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Do Cigarette Taxes Make Smokers Happier Than Nonsmokers?

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DO CIGARETTE TAXES MAKE SMOKERS HAPPIER THAN NONSMOKERS?

by

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ABSTRACT

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Public health advocates justify cigarette taxes, claiming they discourage smoking, which results in a healthier population. However, the more pertinent issue with which health advocates should be concerned is that of smoker well-being. In this paper, I investigate whether cigarette taxes make smokers relatively more satisfied than nonsmokers. Additionally, because poor smokers have a higher discount rate than wealthy smokers, and therefore, perceive the tax differently, I explore the effect that income, in conjunction with a cigarette tax increase, has on smokers' life-satisfaction.

Using cross-sectional and time-series data from the 2005-2010 Behavioral Risk Factor Surveillance System survey, this paper utilizes regression analysis to investigate the effect of cigarette tax on the happiness of smokers relative to nonsmokers and of poor smokers relative to wealthy smokers. Inflation-adjusted tax data was collected from *The Campaign for Tobacco Free Kids* and state unemployment rates were collected from the *Bureau of Labor Statistics*.

Inconsistent with the findings of Gruber and Mullainathan (2005), this paper finds that the satisfaction of smokers does not change relative to nonsmokers in response to cigarette taxes, implying that they do not act in a time-inconsistent manner as was previously thought. In addition, this paper finds some evidence that the satisfaction of low-income smokers increases relative to high-income smokers in

response to a cigarette tax. Policymakers should consider this result when enacting tax hikes.

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~ CHAPTER ONE ~
INTRODUCTION

A. Competing Behavioral Models

The consequences of taxing non-addictive goods that do not create externalities are well understood by economists. Taxes raise the price of the product realized by the consumer, which alters their consumptive behavior away from the optimal level. This ultimately results in the creation of a deadweight loss. The cost to the consumer of such taxes are weighed against the benefits of the newly generated government revenue and judged accordingly. However, the consequences of taxing addictive goods, such as cigarettes, are not as well understood. Several proposed theoretical models have been developed in an attempt to explain how addicts should react to these "sin taxes."

Becker and Murphy (1988) argue that "rational addicts" perceive tax on addictive goods in the same way that traditional consumers perceive tax on non-addictive, non-externality creating goods. That is, smokers choose to do so in acknowledgement of the tradeoff between the long-term costs of consumption[1] and the immediate pleasure of consumption, all while accounting for the addictive nature of cigarettes, which will knowingly lead to future costs.

[1] Reports published by the *Centers for Disease Control and Prevention* (2008) cite tobacco use as the leading cause of preventable death in the United States between 2000 and 2004, as it was responsible for approximately 443,000 deaths annually during that period. In addition, a five-year study that began in 1995 conducted by the *Centers for Disease Control and Prevention* (2002) reports that, on average, smokers die almost 14 years earlier than nonsmokers. These premature deaths are, in large part, due to smokers' increased likelihood of suffering from coronary heart disease, stroke, lung cancer, and chronic obstructive lung disorders. However, the adverse effects of smoking are not limited to the worsening of an individual's prognosis, it is a costly habit too. It is estimated that between 2001 and 2004, smoking was responsible for approximately 97 billion dollars of lost productivity annually and 96 billion dollars in healthcare expenditures annually (Centers for Disease Control and Prevention [CDC], 2008).

However, not all economists and policymakers support this theoretical model. As an alternative, Laibson (1997) proposes the time-inconsistent model. As the name suggests, this model theorizes that consumers are forward looking (an assumption underlying the rational addiction framework, as well), but they have an internal control problem and cannot persuade their current selves to alter present consumption in order to attain future consumption goals.

B. Rational Addiction Model or Time-inconsistent Model

Each of these models offers a theoretical explanation of how smokers might respond to a cigarette tax, and consequently, how the government should approach tax-policy making. However, it is difficult to evaluate which model better predicts smokers. One cannot assess cigarette taxes' effects on well-being by simply observing behavioral changes of smokers. On the one hand, if tax hikes reduce cigarette consumption despite smokers' desire to continue smoking in consideration of future costs, smokers may be worse off. On the other hand, if tax hikes reduce an "unwanted habit," then smokers may be better off. Evidently, an empirical analysis utilizing data on smokers' well-being is necessary to resolve this argument, such that policymakers can enact more well informed legislation.

In their seminal analysis, Gruber and Mullainathan (2005) attempted to determine which theoretical model best represents smokers' decision-making habits using self-reported happiness data from the General Social Survey. To the delight of anti-smoking advocates, the study found that smokers appear to be time-

inconsistent in their decision-making, and report to be happier in the presence of higher cigarette taxes.

C. Contribution and Organization of This Paper

Using cross-sectional and time-series data from the 2005-2010 Behavioral Risk Factor Surveillance System (BRFSS) survey, this paper investigates the relative effect that an increase in the tobacco excise tax has on the life-satisfaction of smokers versus nonsmokers. While existing happiness research suggests that smokers report to be happier with cigarette excise taxes than without them, this may no longer be the case. Gruber and Mullainathan (2005) used data from 1973-1998, a 25 year span which saw a dramatic decrease in smoking rates.[2] My study uses more recent survey responses. In addition, Gruber and Mullainathan (2005) use a linearized regression technique in their study, which is not as statistically accurate as the ordered probit technique utilized in this paper considering the ordinal scale of the dependent variable utilized in the regressions. This paper finds that the well-being of smokers does not increase significantly relative to nonsmokers in response to a cigarette tax increase, indicating that neither the rational addiction model nor the time-inconsistent model accurately characterizes smokers.

Additionally, to the best of my knowledge, no existing research has identified the relative effects of cigarette tax on the well-being of smokers based on income class. In order to accurately assess the social consequences of such taxes, their

[2] Age adjusted prevalence of smokers decreased from 36.9% in 1974 to 23.4% in 1998 (CDC, 2011b).

impact on the well-being of different income classes should be known, as discount rate is not consistent across classes (Lawrance, 1991). This paper finds some evidence that the well-being of poor smokers increases relative to the well-being of wealthy smokers in response to a cigarette tax, implying that smokers may be time-inconsistent, at least with respect to their financial situation. While this result is not robust, in the presence of more convincing results, this information would be useful to policymakers when deciding at what price level to set cigarette tax.

The organization of this paper is as follows. Chapter Two provides a review of the existing literature regarding the price elasticity of demand for cigarettes, the significance of self-reported happiness data, the theory underlying the rational addiction and time-inconsistent models, and the effect of cigarette tax on life-satisfaction. Chapter Three describes the econometric models used in this analysis. Chapter Four provides a description of the data set used to assess the effect of cigarette tax on the satisfaction of smokers relative to nonsmokers, as well as on the satisfaction of poor smokers relative to wealthy smokers. Chapter Five presents the results of this econometric analysis, and Chapter Six provides conclusions.

~ CHAPTER TWO ~
A REVIEW OF THE EXISTING SOCIAL CONSEQUENCES LITERATURE, HAPPINESS RESEARCH LITERATURE, AND THEORETICAL MODELS

This chapter provides a review of the existing literature concerning the price elasticity of demand for cigarettes, the significance and validity of using self-reported happiness data in empirical analyses, and the theory underlying the rational addiction and time-inconsistent models of predicting smoker well-being. In particular, this chapter reviews empirical studies that examine the demand and well-being consequences of cigarette tax.

A. Effect of Cigarette Tax on Smoking Rates

Policymakers and health advocates advertise cigarette taxes as a relatively uncontroversial way for the government to generate revenue (Gruber & Koszegi, 2008), as these taxes price potential consumers out of the market, helping them quit a socially undesirable habit, presumably making them healthier. Between 1961 and 2005, there were 364 independent state legislative cigarette tax increases and 8 ballot initiative tax increases on cigarettes (Chriqui, Baker, Tynan, Kauffman, & el Arculli, 2005). Additionally, between 1964 and 2010, the average state excise tax on a pack of cigarettes increased from approximately six cents to 146 cents, an increase of 2337% (Advisory Committee on Intergovernmental Relations, 1964; Orzechowski & Walker, 2010). Clearly, this is a politically popular tax. However, despite the incontrovertible benefits, cigarette taxes remain controversial because of their potentially regressive nature. On the one hand, the poor population spends nearly 10 times more of its income on tobacco products than does the wealthy

population (Leigh, 1989). On the other hand, low-income populations are more price sensitive than high-income populations. Thus, those in favor of high cigarette taxes argue that raising the price of a pack of cigarettes ultimately benefits the poor more than the wealthy by limiting their opportunity to purchase cigarettes due to their price constraints (Warner, 2000; Lindblom, 2007). A 2008 article published by Coleman and Remler, which utilizes superior income data than that available in any previous study, is not subject to the cross-sectional biases that plague other studies, and is robust to a host of specifications, including border-crossing, smuggling, and generics, concludes that cigarette tax is indeed regressive. While they report that the price elasticity of the low-income population is greater than that of the high-income population (-0.37 and -0.20, respectively), it is only moderately so, and in order to become progressive, the difference in price elasticity of the two populations would have to be substantially greater.

Understanding the responses of smokers towards cigarette tax based on income is not the only interest of researchers. There is a strong allure amongst policymakers, health advocates, and economists to understand the full effect that these taxes have on the smoking population so that the repercussions of policy decisions can be best understood. Consequently, a significant amount of research has been conducted that is intended to determine the behavioral effects of cigarette tax hikes on smokers based on all relevant characteristics.

Significant research has focused on price elasticities between many populations of smokers defined by characteristics such as age, gender, and race/ethnicities. It is generally held that younger smokers are more responsive to

cigarette tax hikes than are older smokers (Farrelly, Pechacek, Thomas, & Nelson, 2008), women are more responsive to cigarette price than men (Townsend, Roderick, & Cooper, 1994), and Hispanic and non-Hispanic Black smokers are more likely than White smokers to reduce or quit smoking in response to a price increase (CDC, 1998). Clearly, smoker characteristics affect behavioral changes in response to price elasticity. But, as mentioned above, understanding behavioral changes is not sufficient to fully understand the consequences of cigarette tax legislation. It is necessary to assess the effect of cigarette tax with respect to well-being changes within one or more of these smoker subpopulations.

B. Is Self-Reported Happiness Data Satisfactory?

The availability of accurate well-being indicators proves to be a useful contribution to many economic analyses. Understanding the behavior of individuals is not always sufficient, particularly when it concerns a highly visible policy decision such as a cigarette tax increase. Even when there is consensus among academics as to how a particular policy will affect behavior, as is the case for cigarette taxes, often times, economists present conflicting theoretical models as to the well-being implications of that behavior. The availability of happiness data allows economists to determine how the consequences of policies affect social well-being from an empirical standpoint (Di Tella & MacCulloch, 2006). However, the use of well-being data in economics is highly contested among academics.

The year 1974 marked the first time that happiness data was introduced into economic analysis. The groundbreaking paper, published by Easterlin (1974),

suggests that while the wealthy are generally happier than the poor, following World War II, happiness levels have remained relatively flat while individual incomes have increased substantially. This result is in conflict with the widely held assumption of utility functions, which holds that higher levels of personal income lead to higher utility (Di Tella & MacCulloch, 2006). Interdependent preference models are cited in order to explain this unexpected result. Specifically, people care about their income relative to others' incomes in their locales, not in absolute terms (Clark, 2003).

Despite this explanation offered by Clark, many economists remain skeptical of using happiness data. Many economists explain Easterlin's puzzle by disregarding happiness data, labeling it as an inaccurate measurement of true utility and simple open-ended questions as unrevealing. This should not come as a surprise, as economists traditionally infer preference by observing individuals' behavior, and not by listening to what an individual says. Even though significant doubt has been raised by academics within the field, this uncertainty seems to be unsolicited. Clark and Oswald (1994) look at the correlation between "bad" variables and unhappiness. As an example, they find that unemployed individuals report to be less happy than employed individuals. This result seems reasonable, and thus, Clark and Oswald (1994) conclude that happiness data must capture at least a portion of true utility.

To further support the validity of happiness data, Ekman, Davidson, and Friesen (1990) turn to science. In their research, Ekman et al. look at the correlation of reported happiness to feigned-versus-genuine smiles of enjoyment. The

Duchenne smile, which involves a muscle near the eye and is considered a signal of true enjoyment due to the fact that it cannot be reproduced on demand, is associated with higher levels of reported happiness than are forced smiles.

In addition to the analysis of facial expression to assess the validity of self-reported happiness, economists have enlisted science to assess the validity of happiness data by analyzing brain activity. A positive correlation has been found between happiness and left frontal brain activity (Di Tella & MacCulloch, 2006). Because this region of the brain has long been known to be a "happiness center," (Davidson & Fox, 1982) it is reasonable to conclude that self-reported happiness is, at least to a degree, an accurate measure of true utility.

Ultimately, the research does support the use of self-reported happiness data as a measure of true utility. While the data does report some noise, the signal-to-noise ratio is high enough that the use of happiness data in empirical analyses is justified (Di Tella & MacCulloch, 2006). Thus, despite concern, happiness data can be employed in the analysis of this paper without worry of inaccurate results.

C. Theoretical Models to Predict Smoker Well-Being Changes in Response to a Cigarette Tax

While behavioral changes in response to cigarette taxes are typically easy to predict, as they are observable, well-being changes are not. Experts have developed theoretical models in an attempt to explain expected well-being responses. The two models relevant to this study are the rational addiction model proposed by Becker and Murphy (1988) and the time-inconsistent model proposed by Laibson (1997).

The rational addiction model proposed by Becker and Murphy is founded on the notion that addictions are rational insofar as they involve forward-looking maximization with stable preferences. They concede that time preference is important in determining whether a person will become addicted to a good, especially a harmful one, citing that present-oriented individuals are more likely to become addicted to harmful goods than future-oriented individuals. The reason for this is that an increase in past consumption leads to a smaller rise in full price when the future is more heavily discounted. However, this model proposes that the short-run loss in utility from stopping consumption gets larger as an addiction gets stronger. Accordingly, a rational addict might postpone terminating his or her addiction while they search for ways to reduce the short-run loss in utility from stopping. Thus, only those addicts who realize a greater future benefit from quitting the addiction than the present loss should rationally quit.

Becker and Murphy defend this by claiming that smokers who want to quit should only do so when they find a way to raise long-term benefits sufficiently above the short-term costs of the adjustment. In this way, the rational addiction model suggests that those smokers who have not yet quit are those smokers whose long-term benefits do not yet exceed short-term costs, and thus, it is rational for these individuals to remain smokers. Accordingly, these smokers will be made unhappier with higher cigarette taxes because they will not be able to exercise their smoking habit, a habit that is rational for them to indulge in despite the costs. Within the spirit of this model then, the only justification for taxing addictive goods is to adjust for the interpersonal externalities associated with consumption of these

goods and to shift consumption towards a more socially optimal level (Gruber & Mullainathan, 2005).

Contrary to Becker and Murphy, Laibson supports the notion that preferences are dynamically inconsistent. There is a substantial body of research on human behavior that has led psychologists to conclude that discount functions are hyperbolic (Ainslie, 1975); that is, discount functions are characterized by a relatively high discount rate over short horizons but a relatively low discount rate over long horizons. This discount structure results in a gap between today's preferences and the preferences that will be held in the future. For example, today I may desire to start a savings plan beginning next year, but when next year comes, I will postpone any sacrifices one more year. Laibson compares this inconsistent time preference to the issue of the goose that laid the golden egg. The goose promises to generate substantial benefits in the long run, but those benefits are difficult to realize in the short run.

Decision makers recognize their hyperbolic discounting and foresee that these conflicts exist. Consequently, most people value the ability to have self-control so that they can achieve their long-term plans. Such is the case for smokers as evidenced by the fact that 68.8% of smokers indicate they want to stop smoking completely (CDC, 2011a). However, most people claim to have below-satisfactory levels of self-control (Laibson, 1997) and smokers are no different. For many time-inconsistent decisions, in order to adjust for this insufficient level of self-control then, most people use commitment devices. However, this is only recently beginning to permeate the smoking cessation program, as just 31.7% of smokers

report using counseling or medication to aid smoking attempts (CDC, 2011a). The vast majority of smokers attempt to quit merely using self-control and will power.

The theoretical model of time inconsistency with respect to addictive goods such as cigarette taxes is as follows: smokers are in conflict with themselves as their short-run high discount rate discourages them from quitting, but their long-run low discount rate desires for them to quit. If cigarettes were a typical product, the smoker would be able to set a commitment device (usually liquid assets) to create a binding constraint in order to realize long-term quit goals. However, such commitment mechanisms are more difficult to implement for addictive goods, such as cigarettes. If smokers are time-inconsistent decision makers, they may be happier with higher cigarette taxes, because they act as a commitment device and encourage people to achieve their long run preference. Because of this potential for benefit from external restrictions on consumption, this model promotes a more paternalistic government position, which would be achieved through more aggressive cigarette tax legislation (Yuengert, 2006).

D. Effect of Cigarette Tax on Happiness

In order to resolve these conflicting theoretical predictions, Gruber and Mullainathan (2005) use self-reported happiness data in order to assess the true happiness implications of cigarette taxes. Their analysis addressed happiness levels of predicted smokers and nonsmokers before and after tobacco tax legislation was implemented. Their findings, which are robust to a number of specification checks, are consistent with the time-inconsistent theoretical model, and provide evidence

that cigarette taxes may serve to increase the well-being of smokers. However, Gruber and Mullainathan (2005) use an OLS regression model when the ordinal nature of the dependent variable suggests that an ordered probit regression model is more appropriate. This paper corrects this.

In addition, this paper studies the effects that a smoker's income level has on their changes in well-being in response to cigarette taxes. As reviewed above, literature suggests that cigarette taxes are regressive, a category of tax that is generally not favored in public opinion due to the lack of equity. This truth opposes the apparent wishes of public health advocates and government officials, alike. The tax provides a means for public health officials to encourage smokers to quit and provides a means for government officials to generate revenues. The lack of public support for such a tax, due to its regressive nature, can ultimately push this successful cessation/revenue generating method out of popularity. Despite its regressivity, the tax may not be as inequitable as it appears. It is possible that if the low-income population realizes significantly greater gains in happiness from the cigarette tax than the higher-income population, than an argument can be made that the cigarette tax is, in fact, equitable. This research has the potential to strengthen the argument of proponents of this tax, if it is found that poor populations experience significantly greater general well-being increases than the wealthy population.

~ CHAPTER THREE ~
ESTIMATING THE EFFECT THAT CIGARETTE TAX HAS ON SMOKERS AND NONSMOKERS

This chapter describes the econometric models used in this analysis. In addition to discussing each of the dependent and independent variables, the chapter outlines the statistical methodology used in this study.

A. Econometric Model to Estimate the Effect of Cigarette Tax on Happiness of All Smokers

To examine the effect of cigarette tax on the happiness of smokers relative to nonsmokers, this study uses the following econometric model:

$$\begin{aligned} Happiness = {} & \beta_0 + \beta_1 CIGARETTE\_TAX + \beta_2 SMOKER + \beta_3 CIGARETTE\_TAX \cdot SMOKER + \\ & + \beta_4 MARRIED + \beta_5 SEPERATED + \beta_6 DIVORCED + \beta_7 WIDOWED \\ & + \beta_8 UNMARRIED\_COUPLE + \beta_9 HSGRAD + \beta_{10} SOME\_COLLEGE \\ & + \beta_{11} COLLEGE\_GRADUATE + \beta_{12} BLACK + \beta_{13} HISPANIC + \beta_{14} MULTIRACIAL \\ & + \beta_{15} OTHER + \beta_{16} ONE\_CHILD + \beta_{17} TWO\_CHILDREN + \beta_{18} THREE\_CHILDREN \\ & + \beta_{19} FOUR\_CHILDREN + \beta_{20} FIVE\_OR\_MORE\_CHILDREN + \beta_{21} EMPLOYED \\ & + \beta_{22} UNEMPLOYED + \beta_{23} HEALTH\_EXCELLENT + \beta_{24} HEALTH\_VERYGOOD + \\ & + \beta_{25} HEALTH\_GOOD + \beta_{26} HEALTH\_FAIR + \beta_{27} HEALTH\_POOR \\ & + \beta_{28} UNEMPLOYMENT\_RATE + \beta_{29} LOW\_INCOME + \beta_{30} MALE + \beta_{31} AGE \\ & + \beta_{32} MALE \cdot AGE + \beta_{33} YEAR + \beta_{34} MONTH + \beta_{35} STATE + \varepsilon \end{aligned}$$

where ε is a stochastic disturbance term.

Dependent Variables for Happiness

Reported Happiness Level	Dummy variable that represents how satisfied with life the respondent is. There are 3 levels - very satisfied, satisfied, and unhappy. This is self-reported happiness.
HAPPINESS	This is a numerical variable that is coded with ordinal values as follows: Very satisfied=4 Satisfied=3 Dissatisfied=2 Very dissatisfied=1

Independent Variables

CIGARETTE_TAX	Variable that indicates the real dollar value of the excise tax on cigarettes at the state level (2005 dollars)

Smoker Definitions

**SMOKER*	Variable that indicates whether the respondent is a current cigarette smoker
HIGH_PROPENSITY_ SMOKER	Defined as a respondent whose predicted smoker status is above the mean
*CIGARETTE_TAX*SMOKER*	Interaction term that shows the relationship that tax and smoking have on happiness

Marital Status of Respondent (reference group: never married)

**MARRIED*	1 if the respondent is married; 0 otherwise
**SEPARATED*	1 if the respondent is separated; 0 otherwise
**DIVORCED*	1 if the respondent is divorced; 0 otherwise
**WIDOWED*	1 if the respondent is widowed; 0 otherwise
**UNMARRIED COUPLE*	1 if the respondent is partner in an unmarried couple; 0 otherwise

Education Level of Respondent (reference group: did not graduate high school)

**HSGRAD*	1 if the respondent is a high school graduate; 0 otherwise
**SOME_COLLEGE*	1 if the respondent has attended college but has not earned a Bachelor's degree; 0 otherwise
**COLLEGE_GRADUATE*	1 if the mother has earned a Bachelor's degree or higher; 0 otherwise

Race/Ethnicity of Respondent (reference group: non-Hispanic White)

**BLACK*	1 if the respondent is non-Hispanic Black; 0 otherwise
**HISPANIC*	1 if the respondent is Hispanic; 0 otherwise
**MULTIRACIAL*	1 if the respondent is Multiracial; 0 otherwise
**OTHER*	1 if the respondent is a race/ethnicity other than White, Black, Hispanic, or Multiracial; 0 otherwise

Number of Children of Respondent (reference group: no children)

**ONE_CHILD*	1 if the respondent has 1 child; 0 otherwise
**TWO_CHILDREN*	1 if the respondent has 2 children; 0 otherwise
**THREE_CHILDREN*	1 if the respondent has 3 children; 0 otherwise
**FOUR_CHILDREN*	1 if the respondent has 4 children; 0 otherwise
**FIVE_OR_MORE_CHILDRE N*	1 if the respondent has 5 or more children; 0 otherwise

Employment Status of Respondent (reference group: not in the labor force)

**EMPLOYED*	1 if the respondent is employed either full time or part time; 0 otherwise
**UNEMPLOYED*	1 if the respondent is unemployed; 0 otherwise

Perceived Health Status of Respondent (reference group: poor health)

HEALTH_EXCELLENT	1 if the respondent perceives himself or herself to be in excellent health; 0 otherwise
HEALTH_VERYGOOD	1 if the respondent perceives himself or herself to be in very good health; 0 otherwise
HEALTH_GOOD	1 if the respondent perceives himself or herself to be in good health; 0 otherwise

HEALTH_FAIR	1 if the respondent perceives himself or herself to be in fair health; 0 otherwise
Sex of Respondent (reference group: female)	
**MALE*	1 if the respondent is male; 0 otherwise
**UNEMPLOYMENT_RATE*	Variable the indicates the state unemployment rate
**LOW_INCOME*	1 if the respondent's household is below the federal poverty line; 0 otherwise
**AGE*	Categorical age variable, 5 year age designations beginning with age 18
**MALE * AGE*	Interaction term that shows the relationship between the age category and male
**YEAR*	Dummy variable that indicates the year the survey was administered, either 2005, 2006, 2007, 2008, 2009, or 2010
MONTH	Dummy variable that indicates the month the survey was administered
**STATE*	Dummy variable that indicates the respondents state of permanent residence

Note: variables marked with an asterisk (*) are the variables that are used in the regression which estimates predicted smoker as discussed in the text of this chapter.

In my initial regression analysis, I mimicked existing literature on the impact of cigarette tax on happiness, and employed an Ordinary Least Squares (OLS) linear probability statistical model. In order to replicate existing literature as closely as possible, I defined three discrete levels of reported happiness (Gruber & Mullainathan, 2005). However, the happiness question in the BRFSS survey used in this study asks, "In general, how satisfied are you with your life? Very satisfied, satisfied, dissatisfied, or very dissatisfied," and there is also an option for "don't know/not sure." Those who responded "don't know/not sure" were dropped from the analysis. Nonetheless, four discrete levels of happiness remain. To cope with this discrepancy between my survey and the U.S. General Social Survey used by Gruber and Mullainathan, I combined the "dissatisfied" responses with the "very

dissatisfied" responses to form an "unhappy" designation.[3] In this way, I created three discrete happiness levels and was able to simply estimate three linear probability models as suggested by existing literature. However, redefining the dependent variables was not the only variable manipulation that was made.

The SMOKER variable was initially defined as any respondent who had smoked 100 cigarettes in his or her life and reported smoking "some days." However, because smoking is itself a function of the tax rate, a model that includes SMOKER is susceptible to sample selection bias. With the expectation that smokers that quit are happier than those that continue to smoke, using the above definition of SMOKER would bias the results towards finding a reduction in happiness of (remaining) smokers. Using this definition of SMOKER does not capture former smokers who quit because of the cigarette tax (price) and in turn became happier. Thus, it is necessary to define SMOKER in a way that captures current smokers, who are potentially reducing their quantity smoked in response to the tax, former smokers, who have quit in response to the tax, and potential smokers, whose happiness might change due to a reduced opportunity to smoke in response to the tax. In short, it is not whether someone currently smokes that is of interest within the context of this study, but rather, whether someone has the propensity to smoke.[4]

In an effort to avoid sample selection bias, SMOKER was redefined as HIGH_PROPENSITY_SMOKER. A regression was run with SMOKER as the dependent

[3] To check the robustness of their results, Gruber and Mullainathan conducted their analysis for Canada as well. The Canadian General Social Survey has four discrete levels of happiness. Gruber and Mullainathan converted these four discrete levels into three discrete levels in similar fashion as I did in this study.

[4] This is a popular approach for the evaluation of welfare programs in labor economics: compare those who are likely to receive welfare to those who are not (Gruber & Mullainathan, 2005).

variable and all variables identified with an asterisk (*) in the table above as the independent variables.[5] This regression was used to estimate the coefficients of the characteristics of a predicted smoker, which are presented in the Appendix (Table A-1). All respondents who had a calculated prediction coefficient above the mean of the prediction of the entire sample were labeled as "high propensity smokers" and all the respondents who had a calculated prediction coefficient below the mean of the prediction of the entire sample were labeled as "low propensity smokers." In order to avoid sample selection bias, this HIGH_PROPENSITY_SMOKER variable was used in place of SMOKER in all relevant regressions. While I cannot perfectly predict smoking, as the R-squared value is only 0.096, there are clear correlates, as nearly all independent variables are significant at the 1% significance level. The standard errors are corrected for clustering within states.

The key independent variable is TAX*SMOKER (with SMOKER redefined as HIGH_PROPENSITY_SMOKER), an interaction term that captures the behavior of smokers dependent upon the rate of cigarette tax. The expected sign of the coefficient in front of this interaction term depends on whether the time-inconsistent model or the rational addiction model more accurately predicts the behavior of smokers. If the rational addiction model more closely predicts smoker characteristics, then the expected sign of this coefficient would be negative, as smokers would be forced to pay more for a product they desire, despite the addictive nature of cigarettes. On the other hand, if the time-inconsistent model

[5] These variables are included in both the predicted smoker regression and in the key regression that uses happiness as the dependent variable (p. 14). However, these variables may have independent effects on happiness, thus justifying their presence in both regressions.

more closely predicts smoker characteristics, then the expected sign of this coefficient would be positive, as the tax assumes the role of a commitment device, helping smokers achieve their future desired state of having quit.

Unlike the key variable, the sign of the control variables' coefficients can be well predicted. I included a variety of variables to control for other determinants of happiness beyond tax. They are: marital status (married, separated, divorced, widowed, unmarried couple, and never married); education categories (high school dropout, high school graduate, some college, and college graduate); race (Non-Hispanic White, Non-Hispanic Black, Hispanic, Multiracial, and other); dummies for number of children; dummies for employment status (employed, unemployed, and not in the labor force); dummies for one's perceived health status (excellent health, very good health, good health, fair health, and poor health); monthly state unemployment rate; household income identifiers (low-income and high-income); and five-year age category and gender interactions.[6]

All of these additional variables should significantly affect happiness. Older individuals have a smaller goal-achievement gap than do younger individuals, meaning they have achieved more of their life aspirations. For this reason, I expect that older individuals will report to be more satisfied than younger individuals (Kahneman, Diener, and Schwarz, 1999; Frey & Stutzer, 2002). In this paper, age is

[6] Gruber and Mullainathan (2005) include religious attendance and education of the respondent's mother and father as additional happiness control variables. Due to the unavailability of this information in the BRFSS survey, these variables were not included in this analysis. In addition, the model employed in this study includes one's perceived health status as a control variable for reasons discussed in the text, which is not included in previous literature as a happiness control. This information was available from the BRFSS but not the General Social Survey used by Gruber and Mullainathan. The inclusion of this variable does not significantly influence the results (refer to footnote 11 [p. 32]).

divided into five-year category variables in the spirit of Gruber and Mullainathan (2005). In addition, men tend to report to be more satisfied than women (Blanchflower & Oswald, 2000), perhaps because of hormonal differences or dissimilar responses to stressors. Furthermore, because wealthier individuals tend to have access to more opportunities and enjoy greater economic freedom, I expect that wealthier individuals will report to be more satisfied than poorer individuals (Frey & Stutzer, 2002).

In addition to age, gender, and income, education should have an effect on happiness as well. Because more highly educated individuals tend to hold more prestigious jobs and earn more money, they traditionally report to be more satisfied (Kahneman et al., 1999). The respondent's race and ethnicity should also affect their self-reported happiness. Historically, ethnic minorities report to be less happy than the majority of the population, predominantly because of lower income, education, and job status. However, studies that control for these factors maintain that race and ethnicity have a significant effect on happiness, just at a much lesser magnitude (Kahneman et al., 1999). Furthermore, literature suggests that individuals involved in a marriage are much happier than those who never marry and those involved in an unmarried couple are moderately happier than those who never marry. Contrarily, widows are slightly less happy than those who never marry, divorcees or moderately less happy than those who never marry, and those who are separated are much less happy than those who never marry (Waite & Gallagher, 2001; Myers, 2000). Being involved in a relationship satisfies human's tendencies towards social and interpersonal connections. Despite these benefits of

marriage, children tend to decrease the happiness of their parents. Children are seen more as a liability than as a source of hope, and therefore, having a child generally decreases one's happiness (Brooks, 2008).

One's perceived general health is also expected to affect happiness. Healthier people tend to be happier, as they don't have to deal with social stigmas and stresses with which unhealthy people have to cope (Graham, 2008). In addition, the unemployed tend to report to be significantly less happy than their employed counterparts, independent of lower income. Again, this is most likely a manifestation of social class (Kahneman et al., 1999). And finally, a high state unemployment rate is found to have adverse affects on people's happiness, even for those individuals with a job (Di Tella & MacCulloch, 2006). It is thought that this is because employed people may empathize with the unemployed or worry about the fate of their own job. Further, it is thought that the generally worse-off economy and society as a whole that are so often coupled to high unemployment rates are responsible for the decrease in happiness observed amongst employed individuals. Lastly, it is proposed that the employed might fear higher crime during times of high unemployment, thus explaining their reduced happiness (Frey & Stutzer, 2002).

Following the three OLS regressions, a very similar regression was replicated using an ordered probit model. As described, the dependent variable in this study has four discrete levels (or in an effort to replicate previous literature, converted into three discrete levels for the OLS regression). In the case of these four choices, the choices are ordered in a specific way: very satisfied, satisfied, dissatisfied, and very dissatisfied. Accordingly, each of the four possible outcomes was assigned an

ordinal value. For such a case, a traditional linear regression model is not appropriate. In linear regressions we treat the y-values as having cardinal meaning, however, this is not the case for this study. In this study, the values of the dependent variable choices are ordinal, simply reflecting the ranking of the outcomes.

For this study, very satisfied was ranked 4 and very dissatisfied was ranked 1, as very satisfied has the highest "sentiment" compared to the alternative choices and very dissatisfied has the lowest. This was then coded into a single variable denoted HAPPINESS and used as the dependent variable in an ordered probit regression, which was run with the exact same parameters as the OLS regression elaborated upon above.

B. Econometric Model to Estimate the Effect of Cigarette Tax on Happiness of Poor Smokers

In addition to estimating a regression that uses TAX*SMOKER as the key variable, I also estimate a regression that uses TAX*LOW_INCOME*SMOKER as the key variable. In this second regression, the key term is an interaction term that captures the behavior of smokers dependent upon the rate of cigarette tax and their household income level.

A low-income household is defined as any household whose gross annual income from all sources is below the federal poverty line for households of their size.[7] Because the BRFSS includes income categories (less than $10,000; $10,000 to

[7] The U.S. Census Bureau uses a set of money income thresholds that vary by family size and age of family members to determine who is in poverty. If a family's total income is less than the family's

less than $15,000; $15,000 to less than $20,000; $20,000 to less than $25,000; $25,000 to less than $35,000; $35,000 to less than $50,000; $50,000 to less than $75,000; and $75,000 or more), a household's income could not be directly compared to the poverty line. To address this, three different low-income variables were defined. The first definition assumes all households within an income category earn an amount equivalent to the lower bound of that category, the second definition assumes all households within an income category earn an amount equivalent to the midpoint of that category, and the third definition assumes that all households within an income category earn an amount equivalent to the upper bound of that category. In defining low-income in this way I was able to avoid any inflation-adjustment concerns that might have arisen because the BRFSS survey reports household income in categories as opposed to numerical values, not allowing for real incomes to be calculated. However, because the federal poverty level takes into consideration fluctuations in the real value of the dollar, no inflation adjustments beyond redefining low-income each year was necessitated.

Three ordered probit regressions were run, one using each of these income definitions. Additional ordered probit regressions were run separating males from females while using the low-income definition as defined by the midpoint. All of

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threshold, then that family and every individual in it is considered in poverty. The poverty thresholds do not vary geographically, but they are updated for inflation using Consumer Price Index for All Urban Consumers (CPI-U). The official poverty definition uses money income before taxes and does not include capital gains or noncash benefits. Poverty thresholds were originally derived in 1963-1964 using U.S. Department of Agriculture food budgets designed for families under economic stress and data about what portion of their income families spent on food (U.S. Census Bureau, 2011). The weighted average poverty thresholds for families of specified sizes for the years 2005-2010 can be found: http://www.census.gov/hhes/www/poverty/data/historical/people.html

these regressions used identical control variables as in the initial OLS regressions previously defined.

~ CHAPTER FOUR ~
SELECTING THE SAMPLE FROM THE 2005-2010 BEHAVIORAL RISK FACTOR SURVEILLANCE SYSTEM

This chapter provides a description of the 2005-2010 BRFSS survey. It also presents the descriptive statistics for the data set used in this analysis.

A. Overview of the 2005-2010 Behavioral Risk Factor Surveillance System survey

This study uses cross-sectional and time-series data from the 2005-2010 BRFSS survey to investigate the effect of cigarette tax on the happiness of smokers relative to nonsmokers, as well as the effect of cigarette tax on the happiness of poor smokers relative to wealthy smokers. The BRFSS survey is administered by the Centers for Disease Control and Prevention's Division of Adult and Community Health, National Center for Chronic Disease Prevention and Health Promotion. This telephone survey is the primary source of timely, accurate data on health-related behaviors for non-institutionalized adults in many states.

State health departments are the data collection agents for this survey; however, the Centers for Disease Control and Prevention provides statistical and methodological support. States conduct monthly telephone surveillance using a standardized questionnaire to determine the distribution of risk behaviors and health practices among their residents. Random digit dialing is the method of contact and adults 18 years or older are asked to participate in the survey. Only one adult is interviewed per household. Every year, more than 350,000 adults are interviewed, making the BRFSS the world's largest telephone health survey. The states forward the responses to the Centers for Disease Control and Prevention,

where the monthly state data are aggregated. These data are weighted for the probability of selection of a telephone number, the number of adults in a household, and the number of telephones in a household. In addition, a poststratification adjustment is made for nonresponse and noncoverage of households without telephones. Ultimately, these weights are multiplied together to formulate a final weight.

Monthly state unemployment rate data was collected from the U.S. Bureau of Labor and Statistics. Cigarette tax data was compiled from two sources. The dollar value of the excise tax on cigarettes was collected from the State Tobacco Activities Tracking and Evaluation (STATE) System, an initiative supported by the Centers for Disease Control and Prevention. However, these values were only recorded on a quarterly basis. To determine more specifically the date a cigarette tax increase took effect, the *Campaign for Tobacco Free Kids* report titled "Cigarette Tax Increases by State per Year 2000-2011" was utilized. This report, which obtained its data from an industry-funded annual report, the *Tax Burden on Tobacco, 2010*, as compiled by Orzechowski and Walker, includes the month, day, and year that tax increases became effective.

B. Selection of the Sample and Descriptive Statistics

The full sample used in this paper contains 1,946,393 respondents. This number includes only those respondents who answered every question utilized in this analysis. If a respondent answered any of the questions with "don't know/not

sure" or refused to answer any question, they were dropped from the analysis. In this way, every observation has a complete set of information.

Table 1 shows the descriptive statistics for these 1,946,393 respondents, as well as for the 36,421 respondents used in Gruber and Mullainathan's study. It is worth noting the difference in population composition between this study and existing studies, as this can have an effect on results. Respondents to the survey used in this study report to be much more satisfied than the respondents of the survey used by Gruber and Mullainathan, 45.5% of the population compared to 32.0%. Consistent with this response, a much smaller percentage of the population reported to be unhappy in the survey used in this study, 5.6%, than in the survey used in Gruber and Mullainathan's study, 11.9%.

Additionally, in the more recent survey used in this study, a slightly higher percentage of the population reports to be married, separated, or divorced, and a slightly lower percentage of the population reports to be widowed, than in the older study used by Gruber and Mullainathan. Most notable however, may be the difference in education rates between respondents of the two surveys. In the survey used in this study, nearly 35% of the respondents earned a Bachelor's degree or higher. This is in sharp contrast to only 19.4% of the respondents that attained this level of education in the survey used by Gruber and Mullainathan. Also, it is worth noting that unemployment increased from 2.9% in the survey used by Gruber and Mullainathan to 4.5% in the survey used in this study. Consistent with reported trends, 18% of respondents reported to be smokers in the more recent survey data,

as opposed to 35.2% of respondents who reported to be smokers in the more dated survey data used by Gruber and Mullainathan.[8]

[8] In 1974, the CDC reports smoking prevalence was 37.4% of the population. By 2010, that decreased to 19.3% of the population (CDC, 2011b). The slight variation between these statistics and those found by the survey results can be because dropped observations skewed existing data towards fewer smokers or because the survey results are averaged over many years.

~ CHAPTER FIVE ~
ESTIMATION RESULTS: ASSESSING THE EFFECT OF CIGARETTE TAX ON SMOKER WELL-BEING

This chapter presents the results of the regression analysis. It is divided into two subsections. The first subsection discusses the effect of cigarette tax on the satisfaction of smokers relative to nonsmokers. The second subsection discusses the effect of cigarette tax on the satisfaction of poor smokers relative to wealthy smokers.

A. Effect of Cigarette Tax on the Happiness of Smokers Relative to Nonsmokers

In the spirit of Gruber and Mullainathan (2005), my initial analysis was an OLS regression. Since Gruber and Mullainathan (2005) simply estimate three linear probability models, as they had three discrete levels of reported happiness, I did the same.[9] Columns 1-3 of Table 2 present the estimates for these three linear regressions. Controlling for other factors, there is a positive but insignificant interaction between cigarette taxes and the propensity to smoke for the equation modeling "very satisfied," a negative but insignificant interaction between cigarette taxes and the propensity to smoke for the equation modeling "satisfied," and a positive and significant interaction between cigarette taxes and the propensity to smoke for the equation modeling "unhappy." This suggests that cigarette taxes make those with a propensity to smoke relatively more dissatisfied than

[9] Gruber and Mullainathan (2005) estimate three linear probability models, as the happiness question asked in their survey only included three discrete levels (very happy, somewhat happy, and not happy). The survey used in this analysis included four discrete levels (reference Chapter Three). Accordingly, I combined unsatisfied and very unsatisfied to create a variable named *Unhappy*. This variable imitates the *"not happy"* variable included in Gruber and Mullainathan's (2005) study.

nonsmokers. This is contrary to the findings of Gruber and Mullainathan (2005), who found that cigarette taxes reduce unhappiness amongst those with a propensity to smoke.

While using OLS was initially justified because it was conducted in an attempt to replicate the methodology of the study published by Gruber and Mullainathan (2005), an ordered probit regression is more appropriate when there are more than two outcomes of an ordinal dependent variable. Column 4 of Table 2 presents the estimates of the ordered probit regression that uses a four-level ordinal "happiness" measure as the dependent variable. Using this more accurate regression analysis, controlling for other factors, the estimated coefficient of the dependent variable was positive but insignificant with cut values of -1.552 and 0.295.[10] This suggests that cigarette taxes do not actually affect the satisfaction of smokers differently than nonsmokers. And because satisfaction neither increased, as would be expected according to the time-inconsistent model, nor decreased, as would be expected according to the rational addiction model, neither of these models accurately depicts the behavior of smokers.

There are several potential reasons for the inconsistent results between existing literature and this study. The first possibility is that the data used in Gruber and Mullainathan's study came from a different era than the data used in this study, when smoking rates were higher and the characteristics that defined a smoker were different. The second possibility is that while Gruber and Mullainathan's study used

[10] Due to technological limitations, marginal effects could not be calculated. Nonetheless, the sign and significance could be taken as preliminarily calculated by the ordered probit regression. However, interpreting the magnitude of these coefficients has no meaning without marginal effects.

25 inconsecutive years of data, this study uses six consecutive years of data. The span of data collection is noteworthy because general happiness trends can fluctuate more significantly over 25 years than over six years and perceptions towards cigarettes likely changed more dramatically over the 25-year span than over the six-year span. Finally, the inconsistent findings could be the consequence of the different surveys used, as slightly different happiness questions were asked and different control variables were available. It is important to test the validity of each these explanations.

Using 1993 data (the first year the BRFSS included all questions utilized from 2005-2010 in this analysis), coefficients for a predicted smoker regression were estimated. These coefficients were then used with the 2005-2010 data and High Propensity Smoker was redefined using characteristics of smokers in 1993, more closely matching the definition used by Gruber and Mullainathan (2005). In this way, I was able to determine whether the change in smoker characteristics over the last two decades was responsible for the inconsistent result. As shown in Table 3, the coefficient of the interaction term is positive, but insignificant, indicating that the change in smoking behavior is not responsible for the unexpected results.

Determining whether the inconsistent results are due to the number of years and consistency with which the data was recorded is not testable. The BRFSS has only included a question on life satisfaction since 2005, meaning that the survey used in this study only presents six years of usable data (all of which were used). Therefore, to use 25 years of data in this study, as Gruber and Mullainathan did, is not available.

Finally, determining whether the inconsistent results are due to slightly different questions is also not testable.[11] It would be impossible to go back in time to re-ask previous survey participants the exact same questions with exactly the same wording as in the survey used by Gruber and Mullainathan. However, by comparing the summary statistics, I can hypothesize whether this is a contributing factor to the differing results. Table 1 presents the summary statistics. In the survey data used in this study, respondents were much more likely to respond "very satisfied" and much less likely to respond "dissatisfied" or "very dissatisfied" than they were to respond "very happy" or "not too happy" in the survey used by Gruber and Mullainathan, respectively. This difference is either a function of the way the question was asked or happiness has changed over time. If baseline happiness levels have indeed increased since this analysis had last been conducted, perhaps the result that smokers are no longer modeled as time-inconsistent decision makers is not as surprising as it first appears. The happiness of an already relatively happy population should not fluctuate as dramatically (in the positive direction) in response to a policy change as a less initially happy population.

Neither the OLS nor ordered probit approaches produced consistent results with Gruber and Mullainathan (2005), nor did these approaches produce results

[11] As noted in Chapter Three, this study includes one's perceived health status as a control variable. Gruber and Mullainathan did not include this as a control variable, as the information was not available from the General Social Survey they used. However, all regressions (excluding Table A-1, where its inclusion is not suggested in existing literature) were run both with and without perceived health status as a control variable. Because the inclusion of this as a control variable did not change the significance of any other independent variables, and because this variable was significant in all regressions, its inclusion in all regressions in this study was merited. This control variable does not appear responsible for the unexpected results. All other differences in model definitions (parent's education, religious affiliation, and income quartiles) were not testable because of the unavailability of this information in the BRFSS survey.

consistent with one another. Therefore, it is important to compare the coefficients of the control variables between the two statistical techniques, as the coefficients of these variables are already known (presented in Chapter Four). This way, I can ensure that there is not a more significant issue underlying either of these econometric approaches. As presented in Table 2, the coefficients of many control variables were significant in both the OLS and ordered probit regressions, and in most cases, they were the same sign, as expected. Both regression techniques suggest that individuals involved in a marriage or involved in an unmarried relationship and widows are less dissatisfied than those individuals who have never been married. In addition, individuals who are separated or divorced are more dissatisfied than those who have never been married. Furthermore, both regressions suggest that more educated people are more satisfied than less educated people. Both the OLS regressions and the ordered probit regression found Black and Multiracial people and those that responded "other" to be less satisfied than White people, while both regressions found Hispanic people to be significantly more satisfied than White people.[12] Also, people with children were less dissatisfied than those individuals without children.[13] Additionally, people in better health generally reported to be more satisfied than people in worse health. People who were employed were also less dissatisfied than those who were not in the labor force, while people who were unemployed were more dissatisfied than those who were not in the labor force. And while personal employment status had an effect on

[12] This is not consistent with the literature. As presented in Chapter Four, minorities, including Hispanics, are expected to be less satisfied than non-Hispanic Whites.
[13] This is not consistent with the literature. As presented in Chapter Four, individuals with children are expected to have lower reported happiness than those without children.

satisfaction, state unemployment rate was insignificantly different than zero in both regression types.[14] Finally, low-income people were more dissatisfied than high-income individuals.

B. *Effect of Cigarette Tax on the Happiness of Poor Smokers Relative to Wealthy Smokers*

As addressed in the *Introduction*, it is worthwhile to explore the well-being effects that cigarette taxes have on poor smokers and wealthy smokers independently. Table 4 presents the estimates of the ordered probit regression that uses Tax*Low Income*High Propensity Smoker as the key independent variable. With the inclusion of control variables, the coefficient of the key variable was insignificant when low-income was defined using the midpoint of the BRFSS categories, as shown in column 1. However, a number of additional regressions were conducted in order to ensure that this result is robust. As seen in column 2 and 3, the result holds true for both males and females, however, it does not hold true for alternative definitions of low income (columns 4 and 5). As described in Chapter Three, low-income was defined three ways: using the lower bound of the BRFSS income category, the midpoint of the BRFSS income category, and the upper bound of the BRFSS income category. In all previous regressions, low-income was defined using the mid-point of the BRFSS income category. However, as shown in column 4, when using a low-income variable as defined by the lower bound of the BRFSS income category there is some evidence that poor smokers are significantly

[14] This is not consistent with the literature. However, although the coefficient in front of unemployment rate was insignificant, it was negative, as expected according to existing literature.

more satisfied than wealthy smokers as a result of a cigarette tax. I propose that the mechanism for this finding is as follows: because cigarette taxes are regressive (Coleman & Remler, 2008) poorer smokers may be made better off because they use the tax as a commitment device, minimizing the financial burden of the smoking habit. If this is indeed the case, it implies that poor smokers are forward looking and behave according to the time-inconsistent model. However, this result was not reproduced with alternative definitions of the low-income variable, as shown in columns 1 and 5.

~ CHAPTER SIX ~
CONCLUSIONS

A. Summary of the Findings and Commentary

Using cross-sectional and time-series data from the 2005-2010 BRFSS survey, this study investigates whether cigarette taxes make smokers more satisfied than nonsmokers. In contrast to previous studies, this paper also examines the effect of income on satisfaction changes of smokers in response to cigarette tax.

Contrary to the existing literature, which found that smokers are made happier in response to cigarette taxes, the results of this analysis find that cigarette taxes do not make smokers any more or less satisfied than nonsmokers. Additionally, this study finds some evidence that poor smokers are made more satisfied than wealthy smokers. While there is no existing literature with which to compare this result, as mentioned in the section above, this result is intuitive assuming a financially rational consumer. This result has policy implications that will be addressed in the following subsection.

B. Policy Implications

The results of this paper have potentially pertinent implications on how policymakers should consider cigarette taxes. Contrary to previous literature, which suggests that smokers themselves can be made better off by cigarette taxes, this study suggests that this belief should no longer be informing policymakers' decisions. This paper finds that smokers' satisfaction should not be taken into consideration when setting tax rates, but rather, these tax rates should only adjust

for social externalities associated with the habit (social costs are mentioned in footnote 1 [p. 1]).

C. Suggestions for Future Research

As mentioned above, this study cannot be compared to Gruber and Mullainathan because of survey limitations. The BRFSS has not included a life satisfaction question for a comparable number of years as the General Social Survey used by Gruber and Mullainathan and does not word the well-being question in the exact same way as the survey utilized by Gruber and Mullainathan. It would be worthwhile to repeat this study in several years, when two and a half decades worth of data can be analyzed, to see if time period matters, and it would be interesting to ask a question more similar to that of Gruber and Mullainathan to determine whether the wording of the question is responsible for the varied response rates.

In addition, it is worthwhile to further explore the effect that a smoker's income level has on their satisfaction changes in response to a cigarette tax. The results of this study do provide some evidence that poor smokers are time-inconsistent, but the results are not robust. Future research that might show more convincing evidence that cigarette taxes make poor smokers more satisfied than wealthy smokers could have significant policy implications. If policymakers are trying to produce a similar happiness effect in wealthy smokers, or justify their tax by claiming that it will result in an increase in happiness, they must make the tax large enough that it becomes a significant financial burden to wealthy smokers as well. I do not think differential pricing would be feasible on a state policy making

level, but perhaps more counties or towns should consider instituting a cigarette tax that fits the financial profile of its residents.

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Table 1. Summary statistics for all observations.

	This Study	Gruber & Mullainathan
VARIABLES	**Mean (1)**	**Mean (2)**
Very Satisfied	0.455	0.320
	(0.498)	(0.466)
Satisfied	0.488	0.554
	(0.500)	(0.497)
Dissatisfied	0.045	
	(0.208)	
Very Dissatisfied	0.011	
	(0.105)	
Not Too Happy	0.056	0.119
	(0.152)	(0.323)
Cigarette Tax (real)	1.072	0.316
	(0.681)	(0.158)
Smoker	0.180	0.352
	(0.384)	(0.478)
Marital Status		
Married	0.571	0.565
	(0.495)	(0.496)
Separated	0.022	
	(0.145)	
Divorced	0.145	
	(0.352)	
Widowed	0.122	0.185
	(0.328)	(0.388)
Separated/Divorced	0.167	0.145
	(0.269)	(0.353)
Unmarried couple	0.024	
	(0.152)	
Never married	0.116	
	(0.321)	
Education Level		
Less than high school	0.086	0.265
	(0.281)	(0.441)
High school graduate	0.294	0.321
	(0.455)	(0.467)
Some college	0.271	0.217
	(0.444)	(0.412)
College or higher	0.349	0.194
	(0.477)	(0.396)
Race/Ethnicity		
Non-Hispanic White	0.810	0.835
	(0.392)	(0.371)

Non-Hispanic Black	0.075	0.135
	(0.264)	(0.342)
Hispanic	0.060	
	(0.237)	
Multiracial	0.018	
	(0.131)	
Other	0.037	
	(0.190)	
Number of Children		
No Children	0.684	
	(0.465)	
One Child	0.125	
	(0.331)	
Two Children	0.119	
	(0.324)	
Three Children	0.049	
	(0.216)	
Four Children	0.016	
	(0.125)	
Five or More Children	0.005	
	(0.067)	
Employment Status		
Employed	0.558	0.591
	(0.497)	
Unemployed	0.045	0.029
	(0.207)	(0.169)
Not in the labor force	0.397	0.344
	(0.489)	(0.475)
Perceived Health Status		
Excellent health	0.188	
	(0.391)	
Very good health	0.331	
	(0.470)	
Good health	0.300	
	(0.458)	
Fair health	0.127	
	(0.333)	
Poor health	0.055	
	(0.228)	
Unemployment Rate	6.190	9.556
	(2.475)	(2.694)
Income Designation		
Low-income (lower bound)	0.145	
	(0.352)	
Low-income (midpoint)	0.099	
	(0.298)	

Low-income (upper bound)	0.077	
	(0.267)	
High-income (lower bound)	0.851	
	(0.356)	
High-income (midpoint)	0.901	
	(0.298)	
High-income (upper bound)	0.923	
	(0.267)	
Gender		
Male	0.392	
	(0.488)	
Female	0.608	
	(0.488)	
Number of Observations	1,946,393	36,421

Note: Column 1 represents the unweighted summary statistics for the variables used in this study, Column 2 represents the summary statics for the variables used by Gruber and Mullainathan. Standard deviations are presented in parentheses.

Table 2. Estimates for the model regressions that use Tax*High Propensity Smoker as the key independent variable.

	OLS			Ordered Probit
VARIABLES	Very Satisfied (1)	Satisfied (2)	Unhappy (3)	Happiness (4)
Tax*High Propensity Smoker	**0.001**	**-0.004**	**0.003****	**0.001**
	(0.005)	**(0.005)**	**(0.001)**	**(0.012)**
Cigarette Tax (real)	-0.008*	0.004	0.004**	-0.027**
	(0.003)	(0.003)	(0.001)	(0.009)
High Propensity Smoker	-0.010	0.022**	-0.012**	-0.006
	(0.007)	(0.008)	(0.002)	(0.017)
Married	0.159**	-0.110**	-0.050**	0.448**
	(0.003)	(0.003)	(0.002)	(0.010)
Separated	-0.014*	-0.025**	0.038**	-0.101**
	(0.006)	(0.007)	(0.004)	(0.015)
Divorced	0.005	-0.013**	0.009**	-0.008
	(0.003)	(0.003)	(0.002)	(0.009)
Widowed	0.028**	-0.011**	-0.017**	0.089**
	(0.003)	(0.003)	(0.002)	(0.010)
Unmarried Couple	0.052**	-0.032**	-0.020**	0.152**
	(0.003)	(0.003)	(0.003)	(0.010)
High School Graduate	0.003	-0.006	0.004	-0.002
	(0.005)	(0.004)	(0.002)	(0.014)
Some College	0.014**	-0.022**	0.007**	0.014
	(0.005)	(0.004)	(0.002)	(0.014)
College Graduate	0.068**	-0.063**	-0.006	0.166**
	(0.004)	(0.005)	(0.003)	(0.011)
Non-Hispanic Black	-0.012**	0.017**	-0.005*	-0.019*
	(0.004)	(0.005)	(0.002)	(0.008)
Hispanic	0.021*	0.012	-0.033**	0.112**
	(0.009)	(0.007)	(0.002)	(0.023)
Multiracial	-0.030**	0.012	0.018**	-0.105**
	(0.006)	(0.006)	(0.004)	(0.016)
Other	-0.048**	0.052**	-0.004*	-0.100**
	(0.012)	(0.012)	(0.002)	(0.027)
One Child	-0.013**	0.019**	-0.006**	-0.015**
	(0.002)	(0.002)	(0.001)	(0.005)
Two Children	-0.001	0.012**	-0.012**	0.024**
	(0.002)	(0.002)	(0.001)	(0.006)
Three Children	0.007	0.009**	-0.016**	0.049**
	(0.004)	(0.003)	(0.002)	(0.013)
Four Children	0.019**	-0.007	-0.013**	0.069**
	(0.004)	(0.005)	(0.003)	(0.011)
Five or More Children	0.017	-0.001	-0.016**	0.070*
	(0.011)	(0.010)	(0.005)	(0.029)
Employed	-0.014**	0.037**	-0.024**	0.020**
	(0.002)	(0.002)	(0.001)	(0.004)
Unemployed	-0.111**	0.051**	0.061**	-0.357**
	(0.005)	(0.005)	(0.002)	(0.011)
Excellent Health	0.424**	-0.191**	-0.233**	1.404**
	(0.005)	(0.004)	(0.004)	(0.019)

Very Good Health	0.297**	-0.073**	-0.224**	1.080**
	(0.005)	(0.004)	(0.004)	(0.015)
Good Health	0.149**	0.052**	-0.201**	0.713**
	(0.003)	(0.005)	(0.004)	(0.009)
Fair Health	0.063**	0.078**	-0.142**	0.415**
	(0.002)	(0.003)	(0.003)	(0.007)
Unemployment Rate	-0.001	0.002*	-0.001	-0.002
	(0.001)	(0.001)	(0.001)	(0.004)
Low Income	-0.040**	0.002	0.038**	-0.158**
	(0.004)	(0.004)	(0.004)	(0.015)
Age*Sex Dummies	Yes	Yes	Yes	Yes
State Dummies	Yes	Yes	Yes	Yes
Year Dummies	Yes	Yes	Yes	Yes
Month Dummies	Yes	Yes	Yes	Yes
Constant	0.251**	0.522**	0.227**	
	(0.007)	(0.008)	(0.005)	
Cut1				-1.042**
				(0.024)
Cut2				0.910**
				(0.021)
Observations	**1,946,393**	**1,946,393**	**1,946,393**	**1,946,393**
R-squared	0.12	0.06	0.09	

Note: Columns 1-3 represent the three linear probability regressions, one for each level of life satisfaction. Column 4 represents an ordered probit regression using a dependent variable called "happiness." Standard errors are presented in parentheses: *** p<0.01, ** p<0.05, * p<0.1

Table 3. Estimates for the ordered probit regression that use Tax*High Propensity Smoker as the key independent variable. High Propensity Smoker is estimated using 1993 data, but regression uses 2005-2010 data.

Dependent Variable: Happiness	
VARIABLES	(1)
Tax*High Propensity Smoker	**0.005**
	(0.013)
Cigarette Tax (real)	-0.030***
	(0.011)
High Propensity Smoker	-0.018
	(0.014)
Married	0.447***
	(0.010)
Separated	-0.100***
	(0.016)
Divorced	-0.006
	(0.009)
Widowed	0.089***
	(0.010)
Unmarried Couple	0.153***
	(0.010)
High School Graduate	-0.003
	(0.015)
Some College	0.012
	(0.016)
More College	0.161***
	(0.014)
Black	-0.020**
	(0.008)
Hispanic	0.110***
	(0.021)
Multiracial	-0.106***
	(0.016)
Other	-0.101***
	(0.027)
One Child	-0.014***
	(0.005)
Two Children	0.024***
	(0.006)
Three Children	0.050***
	(0.013)
Four Children	0.070***
	(0.011)
Five or More Children	0.072**
	(0.029)
Employed	0.020***
	(0.004)
Unemployed	-0.356***
	(0.011)
Excellent Health	1.404***
	(0.019)
Very Good Health	1.080***
	(0.015)

Good Health	0.713***
	(0.009)
Fair Health	0.415***
	(0.007)
Unemployment Rate	-0.001
	(0.004)
Low Income	-0.157***
	(0.016)
Age*Sex Dummies	Yes
State Dummies	Yes
Year Dummies	Yes
Month Dummies	Yes
Cut1	-1.039***
	(0.024)
Cut2	0.913***
	(0.022)
Observations	**1,946,393**

Note: Standard errors are presented in parentheses: *** p<0.01, ** p<0.05 ,* p<0.1

Table 4. Estimates for the model regressions that use Tax*Low Income*High Propensity Smoker as the key independent variable.

Variables	Low-income Defined Using Mid-point			Low-income Defined Using Lower Bound	Low-income Defined Using Upper Bound
	All (1)	Females (2)	Males (3)	(4)	(5)
Tax * Low-income * High Propensity Smoker	**-0.009**	**0.004**	**-0.021**	**0.114****	**0.005**
	(0.021)	**(0.028)**	**(0.053)**	**(0.024)**	**(0.026)**
Cigarette Tax (real)	-0.028**	-0.019*	-0.040*	-0.020*	-0.027**
	(0.009)	(0.008)	(0.016)	(0.010)	(0.009)
High Propensity Smoker	-0.009	0.015	-0.036	0.006	-0.008
	(0.015)	(0.016)	(0.023)	(0.013)	(0.014)
Married	0.444**	0.396**	0.484**	0.439**	0.444**
	(0.010)	(0.014)	(0.012)	(0.010)	(0.010)
Separated	-0.101**	-0.115**	-0.091**	-0.098**	-0.101**
	(0.015)	(0.018)	(0.019)	(0.015)	(0.015)
Divorced	-0.009	-0.048**	0.029	-0.008	-0.009
	(0.009)	(0.013)	(0.016)	(0.009)	(0.009)
Widowed	0.087**	0.061**	0.084**	0.089**	0.087**
	(0.010)	(0.013)	(0.014)	(0.010)	(0.010)
Unmarried Couple	0.153**	0.114**	0.183**	0.153**	0.153**
	(0.010)	(0.012)	(0.016)	(0.010)	(0.010)
High School Graduate	0.001	-0.009	0.013	-0.005	0.001
	(0.013)	(0.011)	(0.019)	(0.013)	(0.013)
Some College	0.018	-0.000	0.040**	0.009	0.018
	(0.014)	(0.012)	(0.020)	(0.013)	(0.013)
More College	0.167**	0.164**	0.172**	0.158**	0.167**
	(0.011)	(0.015)	(0.016)	(0.011)	(0.011)
Black	-0.018*	-0.022*	-0.015	-0.015	-0.018*
	(0.008)	(0.009)	(0.014)	(0.008)	(0.008)
Hispanic	0.111**	0.079*	0.139**	0.114**	0.110**
	(0.023)	(0.031)	(0.018)	(0.023)	(0.023)
Multiracial	-0.103**	-0.096**	-0.111**	-0.101**	-0.103**
	(0.015)	(0.014)	(0.025)	(0.015)	(0.015)
Other	-0.100**	-0.098**	-0.100*	-0.098**	-0.100**

	(0.025)	(0.012)	(0.041)	(0.025)	(0.025)
One Child	-0.013**	-0.025**	-0.006	-0.010*	-0.013**
	(0.005)	(0.008)	(0.010)	(0.005)	(0.005)
Two Children	0.026**	0.010	0.035**	0.030**	0.026**
	(0.006)	(0.009)	(0.007)	(0.006)	(0.006)
Three Children	0.051**	0.025	0.070**	0.053**	0.051**
	(0.013)	(0.017)	(0.014)	(0.013)	(0.013)
Four Children	0.069**	0.055**	0.073**	0.079**	0.068**
	(0.011)	(0.016)	(0.015)	(0.011)	(0.011)
Five or More Children	0.068*	0.022	0.116*	0.072*	0.068*
	(0.029)	(0.030)	(0.048)	(0.029)	(0.029)
Employed	0.024**	-0.000	0.048**	0.020**	0.023**
	(0.004)	(0.005)	(0.011)	(0.004)	(0.004)
Unemployed	-0.349**	-0.345**	-0.346**	-0.346**	-0.349**
	(0.011)	(0.014)	(0.017)	(0.011)	(0.012)
Excellent Health	1.412**	1.412**	1.416**	1.405**	1.412**
	(0.018)	(0.023)	(0.018)	(0.018)	(0.018)
Very Good Health	1.090**	1.077**	1.106**	1.084**	1.090**
	(0.014)	(0.014)	(0.020)	(0.014)	(0.014)
Good Health	0.725**	0.702**	0.751**	0.720**	0.725**
	(0.008)	(0.011)	(0.012)	(0.008)	(0.008)
Fair Health	0.431**	0.404**	0.462**	0.429**	0.431**
	(0.007)	(0.009)	(0.013)	(0.007)	(0.007)
Unemployment Rate	-0.002	0.001	-0.004	-0.002	-0.002
	(0.004)	(0.003)	(0.006)	(0.003)	(0.004)
Low Income	-0.207**	-0.188**	-0.226**	-0.054**	-0.169**
	(0.030)	(0.025)	(0.073)	(0.015)	(0.009)
Tax*Low Income	0.015	0.018	0.006	-0.104**	-0.006
	(0.024)	(0.029)	(0.052)	(0.030)	(0.012)
Tax*High Propensity Smoker	0.001	-0.013	0.019	-0.008	0.001
	(0.011)	(0.010)	(0.014)	(0.011)	(0.011)
Low Income*High Propensity Smoker	0.048*	-0.013	0.115	-0.135**	0.017
	(0.024)	(0.030)	(0.067)	(0.019)	(0.041)
Age*Sex Dummies	Yes	Yes	Yes	Yes	Yes
State Dummies	Yes	Yes	Yes	Yes	Yes

Year Dummies	Yes	Yes	Yes	Yes	Yes
Month Dummies	Yes	Yes	Yes	Yes	Yes
Cut1	-1.845**	-1.839**	-1.753**	-1.858**	-1.843**
	(0.026)	(0.033)	(0.040)	(0.026)	(0.026)
Cut2	-1.029**	-1.033**	-0.926**	-1.041**	-1.028**
	(0.023)	(0.031)	(0.041)	(0.023)	(0.023)
Cut3	0.923**	0.903**	1.045**	0.912**	0.925**
	(0.022)	(0.025)	(0.043)	(0.021)	(0.021)
Observations	**1,946,393**	**1,184,165**	**762,228**	**1,946,393**	**1,946,393**

Note: Columns 1-3 present the results of the regressions that use a low-income variable defined by using the mid-point of the BRFSS household income category; column 1 includes the whole population, column 2 includes only the female population, and column 3 includes only the male population. Column 4 presents the results for the regression that uses a low-income variable defined by using the lower bound of the BRFSS household income category and includes the whole population. Column 5 presents the results for the regression that uses a low-income variable defined by using the upper bound of the BRFSS household income category and includes the whole population. Standard errors are presented in parentheses: *** p<0.01, ** p<0.05, * p<0.1

APPENDIX

Table A-1. Predicted smoker OLS regression.

VARIABLES	(1) Smoker
Married	-0.065***
	(0.003)
Separated	0.079***
	(0.007)
Divorced	0.071***
	(0.003)
Widowed	0.012***
	(0.003)
Unmarried Couple	0.055***
	(0.010)
High School Graduate	-0.056***
	(0.012)
Some College	-0.109***
	(0.014)
More College	-0.217***
	(0.017)
Low Income	0.048***
	(0.007)
Black	-0.057***
	(0.009)
Hispanic	-0.111***
	(0.004)
Multiracial	0.047***
	(0.006)
Other	-0.020***
	(0.005)
One Child	-0.007*
	(0.004)
Two Children	-0.024***
	(0.002)
Three Children	-0.026***
	(0.004)
Four Children	-0.028***
	(0.005)
Five or More Children	-0.031***
	(0.009)
Employed	-0.006**
	(0.003)
Unemployed	0.091***
	(0.004)
Unemployment Rate	-0.002*
	(0.001)
Age*Sex Dummies	Yes
State Dummies	Yes
Year Dummies	Yes
Time Dummies	Yes
Constant	0.162***

	(0.013)
Observations	**1,946,393**
R-squared	0.096

Note: Standard errors are presented in parentheses:
*** p<0.01, ** p<0.05, * p<0.1