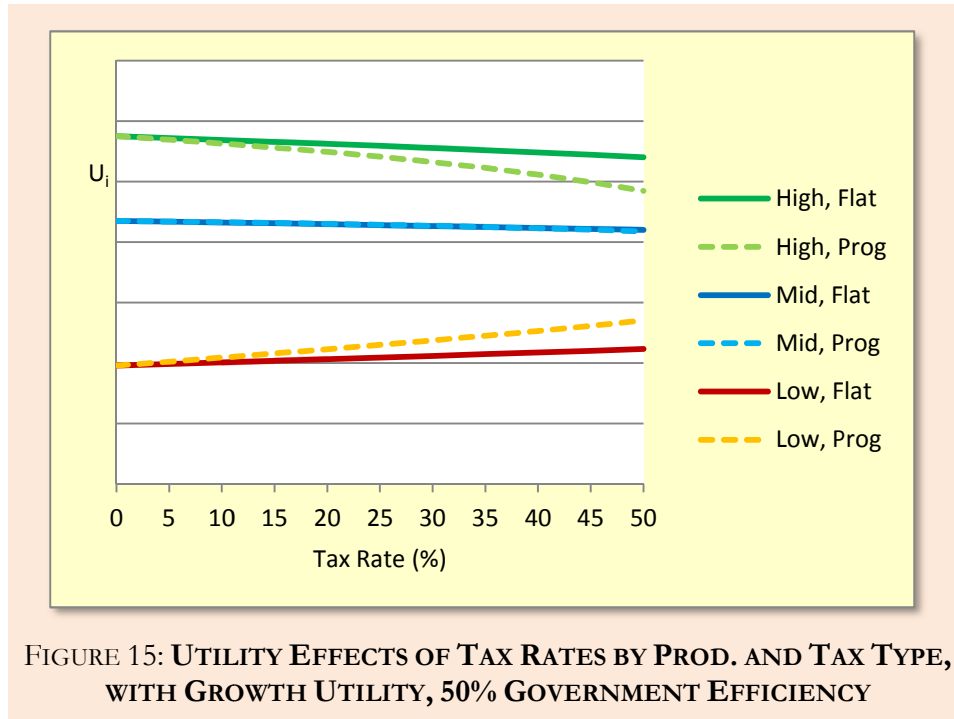
The benefit is just as impressive, if more uneven, when a progressive tax ( $k = 1.35$ )<sup>25</sup> is applied as shown by the dashed data series in Figure 14. Here the slope of the lower and mid-productivity individuals' utilities are even steeper, but the higher productivity individual is decidedly made worse off by any tax rate. The benefit for mid-productivity workers indicates that a progressive tax could be politically saleable in democratic societies.

The problem with the foregoing analysis is that it ignores two important factors: the impact of consumption growth on utility; and the efficiency of government spending. If these factors are introduced into the model, the picture is much less rosy for an activist government. For example, if we change the weighting configuration to include consumption

<sup>25</sup> The 1.35 figure is used for a typical progressive tax. In Chapter 2 (p. 47), I determined that this level of progressivity roughly estimates the progressivity of the United States federal income tax in 2013.

growth (*i.e.*, revert to the standard  $[\alpha, \beta, \gamma] = [.2, .2, .2]$ ) and reduce the government efficiency to 50%, the utility effects of various tax rates are as shown in Figure 15. With these changes, not only does the worker with an average wage switch to desiring less taxes rather than more (regardless of tax type), but the loss of utility from higher taxes experienced by the highly productive exceeds the gain in utility experienced by the less productive.

Introducing these two factors may thus fundamentally alter the conclusions of those who believe the positional externality demands more taxes to eradicate positional consumption by making people work less. However, the issue may hinge on the level of government efficiency. The response to tax rates for all individuals appears to be roughly monotonic. So at some level of government efficiency, a worker switches from being anti-tax (because the gains from greater leisure and government spending on non-positional consumption are outweighed by the loss in consumption from the tax) to pro-tax (where the



stronger gains from government spending and leisure outweigh the direct consumption loss).

Such a tipping point is the optimal tax rate for the individual. The optimal tax formula was computed; however, the results are excessively complex and need not be reproduced here. It is sufficient to say that the optimal tax rate depends on several factors: component weights, government efficiency, age, productivity, wage growth, and the progressivity of the tax. In Figure 16, three individual's optimal tax rates are plotted for a flat tax and a typical progressive tax ( $k = 1.35$ ) for various levels of government efficiency. As before, the standard component weights and representative age are used.

The results show that a flat tax imposes a relatively narrow leap between wanting no tax and wanting as high a tax as possible. Government efficiency dictates the desirability of more taxes. Further, there is a large difference between productivity levels in the rate of

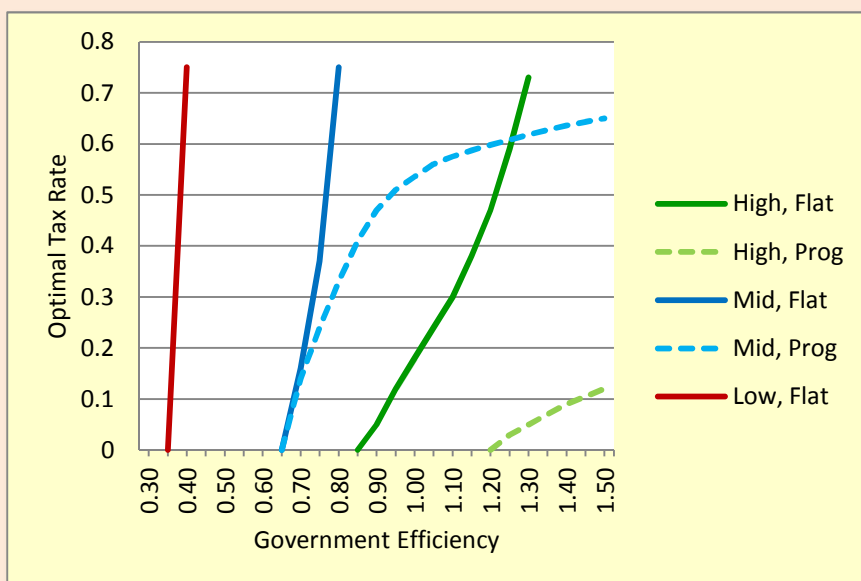


FIGURE 16: **GOVERNMENT EFFICIENCY EFFECTS ON OPTIMAL TAX RATE, BY PRODUCTIVITY & TAX TYPE**

efficiency that justifies taxation. Individuals who are more productive demand much greater efficiency to justify higher taxes and also have a more elastic sensitivity to tax rates.

Progressive tax rates greatly exacerbate this difference. The progressive rate for low productivity individuals is not even plotted. Such individuals demand as much government as possible regardless of government efficiency. The effects on positionality are the reason. With progressive taxes, the less productive gain more by their relative consumption (and less need for work effort) due to curtailed income and spending of those above them than they lose from consumption loss attributable to the tax—the government subsidy is not even needed as a justification for more taxes. The mid-productivity individual is more judicious: higher tax rates are only optimal as government is more efficient and the optimal rate somewhat levels off at upper levels of efficiency. The high-productivity individual accepts only a minimal level of taxation and only at supreme efficiency (1.25+).

### *The Effect of Progressivity*

The third questions for the research objective are: *How do different degrees of tax progressivity affect individuals of varying productivity growth? How do other factors influence these effects?*

To determine the factors that influence how progressivity affects utility, the response of utility to an incremental change in progressivity must be assessed. Thus, equation (17) was differentiated with respect to  $k$ . The partial derivatives of the various components and their combination are as follows:

$$\frac{dA}{dk} = \alpha \left( -h_{i,n} r w_{i,n}^k \ln(w_{i,n}) + \mu \bar{h} r (2\phi k - \phi) \right) A^{\alpha-1} \quad (25a)$$

$$\frac{dB}{dk} = \beta \left( \frac{h_{i,n} r \bar{w}_n^k (w_{i,n} - r w_{i,n}^k) \ln(\bar{w}_n)}{\bar{h}_n (\bar{w}_n - r \bar{w}_n^k)^2} - \frac{h_{i,n} r w_{i,n}^k \ln(w_{i,n})}{\bar{h}_n (\bar{w}_n - r \bar{w}_n^k)} \right) B^{\beta-1} \quad (25b)$$

$$\frac{dC}{dk} = \gamma \left( \frac{h_{i,n} r w_{i,n-1}^k (w_{i,n} - r w_{i,n}^k) (\ln w_{i,n-1})}{h_{i,n-1} (w_{i,n-1} - r w_{i,n-1}^k)^2} - \frac{h_{i,n} r w_{i,n}^k \ln w_{i,n}}{h_{i,n-1} (w_{i,n-1} - r w_{i,n-1}^k)} \right) C^{\gamma-1} \quad (25c)$$

Because hours worked are chosen with consideration for progressivity (as evidenced in equation (23)), the complete effect on utility must account for this in addition to the derivatives of the utility components:

$$\frac{du}{dk} = \left( \frac{\frac{dA}{dk}}{A^\alpha} + \frac{\frac{dB}{dk}}{B^\beta} \left( \frac{d\bar{h}_n}{dk} \right) + \frac{\frac{dC}{dk}}{C^\gamma} \right) \left( \frac{dh_{i,n}}{dk} \right) \quad (25d)$$

These responses of utility to changes in progressivity reveal that progressivity will generally affect individuals in four significant ways.

The first and most obvious effect is that progressivity exacerbates tax rates to the extent that the wage rate deviates from the average. The cost (in an increased loss of income and consumption) is greater for high income individuals than the benefit (in a decreased tax) is for low income individuals. Also, since this effect pivots with regard to average income, high productivity individuals may actually benefit from this effect if they earn less than the overall societal average early in their working life (in the productivity-adjusted life-cycle model this occurs through age 28) and low productivity individuals may suffer from this effect if their peak earnings are above the average (in the model this does not occur). This overall effect on after-tax earnings impacts individuals through absolute consumption and especially relative consumption.

Second, all individuals will adjust work hours. As shown in equation (24), optimal hours worked depend in part on the after-tax wage. Generally, high productivity individuals will work less with increased progressivity because their wage is above average. Yet even mid-productivity individuals will work less because of the ‘rebate effect’: greater government

revenue means greater absolute consumption and lesser returns to their own contributions to consumption. The least productive may work more or less depending on the level of progressivity and the tax rate. Other factors that influence the effect are the level of inequality ( $\phi$ ) and the government efficiency factor. Greater inequality has no effect if the tax is flat, and puts downward pressure on work hours if the tax is progressive. Government efficiency increases the tax rate effect, and intensifies the shift of progressivity. But the principal driver is the after-tax wage rate. An illustration of how work hours are affected by a flat tax and a progressive tax ( $k = 1.35$ ) is given in Figure 17. In the example shown, the standard component weighting and representative age are used, and government efficiency is set at 0.8.

Third, keeping tax rates constant, greater progressivity adds to government revenue

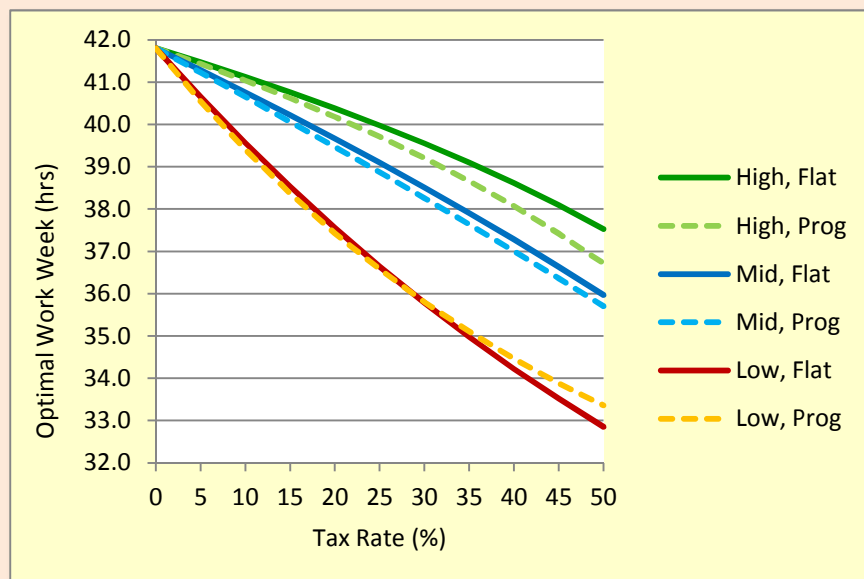


FIGURE 17: **WORK EFFORT EFFECTS OF TAX RATES BY PRODUCTIVITY AND TAX TYPE**



because it gathers more additional revenue from high wage earners than it loses from low wage earners.<sup>26</sup> So low wage workers gain from increased progressivity through higher absolute consumption resulting from a greater rebate effect. High wage workers also gain, but the positive effect is always outweighed by the negative effect on the after-tax wage. Greater taxes on high wage workers finance greater government spending for all.

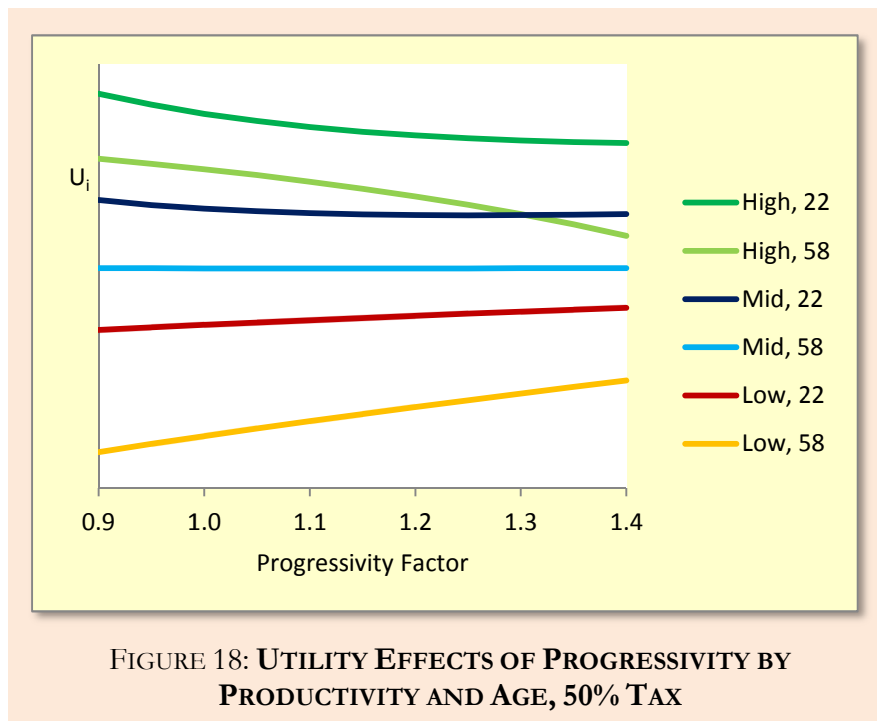
Fourth, consumption growth suffers from diminished after-tax wage growth with increased progressivity, as higher wages attract not only higher taxes on the higher wages but also a higher effective tax rate on all wages. If wages are declining there is a positive effect, but this would likely occur far less often (in the model there is modest wage decline after age 58). This almost exclusively negative effect is indiscriminate, affecting high and low productivity workers, both of whom have wage growth for most of their working lives albeit at different rates. This effect essentially confirms the theoretical foundation of section 3.

The larger question here is which effects are strongest. For the highly productive, the lost wages and diminished growth overpower the relatively minor gains from increased leisure and government rebates. For the less productive, the opposite is the case. The average of the two finds some positive effects due to greater government payout, but balances this with less growth.

The effect is notably different in character, though similar in overall outcome, when looked at from two different points in the life cycle. In Figure 18 the utility effects of progressivity factor variation is displayed for different productivity classes for two ages, 22

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<sup>26</sup> An alternative is to make the change in progressivity revenue-neutral by making the tax rate a function of the progressivity parameter. As this would have been a more complicated route, it was not pursued.



(when growth is strong but wages are weak) and 58 (when wages are strong and growth is approximately zero). The tax rate here is 50% (lower rates are more difficult to illustrate), government is 80% efficient, and the standard component weighting applies. The graph appears to indicate that: (1) progressivity is negatively correlated with utility for the highly productive; (2) progressivity is positively correlated with utility for the lesser productive; (3) the average productivity level is rather indifferent to progressivity, but may be open to less progressivity and flatter taxes early in working life; and (4) the highly productive have a diminishing distaste for greater progressivity in early years and an increasing distaste for greater progressivity in later years.

The indications listed do not change with changes in the level of government efficiency. If the tax rate is reduced, there is some alteration and even reversal in the younger

mid-productivity response to progressivity—the slope switches from positive to negative at the 35% tax rate.<sup>27</sup> However, because the slope here is so flat, these differences should not be taken with too much interest.

## 5. Discussion

### *Analysis of Research Findings*

It may have occurred to the reader that Section 4 repeatedly inserted the “Mid”-dle productivity class in the output even though the model only had two classes (“Low” and “High”). The middle class is simply an average of the other two. The reason for this is to show that, in a world in which there is an innumerable array of productivity variations, there is in some sense a middle individual of each age who may be thought of as a median voter whose experience will likely tip policy in one direction or another (should individuals vote solely to improve their own utility prospects, a dubious proposition). It is for this reason that the middle productivity example was inserted. In a less simplified model, more numerous productivity strata might be used to determine economic and political cleavages more precisely.

The research appears to show the effects of progressivity are such that their cost to the highly productive and their benefit to the lesser productive largely cancel out and their cost and/or benefit to the middle are so negligible as to make the middle indifferent.

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<sup>27</sup> The slope of the mid-productivity utility response to progressivity is bowed upwards, so the “slope” here is in reference to the difference between a flat rate ( $k = 1$ ) and the typical ( $k = 1.35$ ) progressive rate.

One thing that is very apparent from the research findings is that the positional externality cannot be addressed in isolation. Taxing work effort will reduce the positional externality but may also have collateral effects, and these collateral effects may outweigh the externality effect. These collateral effects will be internalized, but the question remains as to what kind of tax to apply and how heavy should it be.

Of course, in any given social polity the current tax system is already compensating for the externality; it may be over-compensating or it may be not compensating enough. The research here attempts to show that traditional analysis of the positional externality does not include consideration for utility from growth, and that may change the conclusion of whether taxes are at an appropriate level or whether they should be more or less progressive. The results show that on the question of progressivity, consideration for growth would cause an objective policymaker to be less inclined towards it.

Another possibility may be at work. The current societal work effort may in fact be the social optimum. It should be noted that if work hours are standardized across the population, the individual works the social optimum work hours. For example, if  $h_{i,n} = h^*$  for all individuals  $i$  and all periods (*i.e.*, ages)  $n$ , then the work effort model in equation (10) is modified as follows:

$$u_{i,n} = (h^* w_{i,n})^\alpha \left( \frac{w_{i,n}}{\bar{w}_n} \right)^\beta \left( \frac{w_{i,n}}{w_{i,n-1}} \right)^\gamma (1 - h^*)^\delta \quad (26)$$

Here the individual and social optimum hours are the same:  $h^* = \alpha / (1 - \beta - \gamma)$ . This is due to the fact that there is no latitude to increase or decrease *individual* work effort—there is only a binary choice of whether to work or not to work. Positional utility is derived simply from age and productivity differences within one's social reference group. It just may

be the case that this is the situation in which we find ourselves: there is a common cultural locus of a forty hour work week. This locus may in many or even most cases make it impossible for the individual to alter his work effort. Thus, his positional situation is intransigent, it being predetermined by innate or early education factors.

This standardized work week need not be due to the force of law,<sup>28</sup> but rather may be due to coordination benefits that obtain because of specialization and teamwork. Whereas the government may be able to affect the work hour locus by imposing a different work week (as was done in France in 2000), this may simply be a public choice response to a general desire in society to switch to a more commonly desired locus—people use the government to take the first step so as not to lose the locked-in coordination benefits.

There may be policy responses to a situation with standardized hours, but they are much different from the traditional Pigovian tax response. For example, age-dependent taxation may be used to force dissaving in high income years. Or early education may attempt to mitigate the productivity differences that emerge when entering working life (should such differences depend on education), as is current policy in most societies. Such tinkering, however, may still run afoul of growth utility effects, among others. It may be best to permit the natural balance of things: people gain from growth in early working life, from elevated consumption in middle-age, and from leisure in retirement.

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<sup>28</sup> In the United States, forty hours is a general maximum enforced by the Fair Labor Standards Act (1938). Non-salaried workers must be paid a higher wage above this maximum.

### *Implications for Positional Externalities and Progressive Taxation*

The emergence of literature in the last forty years showing that a positional externality exists and may be substantial has renewed intellectual vigor in favor of higher and more progressive taxes. Combined with the longstanding argument of the diminishing marginal utility of wealth and income, the positional externality insight has led many economists to believe that more people will benefit from higher taxes and greater progressivity than would not.

The present paper has built a model around these two ideas. It features diminishing marginal utility through the Cobb-Douglas formulation, and it includes positional consumption as one of the principal components of a personal utility function. Yet it also includes another idea that emerged alongside positionality: adaptation. Through a growth component the utility function models how people discount their adapted circumstances and gain utility through the betterment of their condition.

Taxation alone may not be the answer to positional externalities, because taxation has collateral negative effects on the same end goal pursued by addressing the externalities: human happiness. At the very least, the determination of the correct level of taxation must not ignore these effects.

Also, the salience of positional concerns does not automatically mean that public goods are less costly or under-provided, nor does it absolve policymakers of the responsibility to make government more efficient. Individuals are still sensitive to the ability of government to produce goods that they want efficiently, even with positional concerns.

The single most important implication for the study of public finance is that progressivity detracts from anyone's enjoyment of personal growth. Because people

generally experience upward wage growth through their working lives, progressive taxes will generally have a negative effect on people's feeling of growth through increasing income and consumption. With a growing body of evidence supporting an adaptation effect on people's reported happiness and well-being, this effect cannot be ignored.

Progressivity may also engender political enmity and discourage good government. As the graphs in Figures 15 and 16 illustrate, progressive taxes have an unambiguous effect against high productivity individuals and favoring low productivity individuals, polarizing the classes on the tax issue. Also, since low and high productivity individuals are made better off and worse off, respectively, regardless of government efficiency (as in Figure 16), they both may be less concerned with ensuring that government is efficient.

These implications do not appear to show that progressivity conclusively makes people or society worse off. Indeed, the research findings suggest offsetting effects on low-wage and high-wage workers and a minimal effect on middle-wage workers. Yet if the existence of positional externalities is a subtle reason why people should consider higher and more progressive taxes, the existence of adaptation amid growing incomes is shown here as a subtle reason why people should reconsider lower and less progressive taxes.

## **6. Conclusion**

Recent research has shown that people derive some of their utility from positionality and they therefore create a negative externality on each other when they consume more. Some economists have used this research as a justification for progressive taxation. Other research has shown that people adapt to their income and consumption levels, and that income or consumption growth is an important driver of personal utility.

The research presented here shows that if people generally have positive growth over their lifetime, progressive taxation will have an unambiguously negative effect on the part of their utility that is driven by growth. If people are affected by both positionality and adaptation, the positive effects of progressivity that result from a diminished positional externality may be offset by negative effects that result from diminished growth.

More specifically, my research offers the following conclusions:

- 1) If the individual has a choice of work hours and cares about positionality, a positional externality exists to the extent that they do and people work more than is socially optimal.
- 2) Higher tax rates have a negative impact on work effort, and higher progressivity for the same tax rate has a negative impact on all but the least productive, whose impact is mixed.
- 3) The optimal tax rate for the individual may depend heavily on the productivity growth of the individual and the ability of government to efficiently deliver public and non-positional goods that the individual values. If tax rates are progressive, the differences between individuals in their demand for efficient government are widened.
- 4) The effects of greater progressivity include: increased sensitivity of wages to taxes; reduced work effort, as explained in (2) above; greater government revenue and thus greater sensitivity to government efficiency; and reduced consumption growth for all individuals who experience increased consumption over time.
- 5) The optimal level of progressivity follows the wage level and wage growth. Those with wages above the average (or flat tax equivalent) level or with high wage growth will be



negatively affected by greater progressivity, while those with wages below the average or with modest wage growth will be positively affected.

- 6) Given existing tax systems, market economies may already be at socially optimal work effort levels. Work hours are in large part standardized by a socially emergent response to coordination benefits. The forty hour workweek in the United States and the thirty-five hour workweek in France may be reflective of a difference in socially optimal work hours.

Future research may be useful in confirming the assumptions of the model, estimating the parameters or variables, or further pursuing tax and policy effects of a full consideration of income and consumption growth. Alternative responses to positional externalities may be a fruitful line of enquiry. Also, an analysis of the contributing factors and the costs and benefits of standardized work hours would be useful in edifying the model.

## Glossary

The variables and parameters used in this paper are defined here for reference.

$a$	<u>A</u> ge
$c$	<u>C</u> onsumption
$f$	Generic <u>f</u> unction
$g$	<u>G</u> overnment spending
$h$	Fraction of available <u>h</u> ours worked
$i$	<u>I</u> ndividual
$j$	Income
$k$	Progressivity parameter
$n$	Period
$p$	<u>P</u> roductivity factor
$r$	Tax <u>r</u> ate
$s$	<u>S</u> ex
$t$	<u>T</u> ax
$u$	<u>U</u> tility
$v$	<u>V</u> isible (positional) consumption
$w$	<u>W</u> age
$y$	Generation birth <u>y</u> ear
$A$	Absolute component summary variable
$B$	Positional component summary variable

$C$	Growth component summary variable
$D$	Leisure component summary variable
$N$	System-wide <u>n</u> umber of work periods
$P$	System-wide <u>p</u> opulation
$T$	System-wide <u>t</u> ax revenue
$X$	Generic component summary variable
$\alpha$	Absolute component weight
$\beta$	Positional component weight
$\gamma$	Growth component weight
$\delta$	Leisure component weight
$\eta$	Component normalization parameter
$\theta$	Max-to-min ratio
$\mu$	Government efficiency parameter
$\rho$	Positional fraction parameter
$\sigma$	Consumption propensity parameter
$\tau$	Life-cycle model coefficients
$\phi$	Inequality parameter

## ALTERNATIVES TO TAXING POSITIONAL EXTERNALITIES

### Abstract

The discovery of positional externalities has resulted in numerous calls for a Pigovian tax to reduce positional economic activity. Absent from the discussion are any calls for addressing the reciprocal externalities by reducing the significance of positionality in people's utility functions. Problems with the taxation approach are reviewed, including the specific problems of progressive taxation. The reciprocal approach is analyzed as an alternative with greater promise for overall utility gains. Four approaches are discussed for reducing the positional externality: (1) reducing feelings of positional inferiority ("envy") directly through cultural and moral education; (2) reducing positional superiority ("vanity") through cultural and moral education; (3) reducing positional awareness through reference group tailoring; and (4) reducing positional awareness by excluding the reference group to foreigners, ancestors, and the self.

### 1. Introduction

#### *Responses to Positional Externalities*

In the past forty years, happiness economics has emerged as a large and growing body of research combining elements of economics, psychology, and sociology. One of the principal findings of this research concludes that, while people generally desire more income

and consumption, to at least some degree they derive their happiness or general well-being from their income and consumption position *relative* to the position of others. Individual utility, a proxy for well-being, is thus at least partially based upon relative economic position, or what is often called one's "positionality".

The idea that relative economic position is an important driver of well-being and utility gave birth to another idea: When an individual earns or consumes, he creates a negative externality on all other people who compare their income or consumption to his. If everyone in a community obtains some portion of their utility from their relative consumption compared to everyone else, for example, then whenever anyone consumes they lower everyone else's consumption relative to the community. Effort expended to increase one's private standing is effort expended in a zero-sum game with no net social benefits; therefore, it is likely that people are expending too much effort to earn and consume.

Recognizing this negative externality, some economists have suggested an offsetting Pigovian tax. Correctly applied, a tax on positional activity such as consumption would diminish the amount of private consumption to the level that would exist absent the externality; the result would be a level of consumption that satisfied people's desires for absolute consumption while removing people's indulgence in positional consumption, which has no net social benefit. Because it is also suggested that positional consumption occurs after a basic level of non-positional consumption satisfies basic human needs, some economists have posited that such taxation should be progressive.

Yet the taxation approach often ignores some costly side-effects. The most common targets for positionality taxation, work and consumption, have been shown to feed individual utility through other avenues such as absolute consumption or income/consumption

growth. As consumption is taxed, people may become more positional in income (or if income is taxed, they may become more positional in consumption), or become more positional in ways that are not economic at all. And taxing income or consumption progressively may result in *increasing* the concern that people have for their positional ranking in society.

There may be a more effective approach to positional externalities.<sup>29</sup> Ronald Coase famously found that Pigovian tax responses, while not altogether unsound, are not the only way to address negative externalities; they are appropriate only when the parties involved have barriers to negotiating a jointly agreeable arrangement. Even if negotiating is not possible (as with positional externalities), Coase recognized that every externality is reciprocal: The externality results from both the activity of the apparent aggressor and the passive response of the apparent victim. In the case of positionality, conspicuous consumption does result in envy among people who become less consumptive in relative terms; but this only occurs to the extent that people *care* about relative consumption. An alternative to taxing the externality is therefore to simply reduce positional concerns generally.

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<sup>29</sup> The term “positional externality” is often used to refer to any externality where the changing of relative position among participants has an external effect on other participants. Positional externalities are not limited to income and consumption generally but also occur in more specific and localized decision-making. The externality that results from consumption due to concerns for relative consumption position is perhaps the most well-known positional externality. In this paper, “positional externality” shall be used to refer to this type of externality only.

If reducing the importance of positionality for individuals is a valid approach for eliminating positional externalities, then the question of how such reduction might be accomplished remains. As with other large-scale externality responses such as the conservation/environmental movement, one approach is moral education: change people's perception of what is socially acceptable. Dissuade people away from feelings of jealousy and envy, and temper public policy to not assume or build-in positional competition. Discourage people from consuming conspicuously and flaunting their relative positional superiority. Encourage people to narrow their positional reference group, perhaps to others who are their true peers. And encourage people to compare their situation not to society in general but to outsiders, ancestors, and one's own past. If in one or two generations an environmentalist agenda can affect a sharp reduction in littering and an increase in recycling principally through moral education, why can't a similar positional agenda affect share reductions in intentionally conspicuous consumption and feelings of envy with the same?

#### *Research Objective*

The overall objective of this paper is to critically examine the traditional tax response to positional externalities and offer alternative responses. The alternative responses stem from the possibility that status-seeking and positionality may be reduced, and that various efforts at reduction may be viable alternatives to Pigovian taxation for resolving positional externalities.

The objective is separated into three parts. First, the paper will show that reducing people's concern for status and positionality is a valid approach for accommodating positional externalities. The concept of reciprocal externalities shall be raised to show that

the externality only exists to the extent that people care about their relative position in society. If relative position can be made less important to people, the externality is reduced. The paper will show from previous research that positionality is not the only component of individual utility, and the alteration of individual utility functions can be conditioned over time.

Second, the paper will examine four avenues for diminishing people's concern for positionality. The first part of the research objective above shall thus be shown to be practically achievable. The four avenues include: (1) reducing people's feelings of positional inferiority directly through education and policy adjustment; (2) reducing people's desire for and outward manifestations of positional superiority through education and societal disapprobation; (3) tailoring people's reference group selection to reduce the severity and occurrence of positional comparisons; and (4) encouraging the use of comparison referents whose relative position will not affect social welfare.

Third, the paper will show that progressive taxation of income or consumption has significant side-effects. Although progressive taxation may reduce the externality by making people work or consume less and channeling revenues to other areas, it may reduce overall individual utility, which is held by tax proponents to be the ultimate goal of economic and social policy. It may also increase the salience of positionality by increasing feelings of envy and by conditioning people to use politically defined groups as positional referents. The determination of the magnitude of these side-effects is not assessed here, but their inclusion should be grounds for reconsidering the tax response, models for optimal taxation, and the use of progressive rate structures.



### *Research Significance*

The evidence that people concern themselves with positional context for their income and/or consumption levels has been amply supplied. As a result, in recognizing that an externality thereby exists whenever people either work or consume, many researchers have taken the next step and determined that existing taxation levels are efficiently offsetting this externality or that taxation levels are too low and should be higher and more progressive.

This paper asserts that a (higher) tax may not be the most efficient response. The taxes most often suggested have adverse side-effects, and alternative solutions may be able to raise utility with lower social costs. The development of these ideas can be an important contribution to economic research. Policies calling for higher and more progressive taxes as a way to counter the status-seeking and positional impulses of society may be given deservedly greater scrutiny for their overall effects. Indeed, the possibility that progressive taxation actually already contributes to greater positional strife may provide greater academic support to the flattening of tax rates.

Whereas the discussion of problems with the tax approach focus on existing policies that are at least partially intent on reducing inequality and positional activity, the research in this paper can also serve as a beginning for a new approach to dealing with private activities with social costs, such as positionality. Looking to duplicate the success of other mass-education efforts, research that introduces various avenues for reducing the importance of positional concerns among all individuals may serve as a cornerstone for practical efforts to reduce wasteful social struggle and improve overall well-being. The research may also be

beneficial in serving as a model for approaching solutions to other situations where activities with private benefits have significant social costs.

### *Paper Structure*

To achieve the research objectives, the paper is organized into five sections, the first being this introduction. Section 2 reviews the nature of the positional externality and the methods discussed in the existing literature for addressing it. Section 3 examines the general idea of diminishing positional concerns to reduce the externality and raise utility. Section 4 examines various non-tax approaches for addressing positional externalities. Section 5 looks at problems specific to a progressive tax response, especially in light of the discussion of non-tax approaches. Section 6 concludes and suggests further research.

## **2. The Positional Externality and the Tax Response**

### *Positional Externalities*

The existence of positional externalities has long been established. Richard Easterlin (1974) produced a groundbreaking study showing that relative income may be a significant contributor to subjective well-being: “In judging their happiness, people tend to compare their actual situation with a reference standard or norm, derived from their prior and ongoing social experience” (p. 118). Fred Hirsch (1976) recognized that consumption motivated partially by a desire to increase one’s relative position results in an externality: “A disjunction between the terms of individual and social choice offered by market opportunities represents ... a case of market failure. This failure calls for correction by internalizing, *i.e.*, incorporating in the market situation confronting the individual, the

external cost that is imposed on others. The existence of the positional sector in the context of growth in the material sector can thus be seen as a kind of ‘system externality’” (pp. 52–53).

The idea is simple: Individual consumption, particularly conspicuous consumption, has private benefits in (among other things) elevating the relative consumption of the consumer but has social costs as the increased consumption of the individual decreases the relative consumption of others in society who base their relative position with respect to that individual (among others).

As the positionality literature arose at roughly the same time as optimal tax literature, the externality prompted calls for taxes on income and consumption. Layard (1980) claimed that Hirsch’s finding (among others) showed that “a major task of public policy is to counteract the effects of the desire for status upon human behavior” (p. 738). Using a simplified utility model, he suggested taxing income to raise utility, if in fact income confers status.<sup>30</sup> Frank (1985b) suggested “a simple tax on positional consumption expenditures” (p. 115). In later works, he favored a progressive consumption tax (Frank, 2007, 2011a). Ireland (1994) suggests a Pareto-improving tax on conspicuous consumption that then is rebated in whole to the taxed individual, who spends money on both conspicuous and non-conspicuous consumption. Ljungqvist and Uhlig (2000) model a corrective income tax with rebates of equalized lump sums, and shows how such a tax can double as a Keynesian counter-cyclical policy.

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<sup>30</sup> In later work, Layard (2005) argued that the externality can be traced back to excessive work effort, and that a tax on income is appropriate.

### *Problems with a General Tax Response*

Before discussing the possibility of non-tax responses to the externality, it is important to note that a Pigovian tax does not fit exactly as a solution to the discovered positional externality. There are two main concerns with matching a Pigovian tax response to this particular externality: (1) positionality may not be solely economic; (2) where it is economic, positionality does not rest squarely with income, consumption, or wealth alone.

Taxing economic activity is a logical economic response to address positional externalities if such activity causes social costs. But positionality may not be a purely economic phenomenon. It is often claimed that leisure is a non-positional component of individual utility (Frank, 2011a). Yet one of the pioneers of interdependent utility, Thorstein Veblen, spoke not only of conspicuous consumption but also of conspicuous leisure (1899). As of yet there has been no proof that utility is unaffected by comparisons with other people's leisure. Even if leisure is less conspicuous, people may compete more in the areas where it is not.

Tax proponents may say that whether or not leisure is a positional good does not bear on whether well-known positional goods (*e.g.*, conspicuous consumption) should be taxed and at least those externalities addressed. But leisure is inversely related to work, and work is a direct input to income and consumption. Since people care about relative leisure as well as relative consumption, reducing consumption through taxation would almost certainly increase leisure by reducing work effort—one externality is reduced as another expands.

In addition to leisure, people may shift positional competition to other domains that are not directly affected by income or consumption. Beauty, fitness, and health may receive greater positional attention. Several cognitive domains may be positional without being

demonstrated by income. General popularity and fame are yet other domains. As taxation squeezes positionality away from wealth, income, and consumption, people will use these other domains (and countless others) to show their relative superiority. Blum and Kalven state that “Every experience seems to confirm the dismal hypothesis that [with redistributive taxation] envy will find other, and possibly less attractive, places in which to take root” (1953, p. 74).

Another concern is the noisiness of relationships among income, consumption, and wealth. Income is used in most research on subjective well-being, perhaps because income data is more widely available than the others. However, Weinzierl (2005) found that income in happiness regressions is a noisy substitute for consumption. Headey and Wooden (2004) found that wealth is at least as important to well-being as income (p. S24). Mullis (1992) found that permanent income, or annuitized net worth, is a better predictor than other measures, especially income (p. 119). Heady, Muffels, and Wooden (2008) showed that both wealth and consumption predict reported happiness better than income.

If utility derives from income and consumption is taxed, the externality tax can be somewhat avoided by saving, gifts, and bequests. If utility derives from consumption and income is taxed, a dearth of saving and an excess of debt will accumulate. The concern is principally that positionality needs further study to isolate its causes and find an effective method to tax it.

These concerns do not by any means disqualify taxation as a method for addressing positional externalities. Furthermore, some level of taxation is necessary to correct for other market failures and fund true public goods. Rather, the concerns given are cautionary

considerations that may reduce the optimal level of taxation and limit the ability of taxes to adequately tackle this particular externality.

### **3. An Alternative Response to Positional Externalities**

#### *The Reciprocal Externality*

The principal focus of this paper is to examine alternatives to taxation in reducing positional externalities. Taxation as a response to negative externalities was perhaps the most famous contribution of Arthur Pigou, an early 20<sup>th</sup> century English economist. The general idea is to add a tax to economic costs of activities that incur negative externalities, thereby raising the cost until the quantity of the activity is reduced to a point where the social costs equal the social benefits.

Yet even though Pigovian taxes have a place in modern economics, their ubiquitous use in such situations was strongly criticized by Ronald Coase (1960) in his article, “The Problem of Social Cost.” Coase indicated that the reduction of activity which causes the externality is not always the most efficient way to solve the externality problem. He famously showed that, in the presence of clear property rights and low transaction costs, parties will negotiate towards the most efficient solution. Government imposed solutions such as taxes or subsidies are not always necessary, and under some circumstances are necessarily inferior to a private negotiated solution.

The key to a negotiated solution is the idea that there are (at least) two parties to every externality, or as Coase puts it, “We are dealing with a problem of a reciprocal nature ... The real question that has to be decided is: should A be allowed to harm B or should B be allowed to harm A?” (1960, p. 2). An example he gives is a situation where cattle stray

from an unfenced ranch into neighboring farmland and eat or damage the crop. Certainly this is a problem for the farmer. But it is also a problem for the rancher, in that his cattle are damaging crops and he must either pay for them, or build a fence, or negotiate some other solution. Yet it is only a problem for the rancher because his neighbor is a farmer who grows a crop that cattle eat adjacent to his ranch. In the absence of the farmer (or his crop), the rancher has no problem. The straying cattle are a negative externality of the rancher's business, but the externality is reciprocal in the sense that the degree of the externality depends on how much damage the cattle cause, and this depends on the kind of crop the farmer raises, whether *his* property is fenced, etc.

With regard to positional externalities, the reciprocal nature of the externality is clear. If consumer C buys a shiny new sports car, this may impose a negative externality on all other consumers X, Y, and Z, as they each now have less consumption relative to all others in the society in which C, X, Y, and Z live. In emotional terms, they may feel less proud of their own vehicles and more envious of others', since that includes C's. But is this really all C's fault? The negative externality exists only to the degree that relative consumption is a concern for X, Y, and Z. If they were less vain or less envious in relation to others, or had better coping mechanisms, the externality would be weaker or perhaps nonexistent.

In the case of positional externalities, every individual is, to one degree or another, both a consumer and a person who gauges their level of relative consumption. All people are both C and one of X, Y, or Z. This does not change the fact that the externality is reciprocal. It is not difficult to imagine a society where everyone has both livestock and crops, some more of one and some more of the other. In such a society, the straying of cattle is still a problem that need not only be solved by taxing cattle or mandating the fencing of cattle.

People could instead fence out cattle from their crops. Better yet, they could grow less crops and herd more cattle. It all depends on the relative value of cattle and crops and on the most efficient solution.

The critical distinction from the cattle rancher example is that there are high apparent transaction costs in resolving positional externalities. Every individual is potentially aggrieved by the conspicuous consumption (or conspicuous leisure) of every other individual. Indeed, I believe that this is the reason that economists have almost exclusively looked to Pigovian taxation as the preferred solution in this case. I may be able to make a deal with a neighbor or two—“you park your sports car in your garage, and I’ll keep my boat down by the marina.” But it is not possible for me to negotiate with every individual in my reference group in such a manner. Further, negotiating is simple when prices are certain and costs are well known. But positional externalities are concerned with individual utility based on feelings of positional superiority and inferiority. They are far from being quantifiable, certain, or transparent. A solution to the externality must therefore be solved through collective action, not negotiation.

The problem here is that in discarding Coase’s admonition to negotiate a solution because transaction costs make it prohibitive, economists may have discarded Coase’s admonition to consider that externalities are reciprocal. Is it possible that there exist solutions involving *collective* action that focus on the observer of consumption, who may have more efficient tools available to reduce the externality?



### *Positional Utility Function Alteration*

It is well established that for the average individual, utility is at least partially derived from positional comparisons with other individuals, whether these comparisons involve income, consumption, wealth, or non-financial factors. Yet it is also well established that the average individual cares also about other things that involve no positional comparisons—*e.g.*, absolute consumption, inconspicuous consumption, consumption growth, leisure, etc. Recognizing that the former positional components of utility have negative externalities when exercised while the latter non-positional components do not, social welfare theory would suggest that efforts to increase the utility of the positional components are akin to efforts to win a zero-sum game and efforts to increase the utility of the non-positional components are open-ended. Therefore, if it were possible to reduce the *portion* of overall utility afforded to the positional in relation to the non-positional, there would be opportunities for social welfare gains.

A simple model can illustrate how this might improve social welfare more than a Pigovian tax. Following the model in Chapter 3 (p. 101), a Cobb-Douglas utility function is constructed with three components: relative consumption, absolute consumption, and leisure:

$$u = \left(\frac{pw}{\overline{pw}}\right)^{\alpha} (pw)^{\beta} (2 - p)^{\gamma} \quad (1)$$

In (1):  $p$  is the fraction of available periods engaged in work;  $w$  is the wage rate;  $\overline{pw}$  is the reference group average work effort level times the reference group average wage;  $\alpha$ ,  $\beta$ , and  $\gamma$  are the component relative weights for relative consumption, absolute

consumption, and leisure, respectively; and  $u$  is individual utility. The component weights by definition add to unity. The total number of available periods for work and leisure is set to 2.

For simplicity, the wage rate for all individuals is set to unity, and all wages earned are consumed. The optimal hours worked for the individual are  $p = 2(\alpha + \beta)$ . Due to the externality, the social optimum is for the individual to work  $p = 2\beta/(\beta + \gamma)$ . If  $a = .25$ ,  $b = .25$ , and  $c = .5$ , the individual will work for 1 of his 2 available periods (*e.g.*, 8 out of 16 hours in a working day) but the social optimum is for him to work  $.5/.75 = 0.666$  periods.

A proportional income tax would alter the utility model by reducing the wage by one minus the tax rate. The tax proceeds are used to fund public goods (or rebated as a lump-sum benefit). The model is modified as such:

$$u = \left(\frac{p}{\bar{p}}\right)^\alpha (p(1 - t) + t\bar{p})^\beta (2 - p)^\gamma \quad (2)$$

In (2):  $t$  is the proportional tax rate, and all other variables are as in (1). In the relative consumption term, the taxes cancel out. In the example given above, the optimal tax rate is 66.67% where the individual works 0.666 periods.

However, if the component weights were altered so that the relative consumption portion were given zero weight and the other two components increased proportionately (so that  $a = 0$ ,  $b = .333$  and  $c = .667$ ), the optimal tax rate is 0% and the individual also works 0.666 periods. Further, the individual's utility in this scenario is significantly higher than the previous weighting with taxes.

Any positive weighting of the relative consumption term can result in increased utility from an optimal tax rate. Yet any reduction in the weighting of the relative consumption term results in a secular increase in utility. If it is relatively inexpensive to

reduce how much people care about positionality, that may be a more efficient means to achieving higher utility and greater social welfare.

This simplified model does not encounter the pernicious effects of progressive taxes. Chapter 3 (pp. 125-126) indicates that these effects can be such that an externality tax does not even raise utility at all, or does so only for the less productive members of society at the commensurate expense of others. A comprehensive approach, then, would be to reduce positionality concerns, and then use a proportional tax to address remaining positionality.

#### *Is Utility Structure Alteration Possible?*

It is well-accepted that economic and social policy can change an individual's utility by increasing the abundance of things he desires and decreasing that which he abhors. It is also well-accepted that economic and social policy can change individual behavior. But can a policy intentionally change the structure of individuals' utility functions? Is the relative apportionment of individual wants and needs among various drivers of human well-being intrinsic and fixed or is it learned and malleable by environmental and cultural factors?

Prior research has indicated that changing utility functions is possible, and social needs *including the resolution of externalities* might be served by dedicating resources to these changes. Harsanyi (1953) suggested that as people's tastes change with experience, the composition of their utility functions also changes. He concluded that economics need not only be about the allocation of resources in the satisfaction of expressed human wants, but "includes also the question of how these scarce resources should be divided between productive operations for satisfying people's actual wants and measures for changing these wants" (p. 213). More specifically, Weisbrod (1977) claimed that some utility functions can

be said to be preferred to others because of efficiency effects, and “it can be efficient to devote resources to shaping utility functions” as an alternative to tax and subsidy mechanisms for internalizing external effects (p. 995). So “shaping or reshaping utility functions as a potentially efficient alternative to taxes, subsidies, or regulation, may permit expansion of the domain of policy statements that economists can make within our familiar Pareto welfare economic framework” (p. 995).

Other researchers indicate that some well-being factors (which drive utility) are influenced by social and cultural factors. Diener and Lucas (2000) assert that “If the culture emphasizes competition in a certain area, social comparison is more likely to be a chronically salient piece of information when people compute satisfaction judgments or react to immediate events” (p. 69). Also, “we ... recognize the centrality of culture in influencing people’s goals and resources, and therefore the weight given to various life domains in subjective well-being. We propose that biological needs, along with cultural socialization, can strongly influence people’s goals, which in turn are usually likely to be salient information influencing SWB [subjective well-being]” (p. 71). Further, their unified theory of subjective well-being “does not take SWB as an unchanging entity, although there is some stability in average levels due to stable inputs such as temperament, cognitive habits, and resources” (p. 71).

If the determinants of people’s well-being can be influenced by cultural factors, it would seem likely that different cultures have different determinants, or at least value them in different degrees. Cultural differences in this sense have, in fact, been discovered. E. Diener and M. Diener (1995) conclude that “there are different predictors of happiness for different people and in different societies” (p. 662). Suh, Diener, Oishi, and Triandis (1998)

suggested that “the influence of culture on life satisfaction judgments ... may be chronic,” and “culture may also exert a significant influence on the construct of life satisfaction,” in addition to mood, life events, and long-term personality (p. 484).

The foregoing shows that social policy may be able to affect changes in the weight people place on positional comparisons. Research has indicated that utility functions are changeable, that social and cultural factors may affect these changes, and that different cultures have been shown to have different predictors of reported well-being, which influences decision-making and utility functions.

#### **4. Reducing Positionality**

At this point it has been established that addressing the reciprocal externality (*i.e.*, the concern for relative position rather than its taxation) can improve utility alone or in coordination with a Pigovian tax, and that there is a strong possibility that cultural factors can influence how individual utility functions are structured. It remains to be shown the methods by which such cultural adjustment might be accomplished.

This section intends to provide a brief introduction and classification of these methods. The possibilities are arranged in four areas: (1) Reducing feelings of positional inferiority (“envy”); (2) Reducing feelings and exhibitions of positional superiority (“vanity”); (3) Reference group tailoring; and (4) Reference group exclusion. A brief discussion of each of these approaches follows.

It is important to note that these approaches would not appear to be mutually exclusive. They may all be pursued, along with taxation, in any combination that proves successful.

### *Reducing Envy*

The most direct approach to reducing positional attitudes in society is to influence people to feel less uncomfortable when faced with a decline in relative position. Essentially, the idea is to make people feel less envy when faced with a positional comparison. This approach is what is most obviously meant by reducing the reciprocal externality.

Strictly speaking, the intent here is not to reduce envy alone, but to reduce positional comparisons. In an investigation of the psychology of envy, Helmut Schoeck (1966) indicates that “envy is a directed emotion: without a target, without a victim, it cannot occur” (p. 10). When people make comparisons of their position to the status of the wider public, or society as a whole, such comparisons are not what could be strictly defined as envy. Such broader comparisons are in a sense more contrived, artificial, and cognitive than feelings of envy. Nevertheless, because these comparisons feed positional externalities they have social costs. It is not just envy but also these broader positional comparisons that this approach should target.

Can society effectively change the incidence and severity of how envious people feel? One method is to attach (or reinforce) feelings of guilt that may accompany feelings of envy. Kaplow and Shavell (2001) offer a theory showing that “moral sanctions and rewards – feelings of guilt and virtue – [can be] optimally employed ... to maximize social welfare” (p. 20). Furthermore, many existing social institutions appear to follow this path: “That human nature is indeed programmable in this sense is further implied by a wide range of practices, notably, substantial efforts to inculcate guilt and virtue to enforce various moral rules — in the rearing of children, in organized religion, in educational institutions, and in some acts of government” (p. 12).

Kaplow and Shavell suggest not only the inculcation of guilt in the subject, but also the development of social disapprobation: “If guilt is to be inculcated for committing a particular type of act, it may not add much cost, if any, simultaneously to inculcate a sense of disgust at others’ commission of that type of act, which in turn would lead one to express disapprobation” (p. 17). They elaborate that the self-controlling feelings of guilt and virtue can be affected in two ways: through evolution (nature) or inculcation (nurture). Notably, their research intentionally “complements economists’ extensive attention to other means of regulating externalities, namely, government action and Coasean bargaining” (p. 20).

Moral conditioning may be imposed by social inculcation but also by individual subjects. Schoeck (1966, p. 9) states:

Both the envier, who must somehow come to terms with observed inequalities in his life, and the envied person in trying to ignore other’s envy ... will make use of creeds, ideologies, proverbs, etc. which will tend to reduce the power of envy and thus allow daily life to proceed with a minimum of friction and conflict.

The person making positional comparisons may impose limits on himself to avoid comparisons, which detract from his own social harmony.

Not only does the moral conditioning approach have a theoretical basis as a tool for “regulating externalities,” but there is empirical evidence that different societies have evolved different attitudes towards social comparison, envy, and equality of result. Several researchers have found that individualist and collectivist societies differ significantly in what is important to the well-being and life satisfaction of their citizens. E. Diener and M. Diener (1995) found that self-esteem was more important to life satisfaction in individualistic cultures (p. 660). Suh *et al* (1998) found that “in individualist cultures ... individuals’ life satisfaction was based primarily on emotional feelings. In more collectivist cultures ... the

normative desirability of life satisfaction had a significant weight in the individuals' global appraisal of well-being" (p. 491). Trandis (1995) argued that collectivists are socialized to enjoy doing their duty (p. 11). Staudinger (1999) found that socioeconomic status was more salient as a predictor of well-being in the United States than in Germany (p. 314); because the United States is a comparatively more individualistic society than Germany, "personal life investment, especially in the domain of work, showed stronger relationships with well-being in the United States than in Germany" (p. 315).

Even within societies, sub-cultures yield value systems with varying attitudes. Di Tella, Haiken-De New, and MacCulloch (2010) showed that political orientation influences the relative effects of income adaptation and status on well-being: Those on the right adapt to status changes but not to income changes while those on the left adapt to income changes but not status changes. Such a result suggests that ideology and ethics can dissuade over-emphasis on positionality concerns.

Although none of these studies specifically mention the shaping of attitudes toward envy or positionality, it is clear that ideological pervasion can reach as far as how people define life satisfaction and what makes people happy.

In practical terms, the dispensation of guilt and disapprobation upon feelings of envy and positional comparison need not necessarily be directed by governments. It might follow the path of other movements which raise awareness of externalities and social responsibility. The environmental movement, for example, has been successful not only in erecting governmental policies such as taxation and regulation that address pollution externalities; it has been perhaps more successful in bringing awareness to environmental issues generally (and externalities in an informal sense) through childhood education and corporate social



responsibility (CSR). As a result, there is much greater social censure, including personal feelings of guilt and social disapprobation, in acting out of self-interest in everyday actions that have external social costs.

Although there is some admonition in childhood education against envy, it is distinctly relegated to religious instruction.<sup>31</sup> Yet since the magnitude of envy in utility functions has social welfare costs, it may serve social welfare to instruct children to avoid feelings of envy in the same way they are taught to control their temper or not to litter.

Similarly, the development and marketing of goods and services may be constrained by CSR to avoid playing on people's positional proclivities. In the same way that corporations and the business community have in recent years spawned sustainability efforts, social disapprobation of envy may lead them to curtail product lines or marketing campaigns that urge people to buy products and services that make people feel the need to catch up with the latest and greatest of the rich and famous.

#### *Reducing Vanity or Its Exhibitions*

Similar to the Reducing Envy approach is to dissuade people, through moral education and societal disapprobation, from feeling vanity or pride in interpersonal comparisons. Vanity is the feeling experienced by those who through consumption initiate the externality, rather than those who are responsible for its reciprocal. Technically, it flows

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<sup>31</sup> See, for example, The Bible, Exodus 20:17 (the tenth "commandment"): "Thou shalt not covet thy neighbour's house, thou shalt not covet thy neighbour's wife, nor his manservant, nor his maidservant, nor his ox, nor his ass, nor any thing that is thy neighbour's" (King James Version). Also, The Koran, Soorah an-Nisa (4):32 : "Do not wish for what we have favored some of you over others."

not from the idea of addressing the reciprocal externality discussed in Section 3 but from the externality itself. It is included here as a similar alternative to taxation that avoids some of the costs.

In many ways, vanity is the mirror image of envy when one moves from a position of relative inferiority to relative superiority. Efforts to instill a reaction of guilt when one feels envious are easily coupled with efforts to instill guilt when one feels vain.

However, it is not only that there should be guilt or disapprobation in feeling vanity or superiority. It is perhaps more important that people are restrained in conspicuous displays of income, wealth, or consumption. While the reciprocal externality arises directly from the affective emotion of envy, the imposition of the externality is experienced through actions that incite envy, *i.e.* through the *exhibition* of conspicuous consumption that arises from feelings of pride and vanity.

Therefore, in addition to the application of moral education and moral disapprobation that dissuades one from feeling vain with respect to one's relative income or consumption, a practical application of this approach may also include inculcation of responsibility to conceal one's income or consumption out of respect for others' feelings. To some extent, this responsibility has already been internalized in many societies. It is generally considered discourteous to speak freely of one's income level. It is perhaps to a lesser extent considered tacky or ill-mannered to flaunt one's consumption or brag about one's possessions.

This approach is perhaps more obviously conducive to education and changes in CSR. It would appear easier to teach or influence behavior than the constraining of emotions. With CSR, many customers already choose products that are less flashy and

ostentatious to avoid pretension (though many assuredly do not), so the market already dictates some reduction in conspicuous luxury. Yet CSR may have a role in reinforcing these tendencies and further avoiding products and advertisements that encourage people to flaunt their belongings.

### *Reference Group Tailoring*

There is a large body of research in the field of psychology that attempts to determine the referents to whom people compare themselves. Much of this research is applied to the concepts of subjective well-being and utility in the positionality literature. This body of research is generally referred to as “reference group selection.” Of the four non-tax approaches identified in this paper, reference group tailoring is perhaps the approach that is most natural and already occurring.

When discussed or modeled in the applicable literature, positionality is usually framed as an externality to all other members of society (or the political entity for which social welfare is measured). In both an empirical and a normative sense, this is almost certainly incorrect. People care about the feelings of others in inverse proportion to their social distance (Smith, 1790). When I buy a new Porsche, I do not lower the relative position of everyone else in my country or the world, at least not equally. The neighbors on my street or in my community may see my sports-car quite often, parked in my driveway or being driven around the neighborhood. My friends, co-workers, and acquaintances may also be impressed by it every so often. But people across the country or in other countries will probably never see it; their only awareness that consumption of Porsches has increased may

be from the automaker's sales figures or stock price. Needless to say, their exposure to the externality of my specific action will be less than my neighbors' or friends'.

This is not to say that positionality is necessarily overstated. The overall impact of positionality on personal utility may be quite the same with this consideration as with a model that discounts utility by total societal income or consumption: The externality of friends' and neighbors' consumption may be more than the impact of average consumption while the externality of strangers may be less. Yet if conspicuous consumption has an externality because it is conspicuous, the externality on a specific individual will be more or less on account of how conspicuous it is to that individual.

There is no consensus in the literature as to what the standard reference group is for income and consumption comparisons. Knight, Song, & Gunatilaka (2009) showed that in rural China the primary reference group is confined to the village. Morawetz *et al* (1977) found positional effects in competing Israeli kibbutzim. Kapteyn, Van Praag, and Van Heerwaarden (1976) argued that the "social reference space" can in fact include one's entire country. National borders may be a limiting force on reference groups: In Easterlin's (1974) analysis of reported well-being within and among countries, people's reported happiness correlated with intra-national relative income comparisons but less so with comparisons with extra-national incomes. In fact, E. Diener, M. Diener, and C. Diener (1995) found that "*positive* correlations existed between the income (and rights) of neighboring nations and a country's" own surveyed subjective well-being (p. 862, emphasis added), contrary to expectations of inter-national positionality.

Is one's reference group imposed by society or is it chosen by the individual? There is support in the literature for both possibilities.

Several researchers find that people can and do choose their own reference group(s). Diener and Fujita (1997) claim a “coping approach to social comparison ... in which the person takes a much more active role, consciously selecting comparison targets from a wide array of available others” (p. 330). Wood and Taylor (1991) claim that people take such an active role for two reasons: self-enhancement (*i.e.*, making themselves feel better); and self-improvement (*i.e.*, encouraging themselves to perform better). Falk and Knell (2004) introduce a social comparison model “where people choose their reference standards to serve” these two motives, and they provide empirical proof from a questionnaire study (p. 417). Also, people use reference group selection as a coping mechanism against positional inferiority.

However, whereas Wood (1996) agrees that people can and do make their own comparisons on their own terms, “it seems reasonable to assume that in many cases, when people stumble upon social information, they automatically compare themselves” (p. 523). Also, not all social comparisons are conscious endeavors, and “people may not be fully aware of the comparisons they make with their neighbors, coworkers, and TV characters” (p. 524). This view was also advanced by Brickman and Bulman (1977).

The approach discussed here would be to tailor one’s reference group to include people who are more directly comparable to oneself. Examples of tailoring may include the removal of the following from one’s reference group: (1) People of different ages—how can a recent college graduate reasonably compare his art collection to a retiree who has had a lifetime of travels and savings to spend on acquisitions? (2) People of different fortunes—how can a disadvantaged youth who has worked his way through college compare his first car upon graduation to that of a rich family’s scion who received an early inheritance? (3)

People of different geographical areas—why would a software engineer working in Little Rock expect to earn the same income as a similarly-positioned software engineer working in New York City, where the cost of living is substantially higher?

There is significant evidence that people already tailor their reference groups to make more appropriate comparisons. This is what Wood (1996) calls the cognitive response the individual has to a social comparison: the individual may refute or rationalize the comparison, resulting in a muted or nonexistent emotional response. Through education and training, it would appear possible that tailoring could be more adept at removing absurd or incomparable referents.

How does reference group tailoring reduce positionality in individual utility functions? It does so in two ways: (1) by narrowing the inequality upon which comparisons are made; and (2) by reducing the occurrence of positional comparisons.

First, tailoring may reduce the salience of positionality in the overall utility of individuals by reducing perceived consumption inequality. If the reference group is limited to people of the same region, or the same age, or the same educational background, the differences in consumption will be less. The despair and anxiety and injustice felt by individuals due to perceived inequality will be mitigated because people will perceive less inequality when the reference group is more narrowly defined. As they compare themselves with these similar others, the differences are less stark and thus less apt to conjure strong feelings of vanity or envy.

This narrowing of the range of positional variation may not, however, necessarily reduce the salience of positionality. Easterlin (1974) pointed out that “It is at least plausible that sensitivity to income differences might be heightened [if income inequality were halved],

so that lower income people might suffer as much in the new situation from an income spread of 50% as they previously had from a spread of 100%. If this were so, then subjective welfare would be unchanged” (p. 119). In other words, the elasticity of utility with respect to changes in relative income or consumption may adjust to the scale of relative differences. Weisbach (2007) suggests that reducing variation may even increase positional competition. “If you are closer to beating someone in a status race, you might try harder” (p. 8). At the least, it seems plausible that reduction in positionality would not be proportional to the reduction in income or consumption variation that resulted from reference group tailoring.

However, tailoring has a second effect that may reduce positionality. Not only does variation diminish with a narrowly tailored reference group, but tailoring may also reduce positionality by ignoring positional stimuli regarding those outside the narrow reference group, thereby reducing the *occurrence* of positional comparisons. If I only care about how I am doing in relation to friends who attended the same university, for example, I will be less likely to think positionally than if I care about how I am doing in relation to everyone I meet.

#### *Reference Group Exclusion*

The final approach to reducing positionality is to encourage the engagement in reference group exclusion. In this approach, people are encouraged to compare themselves to referents that cannot be injured by feelings of relative inferiority or diminished superiority. It is essentially a more complete form of reference group tailoring, one in which the remaining reference group is not endogenous. The externality is reduced or eliminated because the referents are either no longer included in social welfare or are included only in a

more limited sense. There are three cases in this approach: foreigners; ancestors; and one's past self.

In the case of foreigners, rather than compare one's income or consumption levels to all others in society or to a narrow set of peers, people are encouraged to compare to foreigners, *i.e.* people in the rest of the world or some subset of nations. If the standard analysis treats social welfare as the combined utility of individuals within a nation's borders, and people's referents for relative comparison are foreigners, only foreigners (if anybody) would lose utility from additional income or consumption. The externality disappears. However, there are three problems with this case. First, increasingly economists and social researchers generally do not limit social welfare to their own nation or any specific polity. Social welfare is not parochial and is often a global notion. Second, foreigners are the one group that reference group research clearly indicates is usually excluded as referents. To get people to think of their fellow countrymen in a non-competitive manner and foreigners as competitors is almost asking them to reverse their thinking completely. The concept of social distance is turned on its head. Third, if foreigners reciprocated and used the same strategy, the externality returns in the form of foreigner consumption. In this case the consumption cannot be taxed, so social welfare could be worse off than if referents were endogenous. For these reasons, the use of foreigners as referents does not appear to be a fruitful case in this approach.

The second case is to use one's ancestors as referents. Comparison with one's ancestors is used extensively in the analyses of economic mobility studies. Applying this approach to the problem of positional externalities was identified by Hagerty (2000). Here the idea is also to avoid the reciprocal comparisons made by the referents. As Hagerty puts



it, “Such a historical comparison has the advantage that aggregate human happiness can increase even though no living persons are kept miserable, in contrast to most social comparison solutions” (p. 770).

Whether the individuals use their immediate ancestors or a more general notion of a civilization’s or a nation’s ancestors may be an important distinction. Using one’s immediate ancestors would in many cases still permit externalities to occur through increased consumption by one’s living parents and grandparents. There is also the concern that people may act positionally if they know their immediate descendants will compare themselves to them, even after they have died. If properly perceived, however, the effect should be almost completely mitigated: Comparing my consumption with my parents’ consumption, I should allow for a generational lag of perhaps twenty to thirty years, or simply compare my present consumption with their consumption at the same age. Nevertheless, using a more general notion of ancestors, where specific people are less important, avoids these concerns. In either case, passive referential comparisons are almost completely eliminated, as consumption is not visible.

The third case is to use oneself as the one and only referent. A large body of adaptation research has concluded that people already to a large degree contextualize their income or consumption with their own past as a guide.<sup>32</sup> The idea would be to encourage people to only use their own past as context in self-appraisals that inform on one’s well-being and thereby guide decision-making.

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<sup>32</sup> See, for example: (P. C. D. Brickman et al., 1978; Clark, 1999; Davis, 1984; Easterlin & Angelescu, 2009; Frijters et al., 2006; Stevenson & Wolfers, 2008).

Striving for one's own income or consumption growth would appear to allow for an open-ended amount of utility for the individual, determined by the individual himself; striving for positionality can only attain benefits at the expense of others.

One concern with this approach is that expectations of future references to one's current income or consumption may influence one's present-day work and consumption decisions. Essentially, one's present-day decisions create an externality for one's future self. Layard (2002) makes this case. However, he points out that individuals may be myopic about their future reference to the present (p. 9). In any case, it is not clear that this self-externality has the same effect that inter-personal positional externalities do. If people gain utility from income or consumption growth, it would not appear that greater work or consumption would be wasted due to the self-externality. Whereas positional utility will always have a finite sum to be shared among all members of society, growth utility can be increased without limit.

## **5. Problems with a Progressive Tax Response**

In Section 2, technical problems were raised in connection with the use of a Pigovian tax to address positional externalities. More significant problems can be identified if the tax response includes a progressive rate structure, as has been suggested by some researchers, most notably Robert Frank (1985a, 1995, 2007, 2011a). Progressive taxation has a number of negative (and positive) features identified in the literature. Here I do not examine the full menu of its indictments or make a comprehensive argument against it. Rather, I explore those problems that are raised in connection with positionality and the use of progressivity in addressing its externality. These problems include: (1) negative side-effects on non-

positional utility; (2) increased positionality share resulting from increased envy and vanity; (3) the reinforcement of an artificial national reference group.

#### *Utility Side-effects*

Taxing positional externalities may have significant negative side-effects on other components of individual utility. A fairly large literature maintains that individual well-being (and by extension, utility) is influenced by absolute levels of income/consumption. Another branch of well-being research maintains that adaptation plays a large role in people's happiness, and thus the change in income/consumption over time (*i.e.*, growth) plays a large role also. As taxes are applied to work, income, or consumption in order to reduce the exercise of these activities for positional gain, what collateral effects do these taxes have on these other components of individual utility?

The effects can be better assessed if a comprehensive utility model integrates both absolute and relative consumption along with leisure and consumption growth. In Chapter 3, I built such a utility model. The research shows that tax progressivity, while having positive effects (similar to a proportional tax) on utility due to a reduced positional externality, has an unambiguously negative effect on utility from consumption growth (p. 97, 125). If people are affected by both positionality and adaptation, the positive effects of progressivity that result from a diminished positional externality may be offset by negative effects that result from diminished growth. In short, progressive taxes have a significant side-effect that is absent from proportional taxes.

Because of this, while a proportional tax would be beneficial because of its effect on positional externalities, a progressive tax's effects on social welfare are less clear. If tax

proceeds are used to buttress consumption equally among individuals (perhaps through redistributive entitlements or public goods), the optimal tax rate for the individual may be higher or lower due to the inclusion of absolute consumption; however, with the inclusion of consumption growth higher tax rates have an unambiguously negative effect on utility obtained thereof. A progressive tax may benefit some citizens at the expense of others, and yet the overall effect on social welfare is muddled.

#### *Increased Positional Comparisons*

A second problem arises with progressive taxes in connection with positional externalities: Application of the tax may increase the salience of positional concerns within individuals' utility profiles. Essentially, this works in direct opposition to efforts (identified in Section 4) to reduce positional share by reducing envy, vanity, and positional comparisons generally. Consumption or work would decrease, but the degree to which people care about positionality, and consequently the portion of utility devoted to positionality, may increase. This may occur for two reasons. First is the general awareness of relative position in society. Second is the disapprobation of activities that express that relative position.

The general awareness effect is an indirect negative effect that the tax will have even if the direct effect of the tax is positive. Essentially, people may be incited or tacitly encouraged to think positionally because government policy is responding specifically to positionality. The response is implicit in the different application of rates to different positions (this implication is missing with a proportional tax). A progressive tax is transparently intended to redistribute income or wealth, or at the very least redistribute the public burden of taxation on those who have greater income or wealth. Everyone who pays

taxes (and also everyone who is exempt) is made fully aware that relative differences exist and are a societal issue of contention. Governments do not even have to make this explicit. The structure of tax brackets makes it clear enough.

Even if government policy taxes positional superiority, it fosters positionality by bringing positional concerns in the open. It can be likened to a national discussion of delicate social problems: The discussion itself can injure relations and cause greater polarization than there was previously.

The disapprobation effect may increase or decrease positional concerns. A tax on consumption (or income) only works on one-half of positionality—it taxes actual consumption, the source of the externality. In this way a tax does show societal disapproval of positional superiority. But it does not work on the other half of positionality—inferior positionality. People who feel envious towards those who consume are left to do so with no repercussions. In fact, since the tax proceeds are shared by all or even redistributed to the positionally inferior, the tax is approving of envy and society-wide positional comparison. Their resentment is manifested in a policy of higher and more progressive taxation.

Because lower-end income or consumption is taxed less or exempted altogether, a progressive tax is more than gently approving of positionally inferior attitudes: It is an effective policy tool for them, perhaps the *most* effective policy tool for them. Progressive taxation therefore does not diminish positionality at all—while it discourages positional superiority it encourages positional inferiority in the same degree.

Progressive taxation reduces work and consumption, which may be used as positional tools. But it may very well increase the concerns of inequality and the feelings of

vanity and envy that give rise to positionality. In turn, this may result in greater portions of utility devoted to zero-sum positionality and thus to lower social welfare.

### *Reference Group Imposition*

Progressive taxation's third problem is that it introduces or reinforces the existence of a national reference group.<sup>33</sup> This occurs because there is a strong possibility that information conditioned by society may provoke social comparisons where none existed or where they were rare or incidental. The legislated tax brackets by provincial or national governments may provide such information. Further, the legislative process for deciding and enacting these tax brackets may cascade further information: income distributions, inequality studies, policy discussions, and the like may all flow from the determination of tax brackets, which of course are highly consequential to citizens' tax bills and financial standing. As indicated in Section 4, people can be passive receptors of comparison information and select their reference group from external stimuli. Even the most politically or economically illiterate citizens are not impervious to the resulting information flow; when such information is actively or passively absorbed by a citizen, it is likely that conscious or subconscious social comparisons are made.

It is not expected that the government or the media should hide this information to avoid social comparisons. But the existence of a progressive tax system necessarily adds information where none was before. If the individual intends to use a narrower or more

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<sup>33</sup> Technically, it reinforces the existence of a reference group coinciding with the polity that administers the tax, whether this is a nation, province, municipality, or transnational tax.

appropriate or more natural reference group when making comparisons, that intention is disrupted by the imposition of a polity-based reference group.

Like progressive taxation's second problem above, this third problem also works in direct opposition to an approach from Section 4, in this case reference group tailoring. Rather than narrowing the reference group to similar others, it widens the reference group to people of all ages, occupations, backgrounds, and intra-polity geographical distinctions. Thus, the effects of reference group tailoring are reversed: greater inequality endemic to a more diverse reference group increases the severity of positional comparisons, and the wider range of people in one's reference group (essentially almost everyone one comes in contact with) increases the incidence of social comparisons. What is of concern here is that through progressive taxation government induced social comparisons will cause an affective response in people,<sup>34</sup> making them feel superior or inferior in relation to all other people in the same political entity. This government policy may broaden the scope of how much they care about relative income or consumption, enlarging that component of utility. Since relative comparison utility is a zero-sum game, such government policy results in the kind of behavior that a positional externality tax is supposed to quash.

These latter two concerns, both increased positional comparisons and reference group imposition, share a common feature: They do not technically incite envy. As indicated

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<sup>34</sup> As Wood (1996) points out, the result of each social comparison is potentially three-fold: a cognitive response; an affective response; and a behavioral response. The cognitive response entails a self-evaluation in light of the social comparison and possibly a rationalization and/or a refutation of it. The affective response is an emotional feeling of jealousy or vanity. The behavioral response is to imitate, conform, or sort oneself socially.

in Section 4, envy typically has a specific target. Progressive taxation may increase the number and degree of positional comparisons and may make people compare themselves with a wider and more diverse set of referents, but as a result the positional comparisons are not directed at anyone specifically. If these positional comparisons lack envy, is it possible that these effects are benign?

The problem with positional comparisons is not principally that they incite envy and specific acrimony between people. Though this may also occur as an indirect result of these comparisons, the principal problem is that people feel less positive and suffer utility loss from diminished position. Moreover, these abstract positional comparisons would appear to be almost completely artificial and unnecessary. To help reduce positional comparisons and a wider group of referents, governments can begin by eliminating policies such as progressive taxation that contribute to them.

#### *A Note about Inequality*

The most often stated reason for using progressive taxation to address positional externalities is that economic inequality (of income, consumption, or wealth) is the source of positional comparisons and progressive taxes are an effective policy tool to reduce economic inequality. Schoeck observes that “the reason for steep tax rates is said to be the ideal of equality, which has to be pursued, if only symbolically” (1966, p. 388). Frank (2007, 2011a) makes the case that progressive taxation should be used to address positional externalities. But he also ties progressive taxes directly to reducing inequality: “a progressive consumption tax may be our only politically realistic hope for ... limiting the growth in consumption



inequality that has made life so much more difficult for the [relatively poor] 99 percent” (2011b).

That progressive taxation reduces economic inequality may be a valid argument, but there are also valid reasons to believe that it may be both insufficient and problematic. The argument may be insufficient because it is not clear that a reduction in inequality will in fact reduce the salience of positional comparisons, for three reasons. First, as mentioned in Section 2, people may simply shift their positional activity to non-taxed activities. Second, as pointed out in the Section 4 discussion of reference group tailoring, narrowing the range of income or consumption differences may lead to less severe positional comparisons, or it may simply lead to an adjustment of the elasticity of positional utility with respect to positional differences. Third, even if the reduction in inequality were to reduce positional utility share, it is not clear that it would fully offset the opposite effects mentioned above, *i.e.* the increase in positional utility share due to greater awareness of positionality, government approval of redistributionist envy and positional comparisons, and the imposition of a national reference group. While appearing to combat inequality and positional strife, progressive taxation may simply be making the problem worse.

The inequality argument may also be problematic in that it ignores the positive effects of economic inequality. In his parable of “the poor man’s son,” Adam Smith (1790, pp. 181–185) suggested that inequality spurs economic activity that has positive benefits for society and civilization generally. Chapter 2 indicated that inequality is at least partially due to age and workforce experience, and that portion of inequality reflects productivity growth, which is desirable from a total utility perspective.

It has also been argued that luxury goods serve a positive purpose in society by discovering the necessities of tomorrow. The need for luxury goods was argued by writers as far back as George Mandeville and Adam Smith. More recently, F.A. Hayek (1960) offered a compelling rationale:

What today may seem extravagance or even waste, because it is enjoyed by the few and even undreamed of by the masses, is payment for the experimentation with a style of living that will eventually be available to many ... Even the poorest today owe their relative material well-being to the results of past inequality. (p. 44)

It is conceivable that development of luxury consumption goods could occur without overall inequality: One person has a fancy car, another a large house, a third has a yacht, while all have the same overall consumption allowance. But generally the development of luxury consumption goods occurs when some people consume more than others. Inequality is a consequence of allowing luxuries in society.

Although it is probable that economic inequality exacerbates envy and positional comparisons, it does not follow that reducing inequality through tax progressivity will necessarily result in greater social welfare or even reduced positionality. Progressive taxes have several offsetting effects that inhibit its ability to reduce the prevalence of positionality, and economic inequality has private and social benefits that would be lost if efforts to reduce economic differences to address positionality do so by reducing inequality.

## **6. Conclusion**

The proposition advanced in social science research that people care about their relative position in society as measured by income or consumption prompted the

observation that work or consumption thereby creates a positional externality. In the relevant literature, this has resulted in calls for a Pigovian tax.

This paper raises the possibility that there may be alternatives to such a tax in addressing positional externalities. People could concern themselves less with other people's income or consumption levels. People could flaunt their own consumption less. People could narrow the group of people they compare themselves with to those more similar to themselves. People could compare themselves principally with foreigners, ancestors, or their own past progress. And people could use a combination of these approaches (perhaps also with a Pigovian tax) in ways that they find fruitful.

Table 19 summarizes these approaches, in addition to traditional tax approaches for addressing positional externalities.

This paper also raises concerns with turning the Pigovian tax into a progressive tax, whether on income or consumption. It is argued that a progressive tax may have significant negative side-effects on non-positional utility; that progressive taxes stoke envy and positional concerns directly; and that progressive taxes widen the scope of positional referents resulting in sharper and more common positional comparisons.

It is natural for economists to seek and provide standard economic solutions when faced with social problems that can be framed in economic terms. But it is also incumbent on the economics profession to be open to and seek solutions that do not originate from the economic toolbox. In this paper I have proposed a number of solutions to the problem of positional externalities that are grounded in moral and cultural changes to how we feel about our position in society and how we react to these feelings in ourselves and in others. If

Napoleon Bonaparte is astute in suggesting that “the moral is to the material as ten to one,” then moral solutions should play a prominent role in solving social problems.

It is hoped that future research can build on the approaches introduced in this paper. The ideas presented cast a wide net and many avenues warrant further investigation.

TABLE 19: VARIOUS APPROACHES TO POSITIONAL EXTERNALITIES

<i>Approach</i>	<i>Policy</i>	<i>Effect</i>	<i>Possible Limitations</i>
Vanity Approaches			
Pigovian Tax	Tax	Reduced externality through less work and/or consumption	(1) Positional competition moves to leisure or other non-taxed activity (2) Correct assessment of externality originating from income, consumption, or wealth
Income	Income tax	Less work	(1) Negative side-effects on other utility components, especially adaptation/growth (2) Increased positional utility share from encouragement of envy (3) Increased positional utility share from wider inequality comparisons and more frequent comparisons
Consumption	Consumption tax	Less consumption	
Progressive	Progressive income or consumption tax	Less consumption, especially high-end	
Reduced Vanity	(1) Education (2) CSR (3) Change in government methods	(1) Reduced utility share of positionality (2) Reduced exhibitions of conspicuous consumption	
Envy Approaches			
Reduced Envy	(1) Education (2) CSR (3) Change in government methods	Reduced utility share of positionality	
Combined Approaches			
Reference Group Tailoring	(1) Education (2) Change in government methods	(1) Narrower inequality in comparisons (2) Less frequent comparisons	(1) May simply redirect jealousy, not reduce it
Reference Group Exclusion	(1) Education (2) Change in government methods	Removal of social welfare participants from positional utility function	
Foreigners		Replacement with foreigners	(1) Limits social welfare to non-foreigners (2) Unnatural reference group (3) Foreigners may reciprocate
Ancestors		Replacement with own ancestors or ancestors in general	(1) Immediate ancestors still endogenous
Past self		Replacement with individual's own history	(1) Self-externality

## CONCLUSION

### 1. Dissertation Research Review

Before discussing more general conclusions around the dissertation's central question, a recapitulation of the research findings of the three papers is in order.

In "Income Variation and Tax Progressivity," I showed through empirical analysis of sample and aggregate income data that the application of progressive taxation on an annual basis may result in significant differentials in long-term or lifetime tax liabilities between people with the same income. People have variations ("lumpiness") in annual income streams due to occupational choice, erratic employment, and a general upward trend from skill maturation during the worker's life cycle; some people's income is lumpier than other's. Given the same total income over multiple periods, a person with lumpy income will pay more under a progressive income tax than a person with a level income stream. The size of the tax premium (or "penalty") paid increases as lumpiness increases; it is therefore greater with individuals than with families and with lower income than with higher income taxpayers. Deductions and exemptions exacerbate the differential. The lumpy tax penalty has two important implications for progressive taxation: (1) progressivity inefficiently disadvantages some economic decisions, notably occupation choice; and (2) progressivity treats people who have variable income streams inequitably. Approximately 40% of the penalty can be attributed to the variation of income attributable to life-cycle income patterns.

In the second paper, “Adaptation, Growth, and Tax Progressivity,” I integrate the life-cycle income model developed in the first paper into a comprehensive individual utility model that includes consumption growth, following an adaptation effect, together with positional consumption and two other traditional components of individual utility, absolute consumption and leisure. I showed how progressive tax rates have an unambiguously negative effect on utility from consumption growth, regardless of the individual’s income level or tax bracket. Using the utility model in conjunction with the life-cycle model developed in the first paper, I showed that work hours for high-productivity and mid-productivity workers are curtailed under a progressive tax. Considering the use of tax proceeds to fund public goods or redistribution, the positive effects of progressivity on total individual utility due to increased leisure are offset by the negative effects on consumption growth. Whether the offset completely eclipses the benefit of taxing externalities depends on the weighting of the utility components, the productivity of the individual, the efficiency of government spending, and the progressivity of the tax.

In the third paper, “Alternatives to Taxing Positional Externalities,” I proposed alternatives to a Pigovian tax for correcting positional externalities. I showed that if the proclivity to make positional comparisons could be reduced, this can be a more effective solution to reducing the externality than taxing income or consumption. Four approaches to reducing positional comparisons were proposed: (1) directly reducing feelings of positional inferiority through education and social disapprobation; (2) reducing feelings and outward displays of positional superiority, also through education and social disapprobation; (3) tailoring positional reference group selection; and (4) encouraging the exclusion of positional referents to foreigners, ancestors, or the past self. Progressive taxation works against these

approaches, validating positional concerns and bolstering an artificial national reference group. As a result, progressive taxes may increase the frequency and acuity of positional comparisons thereby increasing positional utility share. In addition to the negative side-effects on utility from consumption growth described in the second paper, these effects are presented as reasons to avoid progressivity in income or consumption taxes for purposes of addressing positional externalities.

## **2. Dissertation Research Conclusions**

The objective of my dissertation was to critically examine the question of whether tax progressivity is a positive policy contribution in responding to positional externalities. I believe that the research presented casts significant doubt on whether positional externalities give new or improved arguments for tax progressivity. On the contrary, alternative solutions presented appear to indicate that progressivity works in the opposite direction, creating utility loss by increasing the significance of positional comparisons in people's lives.

Some of the conclusions in these three papers do not apply specifically to the problem of positional externalities or the treatment of it by progressive taxation. They nevertheless may have lasting importance of a more general nature. The findings and implications of a progressive tax's lumpy income penalty in "Income Variation and Tax Progressivity" offer a more general indictment of progressive taxation. The life-cycle income regression model in that paper also may have uses in income inequality and mobility research. The utility model developed in "Adaptation, Growth, and Tax Progressivity" can serve as the basis for analyzing positionality more generally or analyzing the composite effects of consumption, positionality, and growth.



Taken together, however, the three papers provide a clear answer to the dissertation's central question: Progressivity in taxation lacks justification as an appropriate policy response to positional externalities. First, when considering individual utility as a whole, progressivity renders the effect of otherwise utility-raising taxation ambiguous, as gains in utility from leisure are offset by losses in utility from adaptation and consumption growth. Second, progressivity increases the utility share (*i.e.*, overall concern) of positionality by raising the general awareness of positionality and by implicitly voicing state approval of envy and positional comparisons. Third, progressivity may also be increasing positional utility share by increasing the acuity and occurrence of positional comparisons through the creation or reinforcement of a generally artificial reference group. The criticisms developed here are in addition to any past criticisms of progressivity and criticisms of a more general nature, such as those raised in this dissertation not specific to positional externalities.

As with many economic problems, treating symptoms can result in aggravating the root cause. It is well known that policies that assuage unemployment can boost unemployment rates, policies of state intervention to make medical care affordable can result in medical over-consumption, and policies that help people cope with the high prices of higher education can make those prices even higher. Similarly, policies that intend to raise utility or social welfare by progressively taxing income or consumption can result in lower utility, from side-effects on other utility determinants and increases in how much people care about positional comparisons that have no social value.

As with the vast majority of economic research, most economic analyses of positional externalities have either recommended or built the foundations for recommending a government policy solution, and most of these have focused on what to tax, how to tax,

and how much to tax. The research I have presented diverges from this path and suggests alternative social solutions that focus on moral and cultural adjustments that may or may not involve the state. Not every societal problem subjected to economic analysis can or should be met with a government policy prescription.

Envy, vanity, and positional comparison are habitual psychological tendencies that result from years of upbringing and social edification. They will not be eradicated or even changed overnight. There are still justifications for proportional income or consumption taxation to counter positional externalities. Yet if the social significance of the positional research is that the comparison motivation has no net social value, the long-term solution should not be limited to reducing activities that incidentally aggravate these comparisons; the solution should also involve reducing the tendency of people to make such comparisons. Progressive taxation works against this reduction, and positional externalities appear on balance as an argument against it.

## REFERENCES

- Aaronson, S. (2002). The rise in lifetime earnings inequality among men. Board of Governors of the Federal Reserve System.
- Alesina, A., Di Tella, R., & MacCulloch, R. (2004). Inequality and happiness: Are Europeans and Americans different? *Journal of Public Economics*, 88, 2009–2042.
- Andrews, W. D. (1974). A Consumption-type or Cash Flow Personal Income Tax. *Harvard Law Review*, 87, 1113–1188.
- Ball, R., & Chernova, K. (2008). Absolute Income, Relative Income, and Happiness. *Social Indicators Research*, 88, 497–529.
- Beath, J., & FitzRoy, F. (2007). Status, Happiness, and Relative Income. *Discussion Paper No. 2658*. Bonn: IZA.
- Bjorklund, A. (1993). A Comparison Between Actual Distributions of Annual and Lifetime Income: Sweden 1951-89. *Review of Income and Wealth*, 39(4), 377–386.
- Blanchflower, D. G., & Oswald, A. J. (2004). Well-being over time in Britain and the USA. *Journal of Public Economics*, 88, 1359–1386.
- Blum, W. J., & Kalven, Jr., H. (1953). *The Uneasy Case for Progressive Taxation*. Chicago: University of Chicago Press.
- Boskin, M., & Sheshinski, E. (1978). Optimal redistributive taxation when individual welfare depends upon relative income. *Quarterly Journal of Economics*, 92, 589–601.
- Bowles, S., & Park, Y. (2005). Emulation, Inequality, and Work Hours: Was Thorsten Veblen Right? *The Economic Journal*, 115(507), F397–F412. Retrieved from <http://www.jstor.org/stable/3590388>
- Brickman, P., & Bulman, R. J. (1977). Pleasure and pain in social comparison. In J. M. Suls & R. L. Miller (Eds.), *Social Comparison Processes: Theoretical and Empirical Perspectives*. Washington, DC: Hemisphere.

- Brickman, P. C. D., & Campbell, D. T. (1971). Hedonic relativism and planning the good society. In M. H. Appley (Ed.), *Adaptation level theory: A symposium* (pp. 287–302). New York: Academic Press.
- Brickman, P. C. D., Coates, D., & Janoff-Bulman, R. (1978). Lottery winners and accident victims: Is happiness relative? *Journal of Personality and Social Psychology*, 36, 917–927.
- Burchardt, T. (2005). Are one man's rags another man's riches? Identifying adaptive preferences using panel data. *Social Indicators Research*, 74, 57–102.
- Clark, A. E. (1999). Are wages habit-forming? Evidence from micro data. *Journal of Economic Behavior and Organization*, 39, 179–200.
- Clark, A. E., Frijters, P., & Shields, M. A. (2006). Income and Happiness: Evidence, Explanations and Economic Implications. *Working Paper No. 2006-24*. Paris: Paris-Jourdan Sciences Economiques.
- Coase, R. H. (1960). The Problem of Social Cost. *Journal of Law and Economics*, 3, 1–44.
- CPS. (2012). Annual Social and Economic Supplement (ASEC) to the Current Population Survey (CPS). (U. S. C. Bureau, Ed.).
- Creedy, J. (1991). Lifetime Earnings and Inequality. *Economic Record*, 67(196), 46–58.
- Davies, G. (1977). General Income Averaging. *Canadian Public Policy / Analyse de Politiques*, 3(2), 164–170.
- Davis, J. A. (1984). New money, an old man/lady and “Two’s Company”: Subjective welfare in the NORC General Social Surveys, 1972-1982. *Social Indicators Research*, 15, 319–350.
- Di Tella, R., Haisken-De New, J. P., & MacCulloch, R. (2010). Happiness adaptation to income and to status in an individual panel. *Journal of Economic Behavior and Organization*, 76, 834–852.
- Diener, E., & Diener, M. (1995). Cross-cultural correlates of life satisfaction and self-esteem. *Journal of Personality and Social Psychology*, 68(4), 653–663. Retrieved from <http://psycnet.apa.org/journals/psp/68/4/653/>
- Diener, E., Diener, M., & Diener, C. (1995). Factors predicting the subjective well-being of nations. *Journal of Personality and Social Psychology*, 69, 851–864.

- Diener, E., & Fujita, F. (1997). Social Comparison and Subjective Well-being. In B. P. Buunk & R. Gibbons (Eds.), *Health, Coping and Well-being: Perspectives from Social Comparison Theory* (pp. 329–357). Mahwah, NJ: Lawrence Erlbaum Associates, Inc.
- Diener, E., & Lucas, R. A. (2000). Explaining differences in societal levels of happiness: Relative standards, need fulfillment, culture, and evaluation theory. *Journal of Happiness Studies*, 1, 41–78.
- Easterlin, R. A. (1974). Does economic growth improve the human lot? Some empirical evidence. In R. and R. David R. (Ed.), *Nations and Households in Economic Growth: Essays in Honor of Moses Abramovitz*. New York: Academic Press.
- Easterlin, R. A. (1995). Will raising the incomes of all increase the happiness of all? *Journal of Economic Behavior and Organization*, 27, 35–47.
- Easterlin, R. A., & Angelescu, L. (2009). Happiness and Growth the World Over: Time Series Evidence on the Happiness-Income Paradox. *Discussion Paper No. 4060*. Bonn: The Institute for the Study of Labor (IZA).
- Falk, A., & Knell, M. (2004). Choosing the Joneses: Endogenous goals and reference standards. *Scandinavian Journal of Economics*, 106, 417–435.
- Ferrer-i-Carbonell, A. (2005). Income and well-being: an empirical analysis of the comparison income effect. *Journal of Public Economics*, 89, 997–1019.
- Frank, R. H. (1985a). *Choosing the Right Pond*. Oxford: Oxford University Press.
- Frank, R. H. (1985b). The demand for unobservable and other nonpositional goods. *The American Economic Review*, 75(1), 101–116. Retrieved from <http://www.jstor.org/stable/10.2307/1812706>
- Frank, R. H. (1995). *The Winner-Take-All Society*. New York: Free Press.
- Frank, R. H. (1999). *Luxury Fever: Why Money Fails to Satisfy in an Era of Excess*. New York: Free Press.
- Frank, R. H. (2007). *Falling Behind: How Rising Inequality Harms the Middle Class*. Berkeley: University of California Press.
- Frank, R. H. (2011a). *The Darwin Economy*. Princeton: Princeton University Press.
- Frank, R. H. (2011b, December). The Progressive Consumption Tax: A win-win solution for reducing American income inequality. *Slate*. Retrieved September 09, 2013,

- from  
[http://www.slate.com/articles/business/moneybox/2011/12/the\\_progressive\\_consumption\\_tax\\_a\\_win\\_win\\_solution\\_for\\_reducing\\_american\\_economic\\_inequality\\_.single.html](http://www.slate.com/articles/business/moneybox/2011/12/the_progressive_consumption_tax_a_win_win_solution_for_reducing_american_economic_inequality_.single.html)
- Frijters, P., Geishecker, I., Shields, M. A., & Haisken-De New, J. P. (2006). Can the large swings in Russian life satisfaction be explained by ups and downs in real incomes? *Scandinavian Journal of Economics*, 108, 435–458.
- Graetz, M. J. (1979). Implementing a Progressive Consumption Tax. *Harvard Law Review*, 92(8), 1575–1661.
- Hagerty, M. R. (2000). Social comparisons of income in one's community: Evidence from national surveys of income and happiness. *Journal of Personality and Social Psychology*, 78, 764–771.
- Hagerty, M. R., & Veenhoven, R. (2003). Wealth and happiness revisited - growing national income does go with greater happiness. *Social Indicators Research*, 64, 1–27.
- Harsanyi, J. (1953). Welfare economics of variable tastes. *The Review of Economic Studies*, 21(3), 204–213. Retrieved from <http://www.jstor.org/stable/10.2307/1828083>
- Hayek, F. A. (1960). *The Constitution of Liberty*. Chicago: University of Chicago Press.
- Headey, B., Muffels, R., & Wooden, M. (2008). Money Does not Buy Happiness: Or Does It? A Reassessment Based on the Combined Effects of Wealth, Income and Consumption. *Social Indicators Research*, 87, 65–82.
- Headey, B., & Wooden, M. (2004). The Effects of Wealth and Income on Subjective Well-Being and Ill-Being. *The Economic Record*, 80, S24–S33.
- Hirsch, B. T., Seaks, T. G., & Formby, J. P. (2001). Inter-Age and Intra-Age Income Inequality: A Cross-Sectional Analysis. Georgia State University. Retrieved from [http://www2.gsu.edu/~ecobth/SEJ\\_Inter-Age\\_&\\_Intra-Age\\_Apr80.pdf](http://www2.gsu.edu/~ecobth/SEJ_Inter-Age_&_Intra-Age_Apr80.pdf)
- Hirsch, F. (1976). *Social Limits to Growth*. Cambridge: Twentieth Century Fund.
- Hopkins, E., & Kornienko, T. (2004). Running to Keep in the Same Place: Consumer Choice as a Game of Status. *American Economic Review*, 94, 1085–1107.
- Ireland, N. J. (1994). On limiting the market for status signals. *Journal of Public Economics*, 53, 91–110.

- Ireland, N. J. (1998). Status-Seeking, Income Taxation and Efficiency. *Journal of Public Economics*, 70, 99–113.
- Ireland, N. J. (2001). Optimal Income Tax in the Presence of Status Effects. *Journal of Public Economics*, 81, 193–212.
- Kaplow, L., & Shavell, S. (2001, December). Moral Rules and the Moral Sentiments: Toward a Theory of an Optimal Moral System. Cambridge, MA. doi:10.3386/w8688
- Kapteyn, A., Van Praag, B. M. S., & Van Heerwaarden, F. G. (1976). Individual welfare functions and social reference spaces. *Report 76.01*. Economic Institute, Leyden University.
- Keely, L. C. (2003). Why Isn't Growth Making Us Happier? Utility on the Hedonic Treadmill.
- Knight, J., Song, L., & Gunatilaka, R. (2009). Subjective well-being and its determinants in rural China. *China Economic Review*, 20, 635–649.
- Kohen, A. I., Parnes, H. S., & Shea, J. R. (1965). Income instability among young and middle-aged men. (J. D. Smith, Ed.) *Conference on Research in Income and Wealth*. New York: NBER.
- Kremer, M. (2002). Should taxes be independent of age? Harvard University.
- Layard, R. (1980). Human satisfaction and public policy. *Economic Journal*, 90, 737–750.
- Layard, R. (2002). Rethinking public economics: the implications of rivalry and habit. *RL325*. Centre for Economic Performance, London School of Economics.
- Layard, R. (2005). *Economics and Happiness*. Oxford: Oxford Scholarship Online Monographs.
- Lelkes, O. (2006). Tasting freedom: Happiness, religion and economic transition. *Journal of Economic Behavior and Organization*, 59, 173–194.
- Liebman, J. B. (2003). Should Taxes Be Based on Lifetime Income? Vickrey Taxation Revisited. Harvard University.
- Lillard, L. A. (1977). Inequality: earnings vs. human wealth. *American Economic Review*, 67(2), 42–53.

- Ljungqvist, L., & Uhlig, H. (2000). Tax policy and aggregate demand management under catching up with the Joneses. *American Economic Review*, 90, 356–366.
- Lucas, R. (2005). Time does not heal all wounds - A longitudinal study of reaction and adaptation to divorce. *Psychological Science*, 16, 945–950.
- Lucas, R., Clark, A. E., Georgellis, Y., & Diener, E. (2003). Re-examining adaptation and the setpoint model of happiness: Reaction to changes in marital status. *Journal of Personality and Social Psychology*, 84, 527–539.
- Luttmer, E. (2005). Neighbors as negatives: Relative earnings and well-being. *Quarterly Journal of Economics*, 120(3), 963–1002.
- Lyubomirsky, S., Sheldon, K. M., & Schkade, D. (2005). Pursuing Happiness: The Architecture of Sustainable Change. *Review of General Psychology*, 9(2), 111–131.
- McBride, M. (2001). Relative-income effects on subjective well-being in the cross-section. *Journal of Economic Behavior and Organization*, 45, 251–278.
- McKerchar, M., & Coleman, C. (2003). The Australian income tax system: Has it helped or hindered primary producers address the issue of environmental sustainability? *4th Annual Global Conference on Environmental Tax Issues, Experience and Potential*. Sydney.
- Mirrlees, J. A. (1971). An Exploration in the Theory of Optimal Income Taxation. *Review of Economics Studies*, 38(114), 175–208.
- Morawetz, D., Atia, E., Bin-nun, G., Felous, L., Gariplerden, Y., Harris, E., ... Zarfaty, Y. (1977). Income distribution and self-rated happiness: Some empirical evidence. *Economic Journal*, 87.
- Mullis, R. J. (1992). Measures of economic well-being as predictors of psychological well-being. *Social Indicators Research*, 26, 119–135.
- Needleman, L. (1979). Income Distribution in Canada and the Disaggregation of the Gini Coefficient of Concentration. *Canadian Public Policy / Analyse de Politiques*, 5(4), 497–505. Retrieved from <http://www.jstor.org/stable/3549672>
- Nietzsche, F. (1999). *The Antichrist* (1920 Knopf.). Tucson: Sharp Press.
- Oswald, A. J. (1983). Altruism, jealousy and the theory of optimal non-linear taxation. *Journal of Public Economics*, 20, 77–87.



- Oswald, A. J., & Powdthavee, N. (2006). Does happiness adapt? A longitudinal study of disability with implications for economists and judges. Working Paper, Department of Economics. *IZA DP No. 2208*. University of Warwick.
- Paglin, M. (1975). The Measurement and Trend of Inequality: A Basic Revision. *The American Economic Review*, 65(4), 598–609. Retrieved from <http://www.jstor.org/stable/1806537>
- PSID. (2013). Panel Study of Income Dynamics (PSID), public use dataset. (S. R. C. The Institute for Social Research University of Michigan, Ed.). Ann Arbor, MI. Retrieved from <http://psidonline.isr.umich.edu/default.aspx>
- Schoeck, H. (1966). *Envy: A Theory of Social Behaviour*. Indianapolis, IN: Liberty Fund.
- Seidman, L. S. (1997). A Progressive Consumption Tax. (cover story). *Challenge* (05775132), 40(6), 63–84. Retrieved from <http://mutex.gmu.edu/login?url=http://search.ebscohost.com/login.aspx?direct=true&db=bth&AN=9711091671&site=ehost-live>
- Senik, C. (2004). When information dominates comparison: A panel data analysis using Russian subjective data. *Journal of Public Economics*, 88, 2099–2123.
- Shorrocks, A. (1978). Income inequality and income mobility. *Journal of Economic Theory*, 19(4), 376–393.
- Smith, A. (1790). *The Theory of Moral Sentiments*. (D. D. R. and A. L. Macfie, Ed.) (Glasgow.). Indianapolis: Liberty Fund.
- Staudinger, U. M., Fleeson, W., & Baltes, P. B. (1999). Predictors of Subjective Physical Health and Global Well-Being : Similarities and Differences Between the United States and Germany. *Journal of Personality and Social Psychology*, 76(2), 305–319.
- Stevenson, B., & Wolfers, J. (2008). Economic Growth and Subjective Well-Being: Reassessing the Easterlin Paradox. *Brookings Papers on Economic Activity*, 2008, 1–87.
- Suh, E., Diener, E., Oishi, S., & Triandis, H. (1998). The shifting basis of life satisfaction judgments across cultures: Emotions versus norms. *Journal of Personality and Social Psychology*, 74, 482–493.
- Triandis, H. C. (1995). *Individualism and Collectivism*. Boulder, CO: Westview Press.
- U.S. Federal Individual Income Tax Rates History, 1862-2013. (2013). Washington, DC. Retrieved from

[http://taxfoundation.org/sites/taxfoundation.org/files/docs/fed\\_individual\\_rate\\_history\\_nominal\\_adjusted-2013\\_0523.pdf](http://taxfoundation.org/sites/taxfoundation.org/files/docs/fed_individual_rate_history_nominal_adjusted-2013_0523.pdf)

Veblen, T. (1899). *The Theory of the Leisure Class*. The Floating Press.

Vickrey, W. (1939). Averaging of Income for Income-Tax Purposes. *Journal of Political Economy*, 47(3), 379–397.

Weinzierl, M. (2005). Estimating a relative utility function. Harvard University.

Weinzierl, M. (2011). The Surprising Power of Age-Dependent Taxes. *Review of Economics Studies*, 78, 1490–1518.

Weisbach, D. A. (2006). Implementing Income and Consumption Taxes: An Essay in Honor of David Bradford. *John M. Olin Law & Economics Working Paper*. The University of Chicago Law School.

Weisbach, D. A. (2007). What Does Happiness Research Tell Us about Taxation? *John M. Olin Law & Economics Working Paper*. The University of Chicago Law School.

Weisbrod, B. A. (1977). Comparing utility functions in efficiency terms or, what kind of utility functions do we want? *The American Economic Review*, 67, 991–995.  
Retrieved from <http://www.jstor.org/stable/10.2307/1828083>

Wood, J. V. (1996). What is Social Comparison and How Should We Study it? *Personality and Social Psychology Bulletin*, 22(5), 520–537.  
doi:10.1177/0146167296225009

Wood, J. V., & Taylor, K. L. (1991). Serving Self-relevant Goals Through Social Comparison. In J. Suls & T. A. Wills (Eds.), *Social Comparison: Contemporary Theory and Research*. Hillsdale, NJ: Lawrence Erlbaum Associates, Inc.

Wu, S. (2001). Adapting to heart conditions: A test of the hedonic treadmill. *Journal of Health Economics*, 20, 495–507.

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