Essays on Subjective Well-Being and Public Finance

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Abstract

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This dissertation explores relationships between well-being and public finance by using subjective well-being measures such as self-reported life satisfaction. The first chapter summarizes the discussion over the use of subjective well-being in economics and reviews related empirical literature, especially in the field of public finance. The second chapter examines relationships between subjective well-being and government activities using country-level panel data. Specifically, the chapter examines how government spending, taxes, and deficit/surplus are related to aggregate level of life satisfaction, and how the relationship is different by social groups. The third chapter examines relationship between individual life satisfaction and expenditure by state government in the U.S. The last chapter, which uses the same data set as in the third essay, examines the relationship between individual life satisfaction and revenue structure, especially tax structure, of state government in the U.S. The third and last chapters also study how the impact of spending or taxes is different across income groups. The empirical studies in this dissertation show that public finance is related to subjective well-being, and the relationship is different by individual characteristics such as income levels.

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Chapter 1

Subjective Well-being in Economics

Well-being or utility is one of the most important concepts in economics. In economics, however, we have only dealt with it implicitly by inferring changes in well-being by observing changes in behavior, i.e., relied on revealed preference.

Since 1990s, some economists tried to measure well-being or utility directly by using "subjective well-being," such as self-reported happiness and life-satisfaction levels.[1] The number of studies employing subjective well-being measures keeps rising. As Bernanke stated in his speech, "there is now a field of study, complete with doctoral dissertations and professorships, called 'the economics of happiness.' The idea is that by measuring the self-reported happiness of people around the world, and then correlating those results with economic, social, and personal characteristics and behavior, we can learn directly what factors contribute to happiness." (Bernanke, 2010)

Various reasons motivate economists to use subjective well-being, and can be summarized into two main reasons: (i) well-being is an ultimate interest of economic research; and (ii) subjective well-being enables us to examine well-being explicitly.

As mentioned in multiple studies, most social science is ultimately interested in well-being (e.g., Frey and Stutzer, 2002; Clark, 1996); however, the analysis relying on revealed preference has some limitations. As Koszegi and Rabin (2008) pointed out, "choice behavior alone can never reveal which situations make people better off, even with unlimited data and

[1] This dissertation uses "life satisfaction", "happiness", and "subjective well-being" interchangeably.

under the maintained hypothesis of 100% rational choice. Ancillary assumptions or additional forms of data such as happiness measures are always needed." Additionally, as Kahneman and Deaton (2010) discuss, "If people display bounded rationality when it comes to maximizing utility, then their choices do not necessarily reflect their 'true' preferences, and an exclusive reliance on choices to infer what people desire loses some of its appeal," and "Direct reports of subjective well-being may have a useful role in the measurement of consumer preferences and social welfare, if they can be done in a credible way."

The use of subjective well-being allows us to study questions which have not been examined with a traditional way of measuring well-being. Using subjective well-being, many of the existing literature study the determinants of well-being or discuss people's preference over some economic variables. Further, some research use subjective well-being to examine assumptions made for utility functions, such as bounded rationality. They provide new and insightful empirical evidence.

The objective of this chapter is to summarize the existing studies, which employed subjective well-being in economics. Section 1.1reviews what subjective well-being is and how reliable it is as a well-being measure. Section 1.2 summarizes what has been done with the subjective well-being measure. Section 1.3 summarizes existing literature in the field of public finance. The last section presents the structure of this dissertation.

1.1 Subjective Well-being Measure

Most existing studies employ self-reported life satisfaction level or happiness level as a subjective well-being measure. They are reported as an answer to a question which directly asks

individuals' happiness or satisfaction level. For example, a question may ask, "All things considered, how satisfied are you with your life as a whole these days?"[2] A respondent chooses his/her satisfaction level from an integer number on a certain scale, such as 1 through 10. More and more of the recent surveys include this type of question. The World Value Survey, which covers samples from more than 100 countries and regions around the world, is a famous example. In the U.S., the Behavioral Risk Factor Surveillance System (BRFSS) asks a question on life satisfaction since 2005, and the Panel Study of Income Dynamics (PSID) also asks similar questions since the survey in 2009.

Although the subjective well-being data comes from a simple survey question, one might ask whether we can rely on such a categorical number in economic analysis, and question reliability of the variable. Existing literature discuss the issues. Clark and Oswald (1996) cite the following reasons to employ subjective measures: (i) subjective data has been already used widely by psychologists who are the specialists of such measures; and (ii) subjective data is related to objective events and actions (e.g., job satisfaction is strongly related to objective events such as length of life).

The relationship between subjective data and objective events/actions is evidenced by some of the studies; for example, Helliwell (2006) notes consistency between suicide data and life satisfaction data. Kahneman and Krueger (2006) suggest that "The fact that responses to subjective well-being questions are related to individuals' health outcomes, neurological functioning and characteristics—and predict some future behavior—suggests that the data are a valid subject for study in the sense that they capture at least some features of individuals'

[2] The 2010-2012 World Value Survey.

emotional states." Further, Krueger and Schkade (2008) examine the reliability of subjective measures with respect to the persistency of the answers over time. They ask same questions to same respondents in different time periods, and find that, although the reliability of subjective well-being measures is lower than that for education, income and many other microeconomic variables, it is sufficiently high enough for current research to be reliable, especially research which compares mean of the measure.

Although research on the reliability of subjective well-being measures are still ongoing, the discussions in the existing literature indicate that, as most economic variables do, the measures have both pros and cons. As Frey and Stutzer (2002b) point out, "all social indicators are imperfect." Although we need to be careful dealing with it, the subjective well-being measure would provide us useful information on well-being.

1.2 Subjective Well-being in Economics

The subjective well-being data has been used to examine various questions in economics. This section briefly reviews major findings obtained by using subjective well-being.

The original work in economics that explicitly uses subjective well-being data is Easterlin (1974). The paper examines the relationship between economic growth and happiness level, and finds that the difference in happiness across rich and poor countries are small, and when looking at time series data, the happiness level does not necessarily increase with economic growth. The finding, in which income level and happiness level are not necessarily correlated, is called the "Easterlin Paradox".

There is a wide variety of empirical findings regarding the relationship between income and well-being, especially on the importance of relative income. For example, using data on British workers, Clark and Oswald (1996) examine whether an individual's utility depends on her/his income level relative to a "comparison" level, i.e., the income level which a typical worker with same characteristics could earn. They find that the comparison income is negatively related to job satisfaction. Luttmer (2005) examines the impact of neighbors' income on life satisfaction using the U.S. micro data, and finds that neighbors' earnings have a negative effect on individual happiness level.

The relationship between social inequality and subjective well-being has also been examined. Alesina et al. (2004) study the relationship between inequality and individual happiness in Europe and the U.S. The study shows that, in Europe, the poor and those who have an ideology of left-wing report lower happiness with greater inequality. On the contrary, in the U.S., the rich reports lower happiness with greater inequality while happiness of the poor is not related to inequality. Graham and Felton (2005) find that, in Latin American countries, the inequality has a negative impact on happiness.

Some research use subjective well-being to examine questions in macroeconomics. Di Tella et al. (2001) use happiness data to examine people's preference toward inflation and unemployment. They find that life satisfaction is higher with lower inflation and unemployment rates. Furthermore, they examine the trade-off between inflation and unemployment, and find the marginal rate of substitution to be 1.66 (i.e., the loss of life satisfaction caused by 1 percentage point increase in unemployment is equal to the loss caused by 1.66 percentage point increase in inflation rate). Di Tella et al. (2003) examine the relationship between macroeconomic variables,

such as GDP and unemployment rate, and happiness. Using cross-country data, they find that reported individual happiness level is correlated to movements in GDP, and unemployment rate has a negative impact on individual happiness.

Other studies such as Frey and Stutzer (1999, 2000) study the impact of political system or institution on subjective well-being. Using happiness data from Switzerland, they find that the degree of direct democracy has a positive impact on individual happiness. Helliwell and Huang (2008) examine the relationship between average life satisfaction in a country and quality of government. The results show that the quality of government, measured by the World Bank governance indicator, is positively correlated with life satisfaction, indicating good governance has a positive impact on life satisfaction.

Lastly, although limited, some research use the subjective measure to examine the impact of policy changes. Gruber & Mullainathan (2005) examine the effect of cigarette taxes on smokers' subjective well-being in the U.S. The study shows that cigarette taxes increase happiness of those who have a propensity to smoke. Ifcher (2010) examines the effect of the welfare reform in 1996 on the happiness of single mothers by a difference-in-difference framework. The results show that changes in welfare and tax system increased happiness of single mothers.

The number of studies using subjective well-being is growing, and a wide variety of research exists. The research which we refer in this section is just a part of them. The next section reviews the existing studies in more details by focusing on the field of public finance.

1.3 Subjective Well-being in Public Finance

This section reviews the existing studies which use subjective well-being with its focus on public finance. Some studies examine the impact of government size or size of specific expenditure. The original study in this field is Veenhoven (2000). The paper examines (i) the relationship between welfare expenditure and subjective well-being measures such as health and happiness levels using data from 41 countries in 1990, and (ii) how changes in the welfare expenditures from 1980 to 1990 is related to changes in the well-being measures. The results show no correlation for either estimation. Ouweneel (2002) studies the relationship between welfare expenditure and subjective well-being of the unemployed using data from 42 countries in 1990, and finds welfare expenditure has no significant effect on the well-being of the unemployed.

On the contrary to the above two studies, some studies find statistically significant relationships between government spending and subjective well-being. Bjørnskov et al. (2007) examine the impact of government size, measured by government consumption as a percent of GDP, on an aggregate level of life satisfaction employing data from 74 countries. The results show that an aggregate level of life satisfaction is lower when government consumption is greater. They also find that (i) government effectiveness mitigates the negative effect of government consumption; and (ii) the effect is different depending on the ideology of the government (e.g., life satisfaction is lower with higher government consumption if the government has leftwing ideology). Moreover, they report that the results are different by gender and income groups, e.g., the negative effect of government consumption on female life satisfaction is smaller when government effectiveness is higher while effectiveness has no

differential impact for male. Using large cross-country samples and several measures of happiness, income, and government spending, Ram (2008) re-examines the relationship between government consumption and the nation's life satisfaction as was provided by Bjørnskov et al. (2007), and suggests that there is no evidence for the negative relationship between government consumption and life satisfaction. Additionally, using a micro level data for 12 EU countries from 1990 to 2000, Hessami (2010) examines the impact of government expenditures on individual's life-satisfaction, and indicates that (i) the relationship between government expenditure and life satisfaction is inversely U-shaped; and (ii) the impact of government expenditure depends positively on the extent of decentralization and negatively on the level of corruption. With respect to specific categories of government expenditure, Di Tella et al. (2003) study the impact of generosity of unemployment benefit on individual happiness using micro level data from the Europe. They find that generosity of public unemployment insurance is positively related to happiness level of both the unemployed and the employed.

Although there are several studies which examine the relationship at country level, as mentioned above, there are only a limited number of studies that examine the government expenditure by local government. To the best of my knowledge, Kotakorpi and Laamanen (2008) is the only study which examines the relationship at local level. Using data from Finland, they examine the impact of health care expenditure at local municipality level on individual life satisfaction. They find that health care expenditure has a positive effect on individual's life satisfaction, and middle-income individuals report higher life satisfaction with greater health care expenditure than low-income or high-income individuals do.

The number of research on the revenue side of government activities is also quite limited. Oishi et al. (2012) examine the impact of progressivity of income tax by using cross-country data, and find that progressive taxation is positively related to subjective well-being. Additionally, Lubian and Zarri (2011) study the "tax-payers intrinsic motivation to pay tax". Using micro data from Italy, they construct tax moral indices from survey questions in which a respondent reports to what extent s/he agrees to a sentence such as "Paying taxes is one of the basic duties of citizenship". Using the indices, they find that tax moral is positively correlated with happiness, i.e., those who have higher tax moral report high happiness level.

This section provided the summary of the existing literature using subjective well-being in the field of public finance. A variety of studies are motivated by the fact that the value of public finance to citizens is not obvious. Public goods and services are not traded in the market, and its value is not obvious. Further, people's preference over tax is not clear.

While the existing studies show lots of new empirical evidence, the use of subjective well-being in public finance is still new and needs further development. First, the number of empirical research is still limited, and the results seem sensitive to the samples used in estimations. Second, the research needs more sophisticated empirical method such as the use of panel data. Most of the existing studies employ cross-sectional data at country-level, and may suffer from the effect of unobserved characteristics. Third, while most studies focus on country-level government expenditure, local government may also play an important role. For example, state governments in the U.S. have large autonomy in the allocation of its resources. Fourth, the existing empirical research is mainly on the expenditure side of government. We would expect that the revenue side of public finance, especially the structure of taxes, is an

important factor on well-being. If the tax revenue depends mostly on sales tax, since sales tax is relatively more regressive in terms of tax burden as a percentage in income, those with lower income may feel unhappy. There are many questions to be examined, and more empirical research would be required.

1.4 Conclusion

This chapter discussed what subjective well-being is and why it is used in economic analysis, and also reviewed some of the existing studies which used subjective well-being. Subjective measures provide tremendous possibilities in economics since it allows us to directly examine the impact of economic events on well-being. The research using subjective well-being provides new and insightful empirical evidence, and the number of research keeps rising.

In the field of public finance, some researchers examine the relationship between subjective well-being and government expenditure or taxes. However, the number of such studies is still limited and further empirical analysis is required. The most of existing work employ cross-sectional at country level. The use of panel data would provide more robust empirical evidence. Empirical studies on the impact of local government public finance are limited. The study on revenue side of public finance is also needed.

The rest of this dissertation is organized as follows. Chapter 2 re-examines the relationship between subjective well-being and government expenditure by using panel data of the average level of life satisfaction at country level. The panel data enables us to examine the causal relationship between public finance and subjective well-being and not just the correlation as most of existing literature study. Further, the chapter examines the impacts of taxes and

government deficit on life satisfaction. The analysis in the chapter would provide us not only more robust evidence on the relationship between government expenditure and subjective well-being at country level but also new evidence on the impact of revenue structure.

Chapter 3 examines the impact of state-level government expenditure on individual life satisfaction in the U.S. As mentioned above, research on local government finance is very limited. The chapter adds new empirical evidence to the existing literature.

Chapter 4 examines the impact of revenue side of public finance, especially tax structure, on life satisfaction, using the U.S state data as in Chapter 3. Although the impacts of progressivity of tax and tax morale have been examined, no literature has studied the impact of the overall revenue structure of government. The analysis also examines the impact of public finance when both government expenditure and revenue sides are considered.

Additionally, all chapters 2 through 4 examine how the relationship between public finance variables and subjective well-being is different across individual characteristics such as income level. Such analyses would enable us to discuss people's preference over public finance in depth.

Chapter 2

Life Satisfaction and Public Finance Using Country Panel Data

2.1 Introduction

Government provides public goods and services while it collects money from citizens, mostly in the form of taxes. Such activities are rationalized and justified since the government is expected to increase efficiency and equality of the society, and ultimately, to contribute to improve well-being of citizens. The relationship between public finance and well-being, however, has not been examined directly because well-being itself is considered unobservable.

Since 1990s the subjective well-being such as self-reported level of happiness or life satisfaction has been used as a proxy for well-being, and it enables us to estimate the relationship between public finance and well-being directly. Some research have examined the relationship between government expenditure and subjective well-being. For example, Veenhoven (2000) and Ouweneel (2002) show that the general level of social security has hardly any effect on the well-being while Bjørnskov et al. (2007) indicate that government size has a negative impact on subjective well-being of the country. Furthermore, others find that specific government expenditures are correlated positively with subjective well-being of individuals and that of specific social groups (for example, Kotakorpi and Laamanen, 2008; Di Tella et al., 2003).

While the number of studies is growing, the existing literature shows different results, and the relationship between government expenditure and subjective well-being is still under discussion. Specifically, most existing studies use cross-country data. Thus, causality between government expenditure and subjective well-being is not clear due to unobserved characteristics

such as institution and culture. For example, if a culture places importance on humbleness, people from the culture may report lower life satisfaction than they actually feel. In addition, if a country has greater government expenditure because of greater military expense for political reasons, the government size may just reflect the impact of higher risk of war which, in itself, may be negatively related to subjective well-being. An empirical analysis with panel analysis is needed to study the causal relationship between government expenditure and subjective well-being. Furthermore, most of the existing studies focus only on the expenditure side of the government. The revenue side of government, specifically tax structure, may also be important for well-being since each tax has different impact on the economy and the society.

This paper serves two purposes. First, this paper extends the existing studies on government expenditure by employing country-level panel data. Country specific effects, such as culture or political institution, may exist, and the results from existing studies may be affected by such effects. Using a panel data, the analysis controls country specific effects, which allows us to focus our attention on the impact of public finance variables. The results in this paper would be more comprehensive and provide causal empirical evidence on the relationship. Second, this paper examines the impact of revenue side of public finance on life satisfaction. The way in which government finances its expenditure would matter for subjective well-being. For instance, if people prefer income equality in the economy, they might report higher life satisfaction with greater share of income tax in tax revenue since income tax is relatively more progressive (or proportional if flat rate) while sales tax is more regressive measured as a share in income. On the other hand, if people prefer equality in tax payment, life satisfaction might be higher with greater share of sales tax. We also expect that government deficit is related to subjective well-being since

greater deficit implies that a greater share of expenditure today is financed at the cost of future generations. If people prefer expenditure to be financed by future generation, the size of deficit may have a positive impact on people's well-being. On the contrary, if people dislike leaving debt to their children's or grand-children's generations, the size of deficit may have a negative impact on well-being. We examine these impacts of revenue side of public finance on life satisfaction.

The analysis in this paper provides the following empirical findings. First, the impact of government size, which is measured as a percentage in GDP, differs by sample groups. The government size has a negative impact on average life satisfaction for developing countries while it has a positive impact for 25 OECD countries. The results remain the same even when the estimation model includes an indicator for government efficiency provided by the World Bank, indicating that the results on government size is not being proxy for government efficiency. For OECD countries, the positive impact of the government size on life satisfaction is dependent on the sample periods. Second, the revenue side of government matters for life satisfaction in OECD countries although the relationship is different across samples periods. Lastly, we find government budget surplus is positively related to life satisfaction.

The analyses in this chapter provide comprehensive empirical evidence on the relationship between government spending and subjective well-being using a panel data. In addition, to the best of my knowledge, this paper is the first of its kind to examine the relationship between government revenue and life satisfaction. The results in this paper not only add new empirical evidence to the field of happiness economics but also provide a basis for discussion regarding people's preference over government spending and tax structure.

This paper is organized as follows. Section 2.2 presents the model and the data. Section 2.3 discusses the estimation results. The last section concludes.

2.2 Empirical Model and Data

The equation to be estimated in this paper is given as follows:

$$Satisfaction_{it} = \alpha + \beta_1 Public\ Finance_{it} + \beta_2 log\ Real\ GDP\ per\ capita_{it} + \beta_3 Growth\ Rate\ of\ Real\ GDP\ per\ capita_{it} + \beta_4 Openness_{it} + \beta_5 Time_t + \varepsilon_{it}$$

Satisfaction is the aggregate level of life satisfaction which is an average for country *i* at time *t*. *Public Finance* is the variable of our interest. *Log Real GDP Per Capita, Growth Rate of Real GDP per capita*, and *Openness* are the control variables. *Time* is a set of time variables, and includes year dummies and/or year trend.[3] ε is the usual error term. The equation is estimated using pooled, fixed effect, or random effect model depending on results of specification test. The rest of this section explains each variable in details.[4]

2.2.1 Subjective Well-being

The dependent variable is an average level of reported life satisfaction in a country *i* in year *t*. The variable is calculated from micro data provided in 5 waves of the World Value Survey (1981-1984, 1990-1994, 1995-1998, 2000-2004 and 2005-2009) and 4 waves of the European

[3] As I will explain in the section for subjective well-being, this paper employs two data sets. Since the WVS data has a short time dimension and survey years are not consistent across countries even in the same wave, I include only year trend. On the other hand, as HPI data has a longer time dimension and is almost balanced, I include both year trend and year dummies.

[4] Appendix A-1 presents the sources and definitions.

Value Survey (1981, 1990, 1995 and 2000).[5] For simplicity, the paper refers to these data sets as "WVS". It covers 355,298 individual cases from 98 countries and regions in total. The survey asks each individual to evaluate their life satisfaction level on a scale from 1 to 10 where 10 is "very satisfied". We take an average of the value in a country in a year. Since not all countries are surveyed in every wave and survey year is not always the same even within the same wave, the data is unbalanced panel. The survey also contains questions regarding individual characteristics such as age, gender, education level, marital status, number of children, and job status. We employ these data to examine different impact of government spending on different social groups.

We also employ average life satisfaction data from the Happy Planet Index 2.0, which covers 25 OECD countries from 1961 to 2005. The average life satisfaction data is compiled from various data sources, and takes a value between 0 and 10 where 10 is the highest life satisfaction. The WVS covers countries around the world, but the number of observation is very different among countries. The HPI data is limited to OECD, but it has more observations because of a longer time dimension.[6] One caveat with the HPI data is that the dataset provides only an average life satisfaction level in a country, and thus, we are not able to segment the data into subcategories depending on the demographics.

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[5] Except for a few countries, two surveys cover different countries. According to "WVS", "In order to broaden the range of comparison, both projects agreed on harmonization of variables and data on basis of a common dictionary" (http://www.wvsevsdb.com/wvs/WVSIntegratedEVSWVS.jsp?Idioma=I)

[6] Table A-1 in Appendix A-2 presents the countries in each data set.

2.2.2 Public Finance Variables

Public Finance is the variable of our interest, and includes a different variable depending on the question. First, we examine the relationship between government size and life satisfaction. If the government size is optimized in the sense that it maximize average life satisfaction of the society, at the equilibrium, the difference in government size would merely reflect people's preference in the country, and would not be related to life satisfaction level. On the other hand, if the government size is inefficiently large due to inefficient political systems and/or governance, the government size could be inversely related to life satisfaction (Bjørnskov et al., 2007). This paper employs a share of government consumption in GDP as the government size, which is obtained from the World Development Indicators (WDI).[7] In addition to the relationship at overall country level, we also examine the impact of government expenditure on life satisfaction for different social groups. The greater government size may benefit individuals with lower income more than those with higher income since the lower income individuals depend more on goods and services provided by government. For similar reasons, those who are unemployed may benefit more from a greater government size.

Second, we study the impact of government revenue on life satisfaction. Specifically, the analysis focuses on the impact of tax structure on life satisfaction. Since income tax is more progressive (or proportional if flat rate) than other taxes, if people prefer equality in income, the share of income tax in overall tax revenue may have a positive impact on life satisfaction. On the other hand, if people prefer equal tax payments, income tax would have a negative impact on life satisfaction and sales tax may have a positive impact. To examine the impact of tax structure, the

[7] This follows Bjørnskov et al. (2007) and Ram (2008).

estimation model includes total tax revenue as a percentage of GDP to control overall tax size and the share of specific tax in total tax revenue to focus on the size of specific tax. The data on taxes is from the WDI. Since comprehensive tax data is not available for most developing countries in WDI, the analysis focuses on OECD countries and uses only HPI in this estimation.

Lastly, we examine the relationship between government deficit and subjective well-being. As mentioned above, a greater deficit implies that a greater amount of current government expenditure is financed at the cost of future generation. If people dislike leaving burden to future generation, current deficit may have a negative impact on life satisfaction. On the other hand, if people like to receive more public services with lower burden on themselves, they may report higher life satisfaction with a greater deficit. This paper calculates deficit as a percentage in GDP by taking the difference between total disbursements and total receipts of general government. The data for disbursements and receipts are provided by the OECD.

2.2.3 Control Variables

Following Bjørnskov et al. (2007), we include the following control variables in our estimation: openness to trade and log of real GDP per capita. Although they employ "social trust," a subjective evaluation on the degree of how other people are trustworthy, we do not include the variable because as Hamermesh (2004) points out, regressing subjective data on subjective data would not be reasonable. They also include investment price, which is a PPP price of investment goods using the international prices as a benchmark. They argue that "this variable proxies for a country's business climate as higher values reflect a stronger domestic demand for investment goods. With a better climate, people feel happier in general, for example, because job security is

perceived as being higher." Instead of the investment price, we include the growth rate of real GDP per capita because the job security or business climate would be better reflected in the growth rate of the economy.

We expect the sign of the coefficient on openness to trade to be positive as foreign trade leads to specialization, and ultimately to an increase in social welfare. Log of real GDP per capita and growth rate of real GDP per capita are also expected to be positively correlated with life satisfaction since higher GDP implies more goods and services for citizens. All control variables are from the Penn World Table 6.3.[8]

Appendix A-1 shows the definitions and sources of variables. Table A-2 in Appendix A-2 presents the summary statistics.

2.3 Results

This section presents and discusses the estimation results.

2.3.1 Government Expenditure and Life Satisfaction

We first examine the relationship between government size, measured by government consumption as a percentage in GDP, and life satisfaction. As discussed previously, this paper employs two datasets: WVS and HPI. The WVS data is unbalanced panel data and the number of observations is limited. Furthermore, since this is the first paper examining the relationship

[8] Although the Weber-Fechner Law says the relationship between stimulus and perception is logarithmic, this paper does not employ log form of other variables except for log of real GDP per capita since all the other variables are in percentage form.

between government expenditures and life satisfaction using a panel data, we are not able to rely on the existing literature regarding the model specification on country effects. Rather than assuming a model specification, we first estimate all three models, i.e., pooled, random effect, and fixed effect models, for the WVS data, and compare those results based on test statistics. The table reports the results selected based on the test statistics. On the other hand, for HPI data, since data is balanced panel, and we have a sufficient number of observations, we employ the fixed effects model.

Table 2-1 shows the results. The first column shows the results using WVS data and the second column shows the results using HPI data. The size of government consumption has a negative impact on an aggregate level of life satisfaction for WVS data (Column 1) while we observe a positive impact for the HPI data (Column 2). As mentioned above, a set of countries included is different between WVS and HPI. To check if the different results are driven by the sample selection, we separate the WVS sample into two groups: (i) 25 OECD counties which are consistent with the HPI data, and (ii) countries other than 25 OECD countries which are not included in HPI, and estimate the same model for the two sample groups. Column 3 shows the results for 25 OECD countries in WVS. Although it is statistically insignificant, government consumption has a positive impact on life satisfaction. Column 4 provides the results for the sample of non-OECD countries in the WVS data. The government consumption has a negative and significant impact on life satisfaction. The results in Columns 3 and 4 indicate that the

negative impact of government consumption on life satisfaction, obtained in Column 1, is driven by the sample of less-developed countries.[9]

The results in Table 2-1 show that the relationship is different depending on the sample selection. The results for WVS data, which include more developing countries, indicate that the aggregate level of life satisfaction is lower with a greater size of government consumption. Given the fact that the institution or quality of governance is under-developed in developing countries, the results may reflect the inefficiency of the government, i.e., greater government expenditure implies greater government inefficiency. The results on HPI data may also reflect government efficiency. Since political institution and transparency are high in developed countries, people might allow the government to spend a lot only in a country where the government is efficient. In other words, greater government consumption means government operates more efficiently. To examine whether government size reflects government efficiency, we add the measure of government efficiency to the estimation model in Table 2-1.

Table 2-2 shows the results. The sample size reduces from Table 2-1 because efficiency data is available in every other year since 1996. As a reference, Columns 1, 3, and 5 show the results without government efficiency when we limit the sample to countries whose governance indicator is available. Columns 2, 4, and 6 show the results of estimation with the governance indicator, and they are of our interest. In all three columns, government efficiency is positively

[9] With respect to the control variables in Table 2-1, the estimated coefficients on log of real GDP per capita and the growth rate of Real GDP per capita are consistent with our expectations, and both of them have positive coefficients although insignificant for the growth rate. Higher level of income or higher increase in income would bring higher life satisfaction. The result on openness to trade is opposite of our expectation. There may be several explanations for the negative impact of the openness to trade. First, it may reflect a perception of disadvantages with free trade, such as more competition with foreign countries, rather than the benefit of free trade. Second, it may be because the life satisfaction is relative to others including those from other countries. Open trade and learning how well-off others are in other countries could have lowered one's satisfaction.

correlated with life satisfaction, meaning the higher government efficiency is the higher overall life satisfaction of the country. The comparison of coefficients on government consumption between estimations with and without efficiency indicator enables us to discuss if the government size reflects the impact of government efficiency. In all three sample groups, the coefficient on government consumption is not affected by adding government efficiency. The results in this table show that the impact of government consumption is not a proxy of government efficiency.[10]

The results in Table 2-1 and Table 2-2 show that there is a negative relationship between government size and life satisfaction for non-OECD countries while there is a positive relationship for OECD countries. We also find the results which imply that such relationships do not reflect the effect of government efficiency. The negative correlation for non-OECD countries, which are mostly developing countries, may be explained by a couple of reasons. First, the negative relationship may have reflected the degree of democracy and/or other political issues, which governance indicators may not have captured fully. Second, while our study employs government consumption as a measure of government size, the variable excludes capital outlay and subsidies. Especially in developing countries, people may prefer expenditure on capital or direct subsidies to government consumptions because of higher needs for infrastructure and poverty reduction. Given the revenue base is limited in developing countries, greater government consumption may represent less capital expenditure and subsidies; and thus, the negative impact of government consumption may be a reflection of people's preference towards capital outlay and direct subsidies.

[10] Although I estimate a model which includes other governance indicators such as corruption control, the correlation between government size and life satisfaction remains the same.

We find different results for HPI data: there is a positive relationship between government consumption and life satisfaction. Although we find a positive impact of government size for the whole sample period (Table 2-1), the coefficient becomes negative and insignificant when the sample period is limited to after 1996 due to availability of the efficiency indicator (Table 2-2). Such results suggest that the relationship may be different depending on sample periods.

The different results for different sample periods may reflect a change in people's preference over government activities. For example, in the 1980s, the UK faced lower economic growth and stagflation, and shifted to a "small government". The shift to a small government also occurred in the U.S. under President Regan although it is a different story whether the administration actually achieved the small government. Moreover, as the Cold War ended, people may have preferred a smaller government as the demand for military expense reduced. Our results may reflect these changes in people's preference.

In order to examine whether the relationship changed after the Cold War, we estimate the model by separating sample before and after 1990. Table 2-3 shows the results. For the whole sample, government consumption has a positive coefficient as we found in Table 2-1 (Column 1). When we limit our sample to after 1990, although statistically insignificant, the positive coefficient on government consumption becomes smaller and standard error is greater for the period after 1990 (Column 2). On the other hand, for the period before 1990, the size of coefficient on government consumption stays the same although statistically insignificant. The results imply the magnitude of the impact of government size is different by sample periods.

2.3.2 Government Consumption for Different Social Groups

Next, we examine how the impact of government size is different across social groups. The estimation above shows that the government consumption has a significant correlation at the aggregate level of life satisfaction in a country. We would expect the impact to be different by individual characteristics. For instance, a greater government spending might have a positive impact on life satisfaction of the lower income groups since they might depend on publicly provided goods and services. In addition, those who are unemployed may report higher life satisfaction with a greater government size for the similar reason. To examine if the relationship is different by income groups or job status, we calculate average life satisfaction for each category and estimate its relationship with government spending. As mentioned above, due to data availability, this section employs only the data from WVS.

Table 2-4 presents the results. The first four columns show the results for different income groups. Since the question about the respondents' income is not always asked, the sample size drops from 233 in Table 2-1 to 106 in this estimation. As a benchmark, Column 1 shows the result for the sample in which the data on income level is available. On the contrary to the result in Column 1 of Table 2-1, government size has a positive and significant coefficient in this table (Column 1). This positive correlation may be because the data set includes relatively more developed countries.

Columns 2 through 4 are of our interest. The coefficient of government consumption is positive and significant for middle and low income groups, but is negative and insignificant for

the high income group.[11] This may be because those in high income category receive less net benefit from government expenditure, i.e., they pay more in tax than the benefit they receive from public goods and services. However, in order to discuss this hypothesis, a further analysis using more data on income levels and tax system is warranted. This is further discussed in Chapters 3 and 4 of this dissertation.

The last four columns of Table 2-4 show estimating results by different job status: the fully employed, the unemployed, and the retired. Since the question about the respondents' job status is not always asked, the sample size drops slightly from Table 2-1. We do not observe differences across job categories. Government consumption has a negative impact on life satisfaction for all groups (Columns 6 to 8).[12] This might be because the unemployed or the retired cares about specific expenditure such as unemployment compensation and social security payment rather than the overall government size.

2.3.3 Specific Government Expenditure and Life Satisfaction

This section focuses on detailed categories of government spending. Because of data constraint, we employ two expenditure categories: subsidies and transfer, as well as health. Since specific expenditure benefit specific groups, the impact of the expenditure may be different by individual characteristics. In this section, we control overall expenditure size by percentage of the overall expenditure in GDP and measure specific expenditure as percentage in total

[11] Only in Column 2, the result estimated by a random effect model is reported. This is in accordance with results of specification tests. The coefficient of government consumption is negative and insignificant in the fixed effect estimation.

[12] For the whole sample (Column 5), since the sample size increased in this estimation, the coefficient on government consumption becomes negative in this sample as in Table 2-1.

expenditure. This aims at preventing each expenditure categories to be a proxy of overall government size and focusing on the composition of government spending. Again, we use only WVS data in this section because HPI provides only overall life satisfaction level.

First, we examine if these expenditures are related to life satisfaction for the whole sample. Table 2-5 presents the results. There is no statistically significant correlation between specific government expenditure and life satisfaction (Columns 1 and 2). This result may be because subsidies or health expenditure has different impact for different social groups and the coefficient reflects the average of mixed impacts.

Table 2-6 shows the results for different social groups. Specifically, because the sample is too small to estimate the impact of specific government expenditure on life satisfaction by income groups, we present only the results for job status. Coefficients on both health and subsidies are all statistically insignificant, and we do not find significant differences in the relationships across job status. Again, this result might imply that the unemployed cares more about specific expenditure such as unemployment compensation or spending on job search facilitation rather than overall government expenditure. As the subsidies and transfers are not specific to unemployment compensation, the effect of unemployment compensation for the unemployed may not be captured clearly.

2.3.4 The Revenue Side of Public Finance and Life Satisfaction

This section focuses on the revenue side of government. Specifically, we examine the impact of tax structure on life satisfaction. Since the income tax is relatively more progressive (proportional if flat rate), if people prefer equality in income, people may report higher life

satisfaction with a greater size of income tax. On the other hand, the size of sales tax has a negative impact since the lower income must pay more in percentage of their income with sales tax. Due to data availability, this section uses only HPI data, and thus, focuses only on the developed countries. Additionally, as we discussed in previous section, since the relationship may be different by sample periods, we estimate the model for the periods before and after 1990.

We first examine the relationship between overall tax size and life satisfaction. Table 2-7 shows the results. Before we discuss the results on tax revenue, Columns 1 through 3 provide results for total disbursements of general government, measured as a percentage in GDP, as a reference.[13] Similarly to Table 2-1, the government size, measured by disbursements, has a positive impact for the whole sample between 1965 and 2011 (Column 1). The significant difference from the previous estimation is that we observe a clear difference in the results for different sample periods. The coefficient becomes negative and insignificant for the period after 1990 (Column 2) while it is positive and significant before 1990 (Column 3). The results show the impact of government spending is different by sample periods.

Columns 4 through 6 show the results for tax revenue. We observe the same pattern as with the disbursements. The tax revenue has a positive correlation with life satisfaction for the whole sample period (Column 4); however, it is insignificant after 1990 (Column 5) while positive and significant before the year (Column 6). Since the main source of revenue for a general government is tax, tax size and spending size is close to one-to-one. The consistent results for the impact of tax size and spending size on life satisfaction may reflect simply the impact of government size.

[13] Although I include overall disbursements to control for expenditure size in this estimation, the variable of total disbursement is different from the government consumption used in previous estimations.

Next, we examine the relationship between the size of specific tax and life satisfaction. Table 2-8 shows the results.[14] For the whole sample periods, individual income tax and goods and service tax have a positive impact on life satisfaction while corporate income tax has a negative impact (Columns 1 through 4). The results change before and after 1990. The size of individual income tax is insignificant after 1990 while it is positive and significant for the period before 1990 (Columns 5 and 9). The result is opposite for sales tax. The size of sales tax in tax revenue has a positive and significant impact after 1990 while it is negative and insignificant impact before 1990 (Columns 6 and 10).

The results show that the life satisfaction is higher with greater individual income tax or smaller taxes on goods and service before 1990; but after 1990, average life satisfaction is higher with greater tax on goods and services. One possible interpretation is that people's preference changed over time from equality in income distribution to equality in tax payment.

The results in this section show that the relationship between specific tax size and life satisfaction is different by sample periods. If people preferred a bigger government and equal distribution of income in the historical periods and a smaller government in a later period, the results here might make sense. It is our future research topic to study how the relationship between tax and life satisfaction changed over time.

[14] The size of each tax is measured as a percentage in overall tax revenue. In addition to the size of specific tax, I include the size of tax revenue as a percentage in GDP to control for the overall tax size. Thus, the estimation examines how the structure of tax revenue is related to life satisfaction holding overall tax size constant.

2.3.5 Government Surplus/Deficit and Life Satisfaction

This section examines the relationship between government surplus/deficit and life satisfaction. Since budget deficit implies that some of expenditure today is financed by future generation, the deficit may have a positive impact on life satisfaction if people care only about current generation (and not about future generations). On the other hand, if people care about making future generations pay for the current expenditure, it might have a negative impact on life satisfaction.

Table 2-9 shows the results.[15] The size of surplus has a positive impact for the whole sample (Column 1). The average life satisfaction is higher with greater government surplus, and it may support the view that people prefer not to leave burdens to future generations.[16] We also find that the impact is different by sample periods. The impact is positive and insignificant for the period after 1990 (Column 2) while it is positive and significant before 1990. Again, the preference may be different over periods.

2.4 Conclusion

This paper examines how public finance is related to life satisfaction by employing a country panel data, and finds the following important empirical results:

First, the impact of government size is different for different samples. The government size has a negative impact on average life satisfaction for developing countries while it has a

[15] The surplus/deficit is calculated by taking difference between total disbursements and total receipts, and measured as a percentage in GDP.

[16] One might be concerned that the result on government surplus just reflects the impact of economic fluctuations (i.e., recession or boom). However, even when I include unemployment rate to control the impact of economic fluctuations, the results on government surplus remain the same.

positive impact for 25 OECD countries. These results remain robust even after controlling for government efficiency. Although we need additional studies to figure out what these results imply, we have several interpretations. For example, with respect to the developing countries, the negative impact of government size on life satisfaction may capture institutional matters or political issues such as corruption and low governance, which has not been captured by political indexes. Other possible interpretation is that our measure of government size does not include capital outlay, and the results may have reflected people's preference for capital expenditure. Regarding the results for OECD countries, the positive impact of the government size on life satisfaction is dependent on the sample periods. The result may imply that people's preference has changed over time. The results that the relationship between government expenditure and life satisfaction may be different for different stages of development, and for different sample periods, suggest that we need to be careful in understanding and interpreting the empirical findings provided in existing literature.

Second, we find the revenue side of government matters for life satisfaction in OECD countries, and the relationship is different across sample periods. Before 1990, people report higher life satisfaction with a greater size of tax revenue and a greater share of income tax. On the other hand, tax revenue has no impact and the size of sales tax has a positive impact on life satisfaction after 1990.

Lastly, we find government budget surplus or deficit is related to life satisfaction. People report higher life satisfaction with government surplus (or a smaller deficit), implying that people do not prefer leaving burden for future periods.

The analysis in this paper provides new empirical evidence in the fields of public finance and happiness economics although there are some drawbacks which mainly come from the use of country level-data. First, some time-variant cultural or political changes within a country might not be captured fully even with panel data set. Second, our analysis focuses on general government and does not consider the degree of decentralization in the country and the role of local government. Lastly, the impact of one side of public finance might also depend on the other side. For example, if people think specific government expenditures, such as infrastructure and social equality, are needed, they might accept greater taxes on their income. The impact of tax revenue might depend on how the money is spent by the government. Detailed analysis on both spending and revenue sides is required.

Table 2-1: Government Consumption and Life Satisfaction

Dependent Variable: Avg. Life Satisfaction	WVS	HPI	WVS (OECD countries)	WVS (non-OECD
	(1)	(2)	(3)	(4)
Govt Consumption (% of GDP)	-0.037***	0.040**	0.022	-0.041***
	(0.014)	(0.018)	(0.025)	(0.014)
Openness	-0.001	-0.006**	0.001	-0.002
	(0.001)	(0.003)	(0.002)	(0.002)
Log of real GDP per capita	0.613***	1.048***	0.786*	0.549***
	(0.092)	(0.214)	(0.420)	(0.098)
Growth rate of RGDP per capita	0.002	0.005	0.014	0
	(0.009)	(0.004)	(0.016)	(0.010)
Constant	1.964**	-3.48	-0.692	2.436**
	(1.002)	(2.386)	(4.333)	(1.060)
Model Specification	RE	FE	RE	RE
Observations	233	1115	80	153
Number of id	93	25	25	77
R-squared		0.42		

Robust Standard errors in parentheses

* significant at 10%; ** significant at 5%; *** significant at 1%

Table 2-2: Government Consumption, Government Efficiency, and Life Satisfaction

Dependent Variable: Avg. Life Satisfaction	WVS		HPI		WVS (Non-OECD countries)	
	(1)	(2)	(3)	(4)	(5)	(6)
Govt Consumption (% of GDP)	-0.038**	-0.035**	-0.017	-0.009	-0.037**	-0.036**
	(0.017)	(0.017)	(0.025)	(0.021)	(0.016)	(0.017)
Governement Efficiency		0.310**		0.359*		0.114
		(0.122)		(0.183)		(0.195)
Openness	-0.001	-0.001	-0.003	-0.002	-0.001	-0.002
	(0.001)	(0.001)	(0.002)	(0.002)	(0.001)	(0.001)
Log of real GDP per capita	0.496***	0.282**	0.449*	0.327	0.467***	0.398**
	(0.085)	(0.126)	(0.219)	(0.230)	(0.093)	(0.167)
Growth rate of RGDP per capita	-0.018	-0.011	0.030**	0.027**	-0.023	-0.02
	(0.016)	(0.016)	(0.012)	(0.010)	(0.015)	(0.016)
Constant	2.121**	3.908***	3.1	3.646	1.797*	2.458
	(1.001)	(1.196)	(2.189)	(2.429)	(1.070)	(1.541)
Model Specification	RE	RE	FE	FE	RE	RE
Observations	99	99	175	175	80	80
Number of id	72	72	25	25	64	64
R-squared			0.33	0.43		

Robust standard errors in parentheses

* significant at 10%; ** significant at 5%; *** significant at 1%

Table 2-3: Government Consumption and Life Satisfaction Before and After 1990

Dependent Variable: Avg. Life Satisfaction	HPI		
	Whole Periods	Year>=1990	Year<1990
	(1)	(2)	(3)
Govt Consumption (% of GDP)	0.040**	0.003	0.043
	(0.018)	(0.027)	(0.029)
Openness	-0.006**	-0.003**	-0.009*
	(0.003)	(0.001)	(0.005)
Log of real GDP per capita	1.048***	0.372**	1.138**
	(0.214)	(0.158)	(0.473)
Growth rate of RGDP per capita	0.005	0.022***	0.002
	(0.004)	(0.005)	(0.003)
Constant	-3.197	3.655**	-3.963
	(2.245)	(1.506)	(4.951)
Model Specification	FE	FE	FE
Observations	1115	400	715
Number of id	25	25	25
R-squared	0.42	0.19	0.34

Robust standard errors in parentheses

* significant at 10%; ** significant at 5%; *** significant at 1%

Table 2-4: Government Expenditure and Life Satisfaction: By Demographics

Dependent Variable: Avg. Life Satisfaction	Income Level				Job Status			
	Whole sample	High	Mid	Low	Whole sample	Full employ	unemploy	retired
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Govt Consumption (% of GDP)	0.026**	-0.013	0.034***	0.030**	-0.037***	-0.032**	-0.044***	-0.032**
	(0.011)	(0.015)	(0.012)	(0.014)	(0.014)	(0.015)	(0.013)	(0.015)
Openness	-0.004	-0.0002	-0.007**	-0.005	-0.002	-0.001	-0.002	-0.001
	(0.004)	(0.001)	(0.003)	(0.005)	(0.001)	(0.001)	(0.001)	(0.001)
Log of real GDP per capita	0.856	0.643***	1.190**	1.506*	0.599***	0.558***	0.365***	0.558***
	(0.566)	(0.126)	(0.461)	(0.760)	(0.093)	(0.097)	(0.100)	(0.097)
Growth rate of RGDP per capita	0.003	0.01	0.008	-0.006	0.004	0.004	0.017	0.004
	(0.016)	(0.012)	(0.014)	(0.019)	(0.009)	(0.010)	(0.012)	(0.010)
Constant	-1.337	1.508	-4.257	-7.628	2.141**	2.429**	3.677***	2.429**
	(4.966)	(1.354)	(4.110)	(6.669)	(1.016)	(1.058)	(1.082)	(1.058)
Model Specification	FE	RE	FE	FE	RE	RE	RE	RE
Observations	106	106	106	106	226	226	224	226
Number of id	69	69	69	69	92	92	91	92
R-squared	0.23		0.26	0.18				

Robust standard errors in parentheses

* significant at 10%; ** significant at 5%; *** significant at 1%

Table 2-5: Specific Expenditures and Life Satisfaction

Dependent Variable: Avg. Life Satisfaction	WVS	
	(1)	(2)
Govt Spending (% of GDP)	-0.005	-0.02
	(0.014)	(0.021)
Subsidies and Transfers (% of Spending)	0.0001	
	(0.007)	
Health Expenditure (% of Spending)		0.318
		(3.189)
Openness	-0.009**	-0.003*
	(0.004)	(0.002)
Log of real GDP per capita	1.220*	1.130***
	(0.625)	(0.310)
Growth rate of RGDP per capita	0.023	-0.014
	(0.019)	(0.066)
Constant	(3.823)	(3.503)
	-5.276	-4.286
Model Specification	FE	OLS
Observations	100	41
Number of id	61	
R squared	0.24	0.65

Robust Standard errors in parentheses

* significant at 10%; ** significant at 5%; *** significant at 1%

Table 2-6: Specific Expenditures and Life Satisfaction By Job Status

Dependent Variable: Avg. Life Satisfaction	Full Employment		Unemployment		Retired	
	(1)	(2)	(3)	(4)	(5)	(6)
Govt Spending (% of GDP)	-0.0002	-0.013	-0.007	-0.023	-0.004	-0.025
	(0.009)	(0.022)	(0.011)	(0.024)	(0.012)	(0.028)
Subsidies and Transfers (% of Expense)	-0.007		-0.01		-0.009	
	(0.005)		(0.006)		(0.006)	
Health Expenditure (% of Expense)		0.591		-0.975		0.868
		(3.418)		(2.764)		(4.162)
Openness	-0.003**	-0.003*	-0.003	-0.003*	-0.008**	-0.005*
	(0.001)	(0.002)	(0.002)	(0.002)	(0.004)	(0.002)
Log of real GDP per capita	0.715***	1.045***	0.604***	0.991***	2.300***	1.303***
	(0.110)	(0.310)	(0.098)	(0.275)	(0.657)	(0.401)
Growth rate of RGDP per capita	0.017	-0.011	0.004	0.033	0.009	0.031
	(0.015)	(0.068)	(0.016)	(0.047)	(0.020)	(0.086)
Constant	0.259	-2.89	0.233	-6.375	-12.903**	-6.922
	(0.991)	(4.178)	(0.960)	(4.645)	(5.550)	(6.187)
Model Specification	RE	OLS	RE	OLS	FE	OLS
Observations	98	41	98	41	98	41
Number of id	60		60		60	
R-squared		0.61		0.47	0.29	0.58

Robust Standard errors in parentheses

* significant at 10%; ** significant at 5%; *** significant at 1%

Table 2-7: Disbursements, Tax Revenue, and Life Satisfaction

Dependent Variable: Avg. Life Satisfaction (HPI)	Whole Periods	Year>=1990	Year<1990	Whole Periods	Year>=1990	Year<1990
	(1)	(2)	(3)	(4)	(5)	(6)
Disbursements (% of GDP)	0.011***	-0.002	0.015***			
	(0.002)	(0.003)	(0.003)			
Tax Revenue (% of GDP)				0.023***	0.002	0.014***
				(0.003)	(0.005)	(0.004)
Openness	-0.005***	-0.003***	-0.008***	-0.006***	-0.003***	-0.008***
	(0.001)	(0.001)	(0.002)	(0.001)	(0.001)	(0.001)
Log of real GDP per capita	0.961***	0.386***	0.838***	0.996***	0.368***	1.099***
	(0.070)	(0.145)	(0.166)	(0.054)	(0.134)	(0.101)
Growth rate of RGDP per capita	0.015***	0.021***	0.008**	0.006***	0.021***	0.002
	(0.003)	(0.004)	(0.004)	(0.002)	(0.003)	(0.003)
Constant	-2.298***	3.575**	-1.13	-2.652***	3.574***	-3.583***
	(0.685)	(1.521)	(1.644)	(0.507)	(1.379)	(1.038)
Model Specification	FE	FE	FE	FE	FE	FE
Observations	692	378	314	985	400	585
Number of id	24	24	19	25	25	25
R-squared	0.41	0.19	0.33	0.44	0.19	0.36

Standard errors in parentheses

* significant at 10%; ** significant at 5%; *** significant at 1%

Table 2-8: Specific Taxes and Life Satisfaction

Dependent Variable: Avg. Life Satisfaction (HPI)	Whole Periods				Year>=1990				Year<1990			
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
Tax Revenue (% of GDP)	0.021***	0.025***	0.025***	0.026***	-0.0002	0.010*	0.003	0.007	0.012***	0.014***	0.013***	0.011***
	(0.003)	(0.003)	(0.003)	(0.003)	(0.005)	(0.006)	(0.005)	(0.006)	(0.004)	(0.004)	(0.004)	(0.004)
Taxes on Income etc. of Individuals (% of Tax Rev.)	0.004***			0.002	0.004			0.007	0.006***			0.006***
	(0.002)			(0.002)	(0.004)			(0.005)	(0.002)			(0.002)
General Taxes on Goods and Services (% of Tax Rev.)		0.009***		0.006***		0.018***		0.020***		0.002		-0.007**
		(0.002)		(0.002)		(0.007)		(0.008)		(0.003)		(0.003)
Taxes on Income etc. of Corporates (% of Tax Rev.)			-0.015***	-0.013***			-0.006	-0.003			-0.004	0.001
			(0.003)	(0.003)			(0.004)	(0.005)			(0.003)	(0.004)
Openness	-0.006***	-0.006***	-0.006***	-0.006***	-0.003***	-0.003***	-0.003***	-0.003***	-0.008***	-0.008***	-0.008***	-0.008***
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
Log of real GDP per capita	0.906***	0.995***	0.993***	0.987***	0.438***	0.372***	0.503***	0.469***	0.794***	1.096***	0.825***	0.775***
	(0.054)	(0.053)	(0.055)	(0.055)	(0.135)	(0.133)	(0.144)	(0.143)	(0.097)	(0.101)	(0.105)	(0.105)
Growth rate of RGDP per capita	0.007***	0.006**	0.008***	0.008***	0.022***	0.021***	0.023***	0.022***	0.003	0.002	0.002	0.003
	(0.002)	(0.002)	(0.002)	(0.002)	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)
Constant	-1.875***	-2.817***	-2.546***	-2.666***	2.840**	3.079**	2.373	1.962	(0.688)	-3.706***	(0.857)	(0.394)
	(0.514)	(0.504)	(0.516)	(0.522)	(1.398)	(1.360)	(1.458)	(1.454)	(1.003)	(1.051)	(1.073)	(1.081)
Model Specification	FE	FE	FE	FE	FE	FE	FE	FE	FE	FE	FE	FE
Observations	935	985	935	935	384	400	384	384	551	585	551	551
Number of id	24	25	24	24	24	25	24	24	24	25	24	24
R-squared	0.42	0.45	0.43	0.44	0.2	0.21	0.2	0.22	0.31	0.36	0.3	0.32

Standard errors in parentheses

* significant at 10%; ** significant at 5%; *** significant at 1%

Table 2-9: Government Surplus/Deficit and Life Satisfaction

Dependent Variable: Avg. Life Satisfaction (HPI)	Whole Periods	Year>=1990	Year<1990
	(1)	(2)	(3)
Govt Surplus/Deficits (% of GDP)	0.010***	0.004	0.008*
	(0.003)	(0.004)	(0.004)
Openness	-0.005***	-0.003***	-0.008***
	(0.001)	(0.001)	(0.002)
Log of real GDP per capita	0.970***	0.473***	0.732***
	(0.073)	(0.143)	(0.171)
Growth rate of RGDP per capita	0.012***	0.023***	0.005
	(0.003)	(0.004)	(0.004)
Constant	-1.987***	2.618*	0.393
	(0.702)	(1.445)	(1.651)
Model Specification	FE	FE	FE
Observations	692	378	314
Number of id	24	24	19
R-squared	0.38	0.19	0.29

Standard errors in parentheses

* significant at 10%; ** significant at 5%; *** significant at 1%

Chapter 3

Life Satisfaction and Government Expenditure Using U.S. Micro Data

3.1 Introduction

Our lives depend on goods and services provided by public sector to some extent. We may attend a public school, ride a publicly-operated transportation, use a highway, and receive social welfare from government. The relationship between government expenditure and life satisfaction is an important topic in economics.

In order to examine the relationship between government activities and well-being directly, prior studies use subjective well-being data, such as self-reported happiness and life satisfaction. Some have examined the impact of government spending on subjective well-being. For example, Veenhoven (2000) and Ouweneel (2002) find no significant relationship between the size of welfare expenditure and subjective well-being. Bjørnskov et al. (2007) find that the size of government consumption has a negative effect on an aggregate life satisfaction level of the country. Hessami (2010) finds that some components of government expenditures, including welfare expenditure, are related to individual life satisfaction. These studies employ cross-country data. Regarding local government spending, Kotakorpi and Laamanen (2008) examine the impact of public health care expenditure at municipal level on individual life satisfaction in Finland. They find that public health care has a positive impact on life satisfaction, and the impact is greater for the middle income group than that for low and high income groups.

This paper explores the relationship between life satisfaction and government expenditure, and provides a wide variety of new empirical evidence. Specifically, this paper employs individual life satisfaction data from the Behavioral Risk Factor Surveillance System (BRFSS), which surveys more than 350,000 different individuals every year in the U.S., and state government public finance data for the period from 2005 to 2009. I believe that the U.S. state-level public finance data has an advantage in data comparability over cross-country data, which most prior studies employ. The analysis will suffer less from the country specific effects, such as efficiency or quality of government and other time-variant social and economic events, which country fixed effects may not capture fully even with country panel data.

Although using state government data gives us an advantage in data comparability, we must consider an issue of migration more carefully than using a cross-country analysis. According to the Tiebout hypothesis, when migration cost is low, people move to a state which provides a set of public goods and services that best match with their preference, i.e., they "vote with their feet."[17] If there is no migration cost, in equilibrium, we will not observe any relationship between state public finance and life satisfaction. However, while the possibility of migration may weaken the relationship, we would expect to observe a relationship between public finance and life satisfaction if people have heterogeneous preference on living environment or when the migration cost is high enough.

Using the U.S. state-level data, this paper first examines how state government spending is related to life satisfaction. There is little research examining the impact of local

[17] Tiebout (1956)

government expenditure on life satisfaction and, in particular, no empirical evidence has been provided for the U.S. state governments. Second, we examine how the relationship between government expenditure and life satisfaction is different across income groups. Kotakorpi and Laamanen (2008) study how the health care expenditures of Finnish local governments impact life satisfaction by income groups. They find that the impact of health expenditure is the greatest for the middle income group, and suggest that this is an evidence of the "ends against the middle," which Epple and Romano (1996) present in their theoretical work. This paper examines a similar question with respect to different categories of government expenditures in the U.S.

The analyses in this paper provide the following empirical evidence: First, the size of state general expenditure is positively related to life satisfaction in the U.S. Among the expenditures, health expenditure is positively related to life satisfaction. The impacts of welfare and education expenditures depend on the types of expenditures within the category. Additionally, the impact of education expenditure is different by individual characteristics. Second, compared to the lowest income group, higher income groups report lower life satisfaction with greater general expenditure especially with the welfare expenditure.

To the best of my knowledge, this paper is the first to examine the relationship between life satisfaction and state government expenditure in the U.S. The empirical findings in this paper will add new and comprehensive empirical results to the discussion in the fields of happiness economics and public economics. Specifically, the empirical evidence provides a basis for discussion on people's preference over local public goods in the field of public economics.

Section 3.2 describes data and the empirical model. Section 3.3 presents and discusses the results. The last section concludes.

3.2 Data and Empirical Model

The following is the baseline model of this paper:

$$Satisfaction_{iskt}=\alpha+\beta_1 Public\ Finance_{skt}+\beta_2 State_{skt}+\gamma Individual_{iskt}+\theta Region_k+\delta Time_t+\varepsilon_{iskt}$$

Satisfaction is the life satisfaction level, reported by individual *i* in state *s* in region *k* in year *t*. *Public Finance* is a set of public finance variables of our interest, and *State* is a vector of state-level control variables. *Individual* is a set of personal characteristics of respondents. *Region* is a set of dummy variables for eight regions in the U.S. *Time* is a vector of variables that control time effects, such as interview year dummies and interview month dummies. ε is an error term. The rest of this section describes the variables in details.

3.2.1 Life Satisfaction

Life satisfaction data comes from the Behavioral Risk Factor Surveillance System (BRFSS). The variable is given as an answer to the following question: "In general, how satisfied are you with your life?" The respondent choses his/her satisfaction level from the following four categories: "very satisfied," "satisfied," "dissatisfied," and "very dissatisfied." We assign discrete values from 1 to 4 to each category such that "very satisfied" is 4 and "very dissatisfied" is 1. The reliability and usefulness of the reported life satisfaction data are discussed in prior studies, such as Frey and Stutzer (2002b). Following

the existing empirical studies, we treat the reported life satisfaction as a proxy for well-being.

3.2.2 Public Finance Variables

Public Finance variables are the state-level government expenditure, and obtained from the U.S. Census Bureau. In defining public finance variables, existing studies employ either per capita amount (e.g. Kotakorpi and Laamanen, 2008) or a percentage in overall amount, such as a percentage of education expenditure in overall expenditure (e.g., Hessami, 2010).[18] In this paper, we employ per capita dollar amount (in log form) as a baseline variable to measure public finance variables.[19,20] Since using per capita amount allows us to measure an approximate amount of public goods and services a typical person in a state receives and an approximate amount of taxes s/he pays.

We first examine the impact of government expenditure on reported well-being of the whole sample. In the estimation, *Public Finance* includes per capita amount of specific categories in general expenditure.[21] Moreover, the model also includes tax revenue per

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[18] The latter method includes the size of overall expenditure and percentage of specific expenditure. This method examines, holding the size of overall expenditure constant, how the share of specific expenditure is related to a dependent variable.

[19] In order to take a log form, if a state has zero value for a specific public finance variable, I replace zero with 1 in original value. Further, I employ a dollar amount in current dollars rather than in constant dollars because (i) the inflation in overall U.S. economy would be controlled by time dummies; and (ii) the data covers only 5 years from 2005 to 2009, and inflation rate would not matter significantly in this short period.

[20] I estimated the same model using non-log form of public finance variables, and the results did not change significantly.

[21] This paper employs general expenditure, which consists of direct expenditure and intergovernmental expenditure, since I believe that the activity of state government reflects more precisely when including intergovernmental expenditures. The paper also employs general expenditure and general revenue, and not total expenditure and total revenue, which include expenditures for and revenues from utility, liquor

capita to prevent expenditure variables from being a proxy for tax burden.[22] In addition to the general expenditure, we focus on three major expenditure categories, in which U.S. state governments play an important role: education, welfare, and public health.[23]

Second, we estimate how the impact of government expenditure is different across income groups. For this analysis, Public Finance includes per capita amount of specific categories of general expenditure and interaction terms between individual income categories and the Public Finance variable. The group of the lowest income group is omitted in the estimation, and thus, the coefficient on the public finance variable shows the coefficient for the lowest group. Coefficients on interaction terms show how the impact of the expenditure is different for the income group compared to the lowest.

3.2.3 Other Control Variables

In addition to *Public Finance* variables, our estimation includes various control variables. *State*, a set of state-level control variables, consists of (i) unemployment rate, taken from the Bureau of Labor Statistics, (ii) poverty rate from Center for Poverty Research at University of Kentucky, (iii) per capita personal income from the Bureau of Economic Analysis (BEA), and (iv) average annual temperature from the National Oceanic and Atmospheric Administration, of state *s* in year *t*. We expect coefficients on unemployment rate to be negative because individuals may feel (i) higher risk of being

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stores, and insurance trust in order to focus specifically on government activities that affect all individuals.

[22] Each table reports results with and without tax revenue.

[23] While "State government finance" from the U.S. Census refers to it as "Health," the variable focuses on services for public health, and does not include hospital care.

unemployed in the future or (ii) the difficulty in finding a new job with higher unemployment rate. The literature, such as Di Tella et al. (2003), shows that unemployment rate is negatively and significantly correlated with individual life satisfaction. As a higher poverty rate implies economic downturn or social inequality, we expect the impact of poverty rate on life satisfaction is negative. We would expect the personal income per capita to have a negative impact since people feel that their income is less if their neighbors earn more (relative income effect). The existing literature has shown this effect; for example, using the BRFSS data, Oswald and Wu (2009) find that individual life satisfaction is lower in richer states after controlling for individual income. Luttmer (2005) shows that, controlling for individual's own income, individual life satisfaction is lower when neighbors earn more. The effect of average temperature is expected to be positive since "Generally speaking, a moderately warm and friendly climate could make people feel more satisfied with their lives by, e.g., relieving them of the physical stress of extreme temperatures."[24]

Individual, which is a set of personal characteristics of respondents obtained from the BRFSS, includes age, age squared, gender, race, marital status, job status, education, household income level, and the number of children. Except for age, all individual characteristics are categorical variables and included as dummy variables. We include these control variables following the existing literature. In addition to these variables, our model also includes suburban and rural dummies (urban is omitted). Since living in an urban area has both an advantage, such as convenience, and a disadvantage, such as congestion, we

[24] Bjørnskov et al. (2008)

would expect it to be related to life satisfaction. The most studies in the literature show that coefficients on age, male, unemployed, widowed, divorced, and the number of children are negative while coefficients on age squared, income level, and education level are positive. The expected sign of coefficients on suburban or rural is ambiguous since both positive and negative effects exist.

Region is the U.S. eight regional dummies based on the definition provided by BEA. The regions are Mideast, Great Lakes, Plain, Southeast, Southwest, Rocky Mountain, and Far West (New England is omitted).

Since the dependent variable is a categorical variable, we employ ordered probit model. Appendix B-1 provides detailed descriptions and sources. Table B-1 in Appendix B-2 presents summary statistics of the variables. We limit the sample to adults between 18 and 85 years old.[25] Because of the data availability, the District of Columbia, Guam, Virgin Islands, and Puerto Rico are excluded from the sample.

3.3 Estimation Results

This section presents estimation results. We first examine the relationship between government spending and life satisfaction, and then, examine how it is different across income groups.

[25] This follows Oswald and Wu (2009).

3.3.1 Baseline Model Results

We first estimate the impact of government spending on life satisfaction. Specifically, we focus on the impact of general expenditure and three specific expenditure categories: education, welfare, and public health. We combine other categories of general expenditure and include it in the estimation as "Other expenditure". Since education and public health are considered "goods," we expect the coefficients on these expenditures to be positive. The impact of welfare expenditure is ambiguous. Since welfare expenditure brings direct benefits to the lower income groups, the welfare expenditure may positively impact their life satisfaction; however, the impact of welfare expenditure on higher income groups is ambiguous. If those, who do not benefit directly from the welfare expenditure, benefit from an increase in social equality or any other reason, welfare expenditure may have a positive impact on their life satisfaction. Otherwise, welfare expenditure has a negative or no impact on higher income groups. Thus the net impact of welfare expenditure for the whole sample is ambiguous.

Table 3-1 presents the results.[26] As shown in Column 1, the impact of general expenditure is positive and statistically significant. Since the expenditure size may capture the effect of tax burden to some extent, we add the size of tax revenue in Column 2. The coefficient on general expenditure is still positive and significant. The coefficient on tax

[26] Coefficients on regional dummies and individual characteristics, corresponding to the estimation in Table 3-1, are presented in Table B.2 in Appendix B-2. All estimations in the rest of this paper include individual characteristics and time and regional dummies though not reported.

revenue is negative and significant.[27] The results seem intuitive: holding tax size constant, people report higher life satisfaction with greater government expenditure.

Columns 3 and 4 show the results for specific categories of general expenditure. While welfare and education expenditures have negative impacts on life satisfaction, health expenditure has a positive impact (Column 3). Including tax revenue does not affect the signs and statistical significance of the coefficients except for education expenditure which becomes positive and insignificant (Column 4).

The results in Table 3-1 indicate that state government spending mattes for individual life satisfaction.[28] As mentioned in Section 3.1, this implies that either the migration cost between states is significantly high in the U.S. or people have heterogeneous preference for location. Identifying the size of migration cost or the size of non-public finance compensation is a topic for our future research. The results also suggest that the relationship between government spending and life satisfaction differs by expenditure categories. The result on public health expenditure supports that public health is a "good" for citizens; however, education and welfare expenditures have negative impacts and are inconsistent with what we expected. Section 3.3.2 and 3.3.3 discuss these negative impacts

[27] Regarding the magnitude of impact of public finance variables, for simplicity and following existing literature such as Hessami (2012), I run the model using OLS. The signs and statistical significance of coefficients are the same as Column 2 in Table 3-1. The coefficient of government expenditure is 0.03 with OLS meaning that 1% increase in government expenditure per capita raises life satisfaction by 0.0003 on average. The coefficient on tax revenue is -0.028 meaning that 1% increase in tax revenue per capita lowers life satisfaction by 0.00028 on average.

[28] Although I believe that per capita dollar amount is the appropriate specification to examine the impact of specific category of government expenditures, I also estimate a model with a share of each expenditure category. As mentioned in Section 3.2, this specification examines a different question: holding overall government expenditure constant, how the composition of the expenditure impacts life satisfaction. Table B.3 in Appendix B-2 reports the results. The results are similar to the results in Table 3-1, and shares of welfare and education expenditure have negative impacts while health expenditure has a positive impact on life satisfaction.

in more details. Specifically, Section 3.3.2 examines how each subcategory within those categories of expenditures is related to life satisfaction. Section 3.3.3 examines how the impact is different across income groups.

The coefficients of state-level control variables are in line with the literature and theoretical predictions. The negative correlation between log of per capita income and life satisfaction may imply that relative income matters for individual life satisfaction. i.e., the higher the average personal income is, the less satisfied people feel about their lives. This result is consistent with those reported by Oswald and Wu (2009) and Luttmer (2005). Unemployment rate and poverty rate are negatively correlated with life satisfaction. These variables may reflect the effect of economic downfall, such as risk of being unemployed, as well as social issues, such as more crimes.[29]

One may argue that the coefficients on government expenditure variables absorb some societal characteristics of the state. Thus, we conduct the following robustness checks. First, the coefficient on the education expenditure may reflect demographic characteristics of a state. To control for the effect of demographic characteristics, we include shares of

[29] Although the main interest of this paper is the impact of public finance variables, I also examine how the impact of macroeconomic variables differs by individual characteristics. For example, the unemployed may feel lower life satisfaction with higher state unemployment rate since higher unemployment rate means lower possibility of getting a job. For this estimation, I include interaction terms between macroeconomic variables and various individual characteristics. Specifically, I add interaction terms between (i) unemployment rate and job status, (ii) per capita income and income level, and (iii) poverty rate and income level. Tables B-4 through B-6 in Appendix B-2 present the results. I find the following results. First, compared to those employed for wages, the negative impact on unemployment rate is greater for student and self-employed while it is smaller for those who are retired, homemaker, unemployed, and unable to work. The result on the unemployed might mean that people care about relative income or relative social position. Second, compared to the lowest income group, the negative impact of log per capita income is greater for higher income groups. This implies relative income matters for well-being. Thirdly, compared to the lowest income group, the negative impact of poverty rate is greater for higher income groups. Those with higher income report lower life satisfaction with higher poverty rate as it may reflect higher social insecurity and instability.

three age groups (6-18 years old, 19-22 years old, and over 65) in total population. Even when we control for the demographic compositions, the signs of coefficients on education and other expenditures do not change. Second, following Kotakorpi and Laamanen (2008), we add home value or land value in a state to control for the amenity of the state. Again, coefficients on expenditure variables do not change significantly. Lastly, since Alaska has a unique public finance structure, i.e., a significant size of severance tax revenue, we estimate the model excluding Alaska. We do not find significant differences in the coefficients on public finance variables. The results in Table 3-1 are robust to these tests.

3.3.2 Further Analysis Using Detailed Expenditure Categories

While the relationship between public health expenditure and life satisfaction seems intuitive (i.e., greater public health expenditure leads people to be better off), interpreting the negative coefficients on education and welfare expenditures is not straightforward. To further examine the relationships, we break down these expenditures into more detailed categories.

First, we divide the education expenditure into three categories: higher education, elementary and secondary education, and other education. Table 3-2 presents the results. Higher education expenditure has a negative impact on life satisfaction, and seems to drive the negative impact of overall education expenditure (Column 1). The results remain the

same when we include government expenditure (Column 2). We find evidence that elementary and secondary education has a positive impact on life satisfaction (Column 2).[30]

The question remains as to what drives the negative impact of higher education on life satisfaction. One possible explanation is a perception that people have on efficiency and effectiveness of higher education. Since a return on higher education is not necessarily obvious, people may prefer government spend on other purposes than higher education. As we expect people with higher education are well aware of returns on higher education, we examine the impact of higher education among different education levels. Specifically, we include interaction terms between individual's education level and education expenditure (the category of those without high school diploma is omitted). Table 3-3 shows the results. The coefficients on each expenditure variables alone represent the coefficient for the omitted category. Compared to those without a high school diploma, the negative impact of higher education expenditure is smaller for those who have more than a high school diploma. The result indicates that preference over higher education expenditure is different by education levels. We do not observe differential effect by education level for other expenditure categories except for the welfare expenditure. Those with higher education report lower life satisfaction when welfare expenditure is greater.

Another possible explanation for the negative impact of education expenditure on life satisfaction is that the result reflects the different benefit of education expenditure for different social groups. For example, those whose children are in schools might benefit

[30] As mentioned above, this estimation does not include local government. In the U.S., local government plays an important role in K-12 education, and most of the K-12 education expenditure is financed by local property tax. Since the estimation employs state-level data only, this estimation result shows the impact of state-financed K-12 education only.

more from greater expenditure on education. Additionally, even if an individual does not have a child at school age, some elderly might benefit from education expenditure if their grandchildren are at school age. Thus, we examine how the relationship is different by having a child under 18-year old and by age. As we did for the own education level, we add interaction terms between education expenditure and dummies for having a child and age categories.

Table 3-4 shows the results for having a child under 18. The omitted category is not having a child, and the coefficients on each expenditure variables alone represent the coefficients for the omitted category. The coefficient on higher education is negative and significant in both columns, meaning that the expenditure has a negative impact on the life satisfaction of those who do not have children. The coefficients on the interaction terms are all positive though significant only for those having more than three children. The results imply that the negative impact of higher education is smaller or even positive for individuals with a larger number of children. As for K-12 education, the impact is positive for the individual without a child, and there is no statistically significant difference for those having children.

Table 3-5 shows the results of differential impact of education expenditures by age categories. The omitted category is ages from 23 to 64. With respect to higher education, the coefficient for the omitted group is negative and significant. The interaction term for younger age group (ages between 18 and 22) is positive and significant in both columns, implying those who are 22 or younger report higher life satisfaction, relative to those between ages 23 and 64, with greater expenditure on higher education. This result might

reflect the fact that they benefit directly from higher education expenditure. On the other hand, the interaction term for older age group (ages between 65 and 80) is negative and significant. We observe different result for K-12 education. The coefficient is positive and significant for the group of ages from 23 to 64, and the impact is smaller or even negative for the younger age group while it is greater for the old age group. The results imply that the elderly care about education for their grandchild generation while the young, presumably without children in K-12, do not.

In order to analyze the negative impact of welfare expenditure on life satisfaction, in Table 3-6, we separate the welfare expenditure into three categories: cash assistance, vendor payment to private sector, and other[31]. The coefficient on cash assistance is positive and significant while the coefficients on vendor payments and other welfare are negative. The negative impact of vendor payments and others drive the overall negative impact of welfare expenditure.[32] The result implies that people prefer direct cash assistance to other assistance which is provided through third parties.

3.3.3 Government Spending and Life Satisfaction by Income Groups

Next, we examine how the impact of government expenditure differs across income groups. Epple and Romano (1996) discuss the demand for public goods when private

[31] Vendor payments are payments made directly to private purveyors for medical care, burials, and other commodities and services under welfare program (see Appendix B-1 for definitions of public welfare expenditures).

[32] On average, vendor payment (especially, vendor payments for medical care) is about 75.8 percent of welfare expenditure on average across states and years in the data. Cash assistance is approximately 6.5 percent, and other public welfare is 16.7 percent of total welfare expenditure. Negative coefficients on the largest two categories of welfare expenditure drive the negative impact of overall welfare expenditure.

alternatives are available. Specifically, citing public education as an example, they find an equilibrium in which "a coalition of rich and poor prefer reduced public provision, while the middle class prefer an increase."[33] They call this equilibrium "ends against the middle." Kotakorpi and Laamanen (2008) examine whether the "ends against the middle" applies by using life satisfaction and health care expenditure data in Finland. They find that the impact of health care expenditure on life satisfaction is greater for the middle income group than for the low and high income groups. We examine a similar question for the U.S. state expenditures.

Table 3-7 presents the results for the general expenditure by income groups. The coefficients on expenditure categories alone represent the impact of respective expenditure for the lowest income group in this model. The size of general expenditure has a positive impact on life satisfaction of the lowest income group. Coefficients on interaction terms are negative and significant for higher income groups. With a greater general expenditure, higher income groups report lower life satisfaction than does the lowest income group.

Table 3-8 shows the results for the specific expenditure categories by income groups.[34] Coefficients on interaction terms are negative and significant for higher income

[33] According to Epple and Romano (1996), under certain circumstances, higher income groups prefer less public education since they have private alternatives, and lower income groups do not prefer increases in both tax and public education assuming education is normal goods. By contrast, the middle income group uses public education and prefers tax and expenditure increase.

[34] An estimation using a share of specific expenditure, rather than per capita amount, is presented in Appendix B.2 (Table B-7). After controlling for the size of overall expenditure, interaction terms on the share of welfare expenditure is still negative and significant.

groups for welfare expenditure, indicating that the impacts of these expenditure categories are smaller for higher income groups compared to the lowest.[35]

We do not find evidence to support the "ends against the middle" equilibrium in our data for any of the expenditure categories. Our results imply that people prefer lower level of government expenditure as their income increases.

One should note, however, that the estimation in this section allows only expenditure side to have different impacts by income groups and holds the impact of tax revenue constant across income groups. If the impact of revenue side is also different by income groups, the results in this section might have captured such impacts. Section 4.4 of Chapter 4 will examine how the results change when we allow the impacts of both expenditure and revenue sides to vary by income groups.

3.4 Conclusions

We have explored various relationships between life satisfaction and state public expenditure in the U.S., and found new empirical evidence on the relationships, summarized as follows.

First, the size of general expenditure is positively related to life satisfaction. The result remains the same even when the size of tax revenue is controlled. Among different categories of general expenditure, public health expenditure has a positive impact on life

[35] The sum of the coefficient of the expenditure and the coefficient of the interaction term provides the sign of an overall effect for each income group (other than the lowest). For example, in Column 2, the overall effect of welfare expenditure for the highest income group is negative (0.0095-0.0532=-0.0437). For higher income groups, overall impact of welfare expenditure is negative.

satisfaction. For education and welfare expenditures, the impact depends on types of expenditure within the category. In addition, the impact of education expenditure is different by individual characteristics such as education level, age, and the number of children. Second, compared to the lowest income group, higher income groups report lower life satisfaction with greater government expenditure, especially with greater welfare expenditure.

The results suggest that government spending and revenue are related to individual life satisfaction, and the impact is different across individual characteristics. This is important evidence in the discussion of preference over government activities and the demand for public goods. Specifically, our findings imply that people do not prefer government to spend on goods and services that do not benefit them directly.

There are two caveats in this paper. One may be concerned about the problem of omitted variables. Since we are not aware of a large panel data currently available in the U.S., we try to alleviate this problem by controlling relevant individual characteristics and other explanatory variables. However, in order to fully overcome this issue, we await for the large panel data to become available. In addition, while the paper focuses only on the state public finance, local governments also play an important role in some expenditure categories. The analysis using both state and local finance data is our future research topic.

Table 3-1: Government Expenditure and Life Satisfaction

	(1)	(2)	(3)	(4)
General expenditure (log of per capita $)	0.0146**	0.0673***		
	(0.0060)	(0.0098)		
Education expenditure (log of per capita $)			-0.0174***	0.0002
			(0.0062)	(0.0076)
Welfare expenditure (log of per capita $)			-0.0539***	-0.0437***
			(0.0084)	(0.0088)
Health expenditure (log of per capita $)			0.0124***	0.0134***
			(0.0027)	(0.0027)
Other expenditure (log of per capita $)			0.0357***	0.0427***
			(0.0045)	(0.0048)
Taxes (log of per capita $)		-0.0593***		-0.0359***
		(0.0086)		(0.0088)
Poverty rate (%)	-0.0025***	-0.0028***	-0.0014**	-0.0014**
	(0.0006)	(0.0006)	(0.0006)	(0.0006)
Log of per capita personal income	-0.1188***	-0.0893***	-0.1436***	-0.1212***
	(0.0109)	(0.0116)	(0.0114)	(0.0127)
Unemployment rate (%)	-0.0056***	-0.0061***	-0.0030**	-0.0035***
	(0.0011)	(0.0011)	(0.0012)	(0.0012)
Average annual temperature of the state (℉)	0.0023***	0.0023***	0.0017***	0.0018***
	(0.0002)	(0.0002)	(0.0002)	(0.0002)
Observations	1553186	1553186	1553186	1553186
Pseudo R-squared	0.07117	0.07119	0.07120	0.07121

Robust standard errors in parentheses

* significant at 10%; ** significant at 5%; *** significant at 1%

The estimation includes individual characteristics, regional dummies, year dummies, and month dummies.

Table 3-2: Detailed Education Expenditure Categories and Life Satisfaction

	(1)	(2)
Higher education expenditure (log of per capita $)	-0.0257***	-0.0216***
	(0.0057)	(0.0058)
K12 education expenditure (log of per capita $)	0.0061	0.0209***
	(0.0053)	(0.0061)
Other education expenditure (log of per capita $)	-0.0070**	-0.0071**
	(0.0031)	(0.0031)
Welfare expenditure (log of per capita $)	-0.0609***	-0.0487***
	(0.0087)	(0.0090)
Health expenditure (log of per capita $)	0.0147***	0.0164***
	(0.0028)	(0.0028)
Other expenditure (log of per capita $)	0.0370***	0.0461***
	(0.0045)	(0.0049)
Taxes (log of per capita $)		-0.0446***
		(0.0089)
Poverty rate (%)	-0.0014**	-0.0015**
	(0.0006)	(0.0006)
Log of per capita personal income	-0.1543***	-0.1290***
	(0.0118)	(0.0128)
Unemployment rate (%)	-0.0032***	-0.0040***
	(0.0012)	(0.0012)
Average annual temperature of the state (℉)	0.0013***	0.0013***
	(0.0002)	(0.0002)
Observations	1553186	1553186
Pseudo R-squared	0.07121	0.07122

Robust standard errors in parentheses

* significant at 10%; ** significant at 5%; *** significant at 1%

The estimation includes individual characteristics, regional dummies, year dummies, and month dummies.

Table 3-3: Detailed Education Expenditure Categories and Life Satisfaction by Own Education

	(1)	(2)
Higher education expenditure (log of per capita $)	-0.0575***	-0.0541***
	(0.0154)	(0.0154)
Higher educ exp * (Grade 12 or GED)	0.0096	0.0106
	(0.0169)	(0.0169)
Higher educ exp * (College 1 year to 3 years)	0.0484***	0.0489***
	(0.0171)	(0.0171)
Higher educ exp * (College 4 years or more)	0.0443***	0.0450***
	(0.0169)	(0.0169)
K12 education expenditure (log of per capita $)	0.0343*	0.0491***
	(0.0176)	(0.0178)
K12 educ exp * (Grade 12 or GED)	-0.0278	-0.0284
	(0.0193)	(0.0193)
K12 educ exp * (College 1 year to 3 years)	-0.0259	-0.0261
	(0.0196)	(0.0196)
K12 educ exp * (College 4 years or more)	-0.0327*	-0.0331*
	(0.0192)	(0.0192)
Other education expenditure (log of per capita $)	-0.0055	-0.0060
	(0.0099)	(0.0099)
Other educ exp * (Grade 12 or GED)	0.0027	0.0031
	(0.0111)	(0.0111)
Other educ exp * (College 1 year to 3 years)	-0.0026	-0.0024
	(0.0112)	(0.0112)
Other educ exp * (College 4 years or more)	-0.0047	-0.0041
	(0.0110)	(0.0110)
Welfare expenditure (log of per capita $)	-0.0154	-0.0029
	(0.0185)	(0.0187)
Welfare exp * (Grade 12 or GED)	-0.0295	-0.0298
	(0.0195)	(0.0195)
Welfare exp * (College 1 year to 3 years)	-0.0504**	-0.0513***
	(0.0197)	(0.0196)
Welfare exp * (College 4 years or more)	-0.0693***	-0.0699***
	(0.0193)	(0.0193)

	(1)	(2)
Health expenditure (log of per capita $)	0.0096	0.0114
	(0.0084)	(0.0084)
Health exp * (Grade 12 or GED)	0.0027	0.0026
	(0.0092)	(0.0092)
Health exp * (College 1 year to 3 years)	0.0133	0.0133
	(0.0093)	(0.0093)
Health exp * (College 4 years or more)	0.0025	0.0025
	(0.0092)	(0.0092)
Other expenditure (log of per capita $)	0.0396***	0.0474***
	(0.0137)	(0.0138)
Other exp * (Grade 12 or GED)	0.0029	0.0038
	(0.0153)	(0.0153)
Other exp * (College 1 year to 3 years)	-0.0063	-0.0049
	(0.0155)	(0.0155)
Other exp * (College 4 years or more)	-0.0065	-0.0048
	(0.0152)	(0.0152)
Taxes (log of per capita $)		-0.0439***
		(0.0089)
Poverty rate (%)	-0.0014**	-0.0015**
	(0.0006)	(0.0006)
Log of per capita personal income	-0.1526***	-0.1278***
	(0.0118)	(0.0128)
Unemployment rate (%)	-0.0032***	-0.0040***
	(0.0012)	(0.0012)
Average annual temperature of the state (℉)	0.0013***	0.0013***
	(0.0002)	(0.0002)
Observations	1553186	1553186
Pseudo R-squared	0.07124	0.07125

Robust standard errors in parentheses
* significant at 10%; ** significant at 5%; *** significant at 1%
The estimation includes individual characteristics, regional dummies, year dummies, and month dummies.
The category of those without high school diploma is omitted for the interaction terms.

Table 3-4: Detailed Education Expenditure Categories and Life Satisfaction by Having-children or not

	(1)	(2)
Higher education expenditure (log of per capita $)	-0.0322***	-0.0280***
	(0.0066)	(0.0066)
Higher educ exp * (having 1 child)	0.0138	0.0134
	(0.0133)	(0.0133)
Higher educ exp * (having 2 children)	0.0200	0.0200
	(0.0136)	(0.0135)
Higher educ exp * (having 3 or more children)	0.0322*	0.0324*
	(0.0168)	(0.0168)
K12 education expenditure (log of per capita $)	0.0100	0.0248***
	(0.0063)	(0.0069)
K12 educ exp * (having 1 child)	-0.0089	-0.0088
	(0.0143)	(0.0143)
K12 educ exp * (having 2 children)	-0.0210	-0.0212
	(0.0144)	(0.0144)
K12 educ exp * (having 3 or more children)	-0.0007	-0.0008
	(0.0183)	(0.0183)
Other education expenditure (log of per capita $)	-0.0079**	-0.0081**
	(0.0037)	(0.0037)
Other educ exp * (having 1 child)	0.0113	0.0111
	(0.0083)	(0.0083)
Other educ exp * (having 2 children)	-0.0026	-0.0025
	(0.0086)	(0.0086)
Other educ exp * (having 3 or more children)	-0.0019	-0.0021
	(0.0110)	(0.0110)
Welfare expenditure (log of per capita $)	-0.0639***	-0.0517***
	(0.0094)	(0.0097)
Welfare educ exp * (having 1 child)	-0.0099	-0.0100
	(0.0149)	(0.0149)
Welfare educ exp * (having 2 children)	0.0138	0.0136
	(0.0153)	(0.0153)
Welfare educ exp * (having 3 or more children)	0.0319	0.0314
	(0.0194)	(0.0194)

	(1)	(2)
Health expenditure (log of per capita $)	0.0145***	0.0162***
	(0.0032)	(0.0032)
Health educ exp * (having 1 child)	0.0007	0.0008
	(0.0069)	(0.0069)
Health educ exp * (having 2 children)	-0.0045	-0.0044
	(0.0070)	(0.0070)
Health educ exp * (having 3 or more children)	0.0084	0.0083
	(0.0088)	(0.0088)
Other expenditure (log of per capita $)	0.0347***	0.0438***
	(0.0054)	(0.0057)
Other educ exp * (having 1 child)	-0.0053	-0.0053
	(0.0118)	(0.0118)
Other educ exp * (having 2 children)	0.0114	0.0117
	(0.0120)	(0.0120)
Other educ exp * (having 3 or more children)	0.0156	0.0158
	(0.0152)	(0.0152)
Taxes (log of per capita $)		-0.0445***
		(0.0089)
Poverty rate (%)	-0.0014**	-0.0015**
	(0.0006)	(0.0006)
Log of per capita personal income	-0.1546***	-0.1294***
	(0.0118)	(0.0128)
Unemployment rate (%)	-0.0033***	-0.0040***
	(0.0012)	(0.0012)
Average annual temperature of the state (℉)	0.0013***	0.0013***
	(0.0002)	(0.0002)
Observations	1553186	1553186
Pseudo R-squared	0.0712	0.0712

Robust standard errors in parentheses

* significant at 10%; ** significant at 5%; *** significant at 1%

The estimation includes individual characteristics, regional dummies, year dummies, and month dummies.

The category of not-having a child is omitted for the interaction terms.

Table 3-5: Detailed Education Expenditure Categories and Life Satisfaction by Age Group

	(1)	(2)
Higher education expenditure (log of per capita $)	-0.0185***	-0.0143**
	(0.0063)	(0.0064)
Higher educ exp * (age<=22)	0.0819***	0.0818***
	(0.0304)	(0.0304)
Higher educ exp * (age>=65)	-0.0343***	-0.0344***
	(0.0102)	(0.0102)
K12 education expenditure (log of per capita $)	0.0014	0.0162**
	(0.0060)	(0.0067)
K12 educ exp * (age<=22)	-0.0983***	-0.0984***
	(0.0331)	(0.0331)
K12 educ exp * (age>=65)	0.0258**	0.0258**
	(0.0111)	(0.0111)
Other education expenditure (log of per capita $)	-0.0113***	-0.0114***
	(0.0035)	(0.0035)
Other educ exp * (age<=22)	0.0244	0.0245
	(0.0188)	(0.0188)
Other educ exp * (age>=65)	0.0160**	0.0159**
	(0.0067)	(0.0067)
Welfare expenditure (log of per capita $)	-0.0608***	-0.0486***
	(0.0092)	(0.0095)
Welfare educ exp * (age<=22)	0.0050	0.0039
	(0.0341)	(0.0341)
Welfare educ exp * (age>=65)	0.0023	0.0026
	(0.0117)	(0.0117)
Health expenditure (log of per capita $)	0.0135***	0.0152***
	(0.0031)	(0.0031)
Health educ exp * (age<=22)	-0.0172	-0.0172
	(0.0158)	(0.0158)
Health educ exp * (age>=65)	0.0053	0.0054
	(0.0055)	(0.0055)
Other expenditure (log of per capita $)	0.0451***	0.0544***
	(0.0051)	(0.0054)
Other educ exp * (age<=22)	0.0519**	0.0518**
	(0.0264)	(0.0264)
Other educ exp * (age>=65)	-0.0414***	-0.0419***
	(0.0095)	(0.0095)
Taxes (log of per capita $)		-0.0448***
		(0.0089)
Poverty rate (%)	-0.0013**	-0.0014**
	(0.0006)	(0.0006)
Log of per capita personal income	-0.1526***	-0.1273***
	(0.0118)	(0.0128)
Unemployment rate (%)	-0.0035***	-0.0043***
	(0.0012)	(0.0012)
Average annual temperature of the state (℉)	0.0013***	0.0013***
	(0.0002)	(0.0002)
Observations	1553186	1553186
Pseudo R-squared	0.0715	0.0715

Robust standard errors in parentheses

* significant at 10%; ** significant at 5%; *** significant at 1%

The estimation includes individual characteristics, regional dummies, year dummies, and month dummies.

The category of (22<age<65) is omitted for the interaction terms.

Table 3-6: Detailed Welfare Expenditure Categories and Life Satisfaction

	(1)	(2)
Cash assistance (log of per capita $)	0.0092***	0.0086***
	(0.0016)	(0.0016)
Vendor payments (log of per capita $)	-0.0546***	-0.0480***
	(0.0077)	(0.0082)
Other public welfare (log of per capita $)	-0.0183***	-0.0161***
	(0.0032)	(0.0034)
Education expenditure (log of per capita $)	-0.0074	0.0017
	(0.0064)	(0.0076)
Health expenditure (log of per capita $)	0.0125***	0.0129***
	(0.0028)	(0.0028)
Other expenditure (log of per capita $)	0.0388***	0.0425***
	(0.0047)	(0.0050)
Taxes (log of per capita $)		-0.0209**
		(0.0092)
Poverty rate (%)	-0.0015**	-0.0016**
	(0.0006)	(0.0006)
Log of per capita personal income	-0.1681***	-0.1529***
	(0.0118)	(0.0136)
Unemployment rate (%)	-0.0037***	-0.0040***
	(0.0012)	(0.0012)
Average annual temperature of the state (℉)	0.0019***	0.0020***
	(0.0002)	(0.0002)
Observations	1553186	1553186
Pseudo R-squared	0.07122	0.07122

Robust standard errors in parentheses

* significant at 10%; ** significant at 5%; *** significant at 1%

The estimation includes individual characteristics, regional dummies, year dummies, and month dummies.

Table 3-7: General Expenditure and Life Satisfaction by Income

	(1)	(2)
General expenditure (log of per capita $)	0.0993***	0.1490***
	(0.0150)	(0.0168)
General exp * Income category 2 ($15K<Income<35K)	-0.0565***	-0.0561***
	(0.0167)	(0.0167)
General exp * Income category 3 ($35K<Income<50K)	-0.0890***	-0.0876***
	(0.0183)	(0.0183)
General exp * Income category 4 ($50K<Income<75K)	-0.1193***	-0.1178***
	(0.0181)	(0.0181)
General exp * Income category 5 ($75K or more)	-0.1246***	-0.1223***
	(0.0171)	(0.0171)
Taxes (log of per capita $)		-0.0574***
		(0.0086)
Poverty rate (%)	-0.0026***	-0.0029***
	(0.0006)	(0.0006)
Log of per capita personal income	-0.1168***	-0.0883***
	(0.0109)	(0.0116)
Unemployment rate (%)	-0.0055***	-0.0060***
	(0.0011)	(0.0011)
Average annual temperature of the state (℉)	0.0023***	0.0023***
	(0.0002)	(0.0002)
Observations	1553186	1553186
Pseudo R-squared	0.07120	0.07121

Robust standard errors in parentheses

* significant at 10%; ** significant at 5%; *** significant at 1%

The estimation includes individual characteristics, regional dummies, year dummies, and month dummies.

The category of the lowest income (Income<$15K) is omitted for the interaction terms.

Table 3-8: General Expenditure Categories and Life Satisfaction by Income

	(1)	(2)
Education expenditure (log of per capita $)	-0.0121	0.0044
	(0.0166)	(0.0172)
Educ exp * Income category 2 ($15K<Income<35K)	-0.0012	-0.0012
	(0.0187)	(0.0187)
Educ exp * Income category 3 ($35K<Income<50K)	-0.0098	-0.0095
	(0.0204)	(0.0204)
Educ exp * Income category 4 ($50K<Income<75K)	-0.0061	-0.0059
	(0.0204)	(0.0204)
Educ exp * Income category 5 ($75K or more)	-0.0043	-0.0045
	(0.0194)	(0.0194)
Welfare expenditure (log of per capita $)	-0.0005	0.0095
	(0.0156)	(0.0158)
Welfare exp * Income category 2 ($15K<Income<35K)	-0.0472***	-0.0476***
	(0.0161)	(0.0161)
Welfare exp * Income category 3 ($35K<Income<50K)	-0.0707***	-0.0711***
	(0.0175)	(0.0175)
Welfare exp * Income category 4 ($50K<Income<75K)	-0.0787***	-0.0793***
	(0.0174)	(0.0174)
Welfare exp * Income category 5 ($75K or more)	-0.0525***	-0.0532***
	(0.0164)	(0.0164)
Health expenditure (log of per capita $)	0.0116	0.0127*
	(0.0074)	(0.0074)
Health exp * Income category 2 ($15K<Income<35K)	0.0114	0.0113
	(0.0084)	(0.0084)
Health exp * Income category 3 ($35K<Income<50K)	0.005	0.0048
	(0.0092)	(0.0092)
Health exp * Income category 4 ($50K<Income<75K)	-0.0012	-0.0014
	(0.0091)	(0.0091)
Health exp * Income category 5 ($75K or more)	-0.0131	-0.0133
	(0.0087)	(0.0087)

	(1)	(2)
Other expenditure (log of per capita $)	0.0617***	0.0673***
	(0.0124)	(0.0125)
Other exp * Income category 2 ($15K<Income<35K)	-0.0199	-0.0196
	(0.0142)	(0.0142)
Other exp * Income category 3 ($35K<Income<50K)	-0.019	-0.0183
	(0.0156)	(0.0156)
Other exp * Income category 4 ($50K<Income<75K)	-0.0341**	-0.0329**
	(0.0155)	(0.0155)
Other exp * Income category 5 ($75K or more)	-0.0447***	-0.0426***
	(0.0147)	(0.0147)
Taxes (log of per capita $)		-0.0338***
		(0.0088)
Poverty rate (%)	-0.0015**	-0.0015**
	(0.0006)	(0.0006)
Log of per capita personal income	-0.1410***	-0.1200***
	(0.0114)	(0.0127)
Unemployment rate (%)	-0.0029**	-0.0033***
	(0.0012)	(0.0012)
Average annual temperature of the state (℉)	0.0018***	0.0018***
	(0.0002)	(0.0002)
Observations	1553186	1553186
Pseudo R squared	0.07124	0.07125

Robust standard errors in parentheses

* significant at 10%; ** significant at 5%; *** significant at 1%

The estimation includes individual characteristics, regional dummies, year dummies, and month dummies.

The category of the lowest income (Income<$15K) is omitted for the interaction terms.

Chapter 4

Life Satisfaction and Government Revenue Using U.S. Micro Data

4.1 Introduction

Our well-being depends on government activities to some extent. We rely on public services, such as education, public health, and social security, while we pay government taxes to finance its activities. The relationship between government activities and well-being is an important topic in economics.

Some literature employs subjective well-being data such as self-reported life satisfaction or happiness level, to examine the relationship directly. Various studies focus on the expenditure side of government and examine its empirical relationship with subjective well-being. Those include Veenhoven (2000), Ouweneel (2002), and Bjørnskov et al. (2007). On the other hand, there are only a few empirical works which study the impact of revenue side of government on subjective well-being. The only study of which we are aware is Oishi et al. (2012). They study the relationship between progressivity of income tax and subjective well-being using cross-country data, and find that the progressivity of income tax is positively related to various measures of subjective well-being.[36]

This paper explores the relationship between life satisfaction and overall structure of government revenue by using individual life satisfaction data from the Behavioral Risk Factor Surveillance System (BRFSS), which surveys more than 350,000 different individuals every year

[36] Although it does not directly examine the relationship between revenue structure and subjective well-being, Lubian and Zarri (2011) study the "tax-payers intrinsic motivation to pay tax".

in the U.S., and state government public finance data for the period from 2005 to 2009. Specifically, there are three main questions that this paper examines. The first question is how the government revenue structure, i.e., the source of revenue, is related to life satisfaction. The main sources of government revenue are taxes and transfer from other governments.[37] There are reasons in which the revenue structure can impact life satisfaction. For example, people may be more satisfied if government spending is financed by non-tax revenues, such as intergovernmental transfer, because someone else pays for a part of public service that they receive.

Second, the paper examines the relationship between tax structure and life satisfaction. Each tax possesses different characteristics; for example, income tax is more progressive (or proportional if flat rate) while sales tax is more regressive measured as a share in income. We would expect that a specific tax has a specific impact on life satisfaction and the impact is different across income groups. Higher income groups may prefer a smaller share of individual income tax in tax revenue since they have to pay a higher share of their income with the income tax.

The third question asks whether and how the relationships differ when the structures of both government expenditure and tax are considered together. The analysis enables us to discuss whether people care about both sides or only one side of government, and how the relationship may be different across income groups. For example, since low income groups depend more on public goods and services than the higher income group, they may care about the expenditure side of government. For the higher income groups, despite the fact that they have alternatives for

[37] Since this paper studies the activities of state government in the U.S. which keep balanced budget in principle, I do not consider debt finance in this paper.

some public goods, they pay certain amount of taxes which depends significantly on the tax structure. Thus, higher income groups may care less about the expenditure and more about the tax side than do the low income groups. The paper examines whether the results obtained considering only one side change when both sides are considered.

The analysis shows that government revenue structure matters for life satisfaction as follows. First, life satisfaction is higher with a greater amount of intergovernmental revenue while it is lower with a greater amount of tax revenue. Second, among taxes, individual income tax has a negative impact on life satisfaction. In particular, higher income groups report lower life satisfaction with a greater amount of individual income tax than does the lowest income group. Lastly, when both sides of the public finance are considered, the impacts of both government expenditure and tax revenue are smaller for higher income groups compared to the lowest income group.

To the best of my knowledge, this is the only study which examines the relationship between subjective well-being and overall structure of government revenue. The empirical findings in this paper provide important insights in the fields of happiness economics and public economics. The determinant of life satisfaction is an important topic in happiness economics. The empirical evidence regarding the relationship between public finance and well-being provides implications for people's preference over government revenue structure, especially taxation, and contributes to the discussion of tax incidents.

Section 4.2 describes data and the empirical model. Sections 4.3 and 4.4 present and discuss the results. The last section concludes.

4.2 Data and Empirical Model

The following is the baseline model of this paper:

$$Satisfaction_{iskt}=\alpha+\beta_1 Public\ Finance_{skt}+\beta_2 State_{skt}+\gamma Individual_{iskt}+\theta Region_k+\delta Time_t+\varepsilon_{iskt}$$

Satisfaction is the life satisfaction level, reported by individual *i* in state *s* in region *k* in year *t*. *Public Finance* is a set of public finance variables of our interest, and *State* is a vector of state-level control variables. *Individual* is a set of personal characteristics of respondents. *Region* is a set of dummy variables for eight regions in the U.S. *Time* is a vector of variables that control time effects, such as interview year dummies and interview month dummies. ε is an error term. The rest of this section describes the variables in details.

4.2.1 Life Satisfaction

Life satisfaction data comes from the Behavioral Risk Factor Surveillance System (BRFSS). The variable is given as an answer to the following question: "In general, how satisfied are you with your life?" The respondent choses his/her satisfaction level from the following four categories: "very satisfied," "satisfied," "dissatisfied," and "very dissatisfied." We assign discrete values from 1 to 4 to each category such that "very satisfied" is 4 and "very dissatisfied" is 1. Following the existing empirical studies, this paper treats the reported life satisfaction as a proxy for well-being.[38]

[38] The reliability and usefulness of the reported life satisfaction data are discussed in prior studies, and for example, Frey and Stutzer (2002b) summarize the discussion.

4.2.2 Public Finance Variables

Public Finance variables are the state-level public finance data, and obtained from the U.S. Census Bureau. Public Finance includes different variables based on the question. The first question is how revenue structure impacts reported well-being. For this analysis, *Public Finance* includes per capita amount of specific categories of general revenue.[39] The specific categories are taxes and intergovernmental transfer. In addition, the estimation adds general expenditure per capita to prevent revenue variables from being a proxy for expenditure size.

Second, this paper studies the impact of tax structure on reported well-being, and the model for this analysis includes per capita amount of specific tax categories in Public Finance. The model also includes general expenditure to control for overall size of public goods and services. Averaged over states and years, general sales tax and individual income tax constitute approximately 60 percent of tax revenue. Since these are the major tax categories and are related to all citizens in a state, our study focuses on these two taxes. Furthermore, in order to focus on the impact of tax structure in more details, we also estimate a model which employs shares of specific taxes in tax revenue. As mentioned previously, people may have preference over the composition of general revenue, i.e., people may prefer intergovernmental transfer to tax revenue. Per capita values of specific taxes may capture both the impact of overall tax revenue and those of specific taxes. Thus, we include shares of specific taxes in overall tax revenue while

[39] To define public finance variables, existing studies employ either per capita amount (e.g. Kotakorpi and Laamanen. 2008) or a percentage in overall amount, e.g., percentage of education expenditure in overall expenditure (e.g. Hessami, 2010). This paper employs per capita dollar amount (in log form) as a baseline variable to measure public finance variables. I believe that using per capita amount enables us to measure an approximate amount of public goods and services a typical person in the state receives and to measure an approximate amount of taxes s/he pays. Further, this paper also employs a percentage of specific variables in some estimation, depending on the question examined.

controlling the size of overall tax revenue. This specification allows us to discuss which types of taxes people prefer holding the overall tax revenue constant.

Lastly, this paper examines the impact of government expenditure and taxes on reported well-being when both are considered together. The model for this estimation includes both expenditure and tax variables in *Public Finance*.

In addition to these baseline models, we examine how the relationship is different across income groups by including interaction terms between income categories and Public Finance variables (the interaction variable for the lowest income group is omitted).

4.2.3 Other Control Variables

The empirical model includes various control variables. *State*, which is a set of state-level control variables, consists of (i) unemployment rate, taken from the Bureau of Labor Statistics, (ii) poverty rate from Center for Poverty Research at University of Kentucky, (iii) per capita personal income from the Bureau of Economic Analysis (BEA), and (iv) average annual temperature from the National Oceanic and Atmospheric Administration, of state s in year t. We would expect coefficients on unemployment rate, poverty rate, and per capita personal income to be negative while coefficient on average temperature to be positive.

Individual, which is a set of personal characteristics of respondents obtained from the BRFSS, includes age, age squared, gender, race, marital status, job status, education, household income level, the number of children, and residential information (i.e., rural or suburb). The most studies in the literature show that coefficients on age, male, unemployed, widowed, divorced, and the number of children are negative while coefficients on age squared, income level, and

education level are positive. The expected sign of coefficients on suburban or rural is ambiguous since both positive and negative effects exist.

Region is the U.S. eight regional dummies based on the definition provided by BEA. The regions are Mideast, Great Lakes, Plain, Southeast, Southwest, Rocky Mountain, and Far West (New England is omitted).

Since the dependent variable is a categorical variable, this paper employs ordered probit model. Appendix C-1 provides detailed descriptions and sources. Table C- 1 in Appendix C-2 presents summary statistics of the variables. The estimations employ the sample of adults with ages between 18 and 85 years old.[40] Because of the data availability, the District of Columbia, Guam, Virgin Islands, and Puerto Rico are excluded from the sample.

4.3 Government Revenue Structure and Life Satisfaction

This section explores the relationship between life satisfaction and government revenue structure. In particular, we examine how sizes of intergovernmental transfer and taxes are related to life satisfaction.

4.3.1 Baseline Model Results

We first examine the impact of overall revenue structure on life satisfaction. We would expect that, holding the size of general expenditure constant, life satisfaction is higher when non-tax revenue, such as intergovernmental revenue, is greater because more public goods and

[40] This follows Oswald and Wu (2009).

services are financed by sources other than what they pay themselves. Similarly, we would expect the amount of tax revenue is negatively related to life satisfaction.

Table 4-1 presents the results.[41] As shown in Column 1, the tax revenue has a negative impact on life satisfaction. In addition, as expected and shown in Column 2, the impact of intergovernmental transfer is positive and significant. Life satisfaction is higher with greater intergovernmental transfer. In Column 3, we include all categories of general revenue. The signs and significance of the coefficients on tax revenue and intergovernmental transfer do not change significantly. When we add general expenditure (Columns 4 through 6), the results on tax and intergovernmental transfer also remain the same, although the coefficient on general expenditure itself becomes negative and significant in Column 5 which includes only intergovernmental revenue, and not taxes.[42] This seems to reflect the negative impact of tax revenue. Holding intergovernmental transfer constant, the greater general expenditure implies that the greater amount of the expenditure is financed by tax and other revenues. The results here support our expectation that people report higher life satisfaction when government spending is financed by non-tax forms of revenue.

Next, we examine the impact of tax structure on life satisfaction in more details, i.e., how the impact is different by tax types. Specifically, we focus on the impacts of individual income tax and general sales tax. Since income tax is progressive (or proportional if flat rate) while sales taxes are generally more regressive, tax burden is different among income groups. If people are

[41] Coefficients on regional dummies and individual characteristics, corresponding to the estimation in Table 4-1, are presented in Table C-2 in Appendix C-2. All estimations in the rest of this paper include individual characteristics and time and regional dummies though not reported.

[42] Since the general expenditure is almost equal to the sum of four general revenue categories, I do not estimate a model with all four revenue categories and the general expenditure.

concerned only about their tax burden, the impact of tax structure for the whole sample is ambiguous. Further, if people prefer income equality in the society, the size of income tax would be positively correlated with life satisfaction. On the other hand, if people believe that social mobility is high and they can succeed in the future or have already succeeded, they may not prefer income tax. Thus, the relationship between tax structure and life satisfaction is unclear.

Table 4-2 shows the results for detailed categories of tax revenue.[43] The estimation model combines all other categories of taxes except for income and sales taxes, and includes it in the estimation as "Other taxes". The results show that all types of tax revenues are negatively related to life satisfaction. As shown in Table 4-1, since life satisfaction is lower with a greater amount of tax revenue, the results in Table 4-2 may reflect the negative impact of the overall tax revenue. Thus, we also estimate the impact of specific taxes when holding overall tax revenue constant, i.e., we include overall tax revenue per capita and a share of specific tax in tax revenue rather than per capita amount of specific taxes.

Table 4-3 shows the results. The share of individual income tax in tax revenue has a negative impact on life satisfaction (Columns 1 and 2). The coefficients on the share of general sales tax are statistically insignificant in both columns. The results here indicate that individual income tax has a negative impact on life satisfaction.[44]

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[43] I do not include other revenue categories in the estimation as the analysis focuses on the relationship between life satisfaction and tax structure. Further, as in Table 4-1, including other revenue categories do not affect the sign and significance of the coefficient on tax revenue.

[44] I recognize that property tax, which are mostly charged by local government rather than statement government, is also important in the U.S. Tables C-3 and C-4 in Appendix C-2 show the results regarding the impact of property tax using state and local government data. The per capita amount of property tax has a positive impact on life satisfaction while I do not find statistically significant result for the percentage of property tax in tax revenue. The positive impact may reflect the fact that most of property tax revenue is used for K-12 education at local level.

While we utilize the whole sample in Table 4-2 and Table 4-3, some states in the U.S. have no individual income tax and/or no general sales tax.[45] Not having either income or sales tax may bring a special advantage, such as less time and effort to file state income tax or the ease of transaction without general sales tax. Thus, Table 4-4 estimates the impact of not having individual income or general sales tax by including dummy variables for not having income tax and not having sales tax. Both dummies have positive and significant coefficients, indicating life satisfaction is higher in states without either type of taxes.[46]

In this section, we find that the government revenue structure matters for individual life satisfaction. Life satisfaction is higher with a greater amount of non-tax form of revenue such as intergovernmental transfer. Moreover, life satisfaction is lower with a greater amount of individual income tax. The results imply that people prefer state spending financed by sources other than their taxes, and people prefer smaller individual income tax.

4.3.2 Tax Revenue and Life Satisfaction by Income Groups

We found that tax revenue, especially individual income tax, has a negative impact on life satisfaction for the whole sample in the previous section. This section examines how the

[45] Specifically, revenue from general sales tax is zero in Delaware, Montana, New Hampshire, and Oregon while revenue from individual income tax is zero in Florida, Nevada, South Dakota, Texas, Washington, and Wyoming. Additionally, Alaska does not generate any revenues from either the general sales tax or the individual income tax.

[46] Since not-having specific taxes has a positive impact on life satisfaction, the results in Tables 4-2 and 4-3 may be a combination of the impact of not-having specific tax and the impact of the size of specific taxes. As a robustness check, I estimate the same equation as Tables 4-2 and 4-3 by limiting the samples to states with both individual and general sales taxes. When I employ per capita amount of taxes, both individual income tax and general sales tax have negative impacts on life satisfaction as in Table 4-2 (though the coefficient on sales tax loses its statistical significance). Additionally, when I employ a percentage of each tax category in tax revenue, the individual income tax has a negative impact on life satisfaction while the share of general sales tax has a positive impact.

relationship between the tax structure and life satisfaction differs across income groups. The relationship between tax structure and life satisfaction may be different across income groups since individual tax burden can differ under different tax structures. As burden of income tax is greater for higher income groups, the size of individual income tax is expected to have a greater negative impact on life satisfaction of higher income groups. To examine this question, we include interaction terms between income categories and the size of each tax in addition to variables in the baseline model. Specifically, this section examines how the impact of tax revenue is different by income groups when the impact of government expenditure is held constant across income groups. Note that holding the impact of government size constant across income groups may bias the estimation results since the differential impacts of taxes could capture both the differential impacts of tax and expenditure. Section 4.4 examines how the results in this section may change when we allow the impacts of both revenue and expenditure to be different by income groups.

Table 4-5 shows the results for overall tax revenue. Column 1 shows the interaction terms are negative and significant for the highest two income groups. It indicates that, compared to the lowest income group, higher income groups report lower life satisfaction with greater tax revenue. When we add general expenditure to control for the size of public goods and services in a state, the results remain the same (Column 2). The results here imply higher income groups (especially the highest two groups) prefer lower tax revenue compared to the lowest income group.

Table 4-6 shows the results for individual income tax and general sales tax when taxes are measured in per capita amount. Compared to the lowest income group, higher income groups

report lower life satisfaction when the individual income tax revenue is greater. The general sales tax also has a greater negative impact on the highest two income groups. Again, these results may simply reflect the impact of overall tax size for the different income group. Thus, we also estimate a model, which employs shares of specific taxes in tax revenue rather than per capita amount.

Table 4-7 shows the results. Compared to the lowest income group, higher income groups report lower life satisfaction with a greater amount of tax revenue as we found in Table 4-5. With respect to the specific tax categories, higher income groups report lower life satisfaction than does the lowest income group when individual income tax constitutes a greater share in tax revenue. The highest two income groups also report a lower life satisfaction than does the lowest income group with a greater share of general sales tax in tax revenue.

Given the fact that income tax is progressive (or proportional), it is reasonable for higher income groups to report lower life satisfaction with a greater share of income tax because they usually pay more than the lower income groups for the same level of government expenditure. On the contrary, an interpretation of the results on general sales tax is not straightforward. Since sales tax is regressive in terms of a share in income, we expected that the size of sales tax has a greater negative impact on lower income groups than on the higher income groups. One possible explanation for the results above may be that general sales tax is more visible for higher income groups. For example, while general sales tax applies the same rate to everyone, it is generally exempted for food and necessities. If the share of food and necessities in their total spending is smaller for higher income groups, they may feel that they pay more sales tax than does the lowest income group. Further, although the sales tax is regressive in the share of individual

income, in absolute value, higher income groups pay more than does the lowest income groups. For example, averaged across all states in 2007, a group with annual income less than $18,000 paid 3.3 percent of their income in state and local general sales taxes.[47] Given that the group's average income is $10,700, the group, on average, paid $353.1 (=$10,700*3.3%) in general sales tax. On the other hand, an income group with income between $90,000 and $185,000 pays 1.6 percent of their income to general sales tax. With their average income of $122,400, they pay $1,958.4 in sales tax. The results in this paper may reflect the fact that higher income groups pay more for general sales tax in absolute value.

The estimation results in this section show that an impact of tax structure on life satisfaction is different across income groups. Specifically, the individual income tax has a greater negative impact for higher income groups compared to the lowest income group.[48] We also find that general sales tax has a greater negative impact for the highest two income groups. The results imply that the higher income groups do not prefer higher shares of income and general sales taxes. As noted above, however, we keep the impact of government expenditure constant across income groups in this section. The next section examines how the results change when we allow the impacts of both sides of government to be different by income groups.

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[47] The data is from Institute on Taxation & Economic Policy, 2009, "Who pays? A Distributional Analysis of the Tax Structure in All 50 State 3rd Edition".

[48] I also estimate how the impact of not having a specific tax differs among income groups using dummies for not-having individual income tax and general sales tax. The results are consistent with Table 4-6 and Table 4-7. For individual income tax, the coefficients on interaction terms are positive and significant for higher income groups (although insignificant for the highest). As for general sales tax, the coefficients of interaction terms for the highest two income groups are positive. Compared to the lowest income group, higher income groups report higher life satisfaction for not having the specific taxes. Furthermore, I estimate the model as in Table 4-6 and Table 4-7 by limiting samples to states with both income and sales taxes. The results on interaction terms for income tax and sales tax do not change significantly from those in Table 4-6 and Table 4-7.

4.4 Government Expenditure, Tax Structure, and Life Satisfaction

We have explored the impact of government revenue on life satisfaction so far. When investigating the impact of one side of public finance in previous sections, we controlled for the other side by including per capita tax or per capita expenditure amount. This section explores the impact of public finance on well-being considering both expenditure and tax structures together, and discusses how the results change from those in previous sections. In this section, we simply include both government spending and tax variables to one estimating equation.

4.4.1 Baseline Model Results

We first explore the relationship for the whole sample as provided in Table 4-8. The signs of coefficients on expenditure categories and specific taxes remain the same as when we consider only one side of the public finance. Welfare expenditure and individual income tax have negative impacts on life satisfaction while health expenditure has a positive impact. Including both sides of government structures has no significant effect on the impact of government spending and taxes on life satisfaction. The result here is consistent with the results when only one side is considered.[49]

4.4.2 Government Expenditure, Tax Structure, and Life Satisfaction: By Income Groups

In previous sections, we found that higher income groups report lower life satisfaction than does the lowest income group with greater government expenditure and taxes. In this

[49] I also estimate a model which employs percentage values for tax structure. The results do not change significantly when only one side is considered.

section, we examine the impact of public finance by income groups, considering both government expenditure and tax structures.

We first examine the impact of overall expenditure and tax as shown in Table 4-9. Columns 1 and 2 are presented for comparison purposes. Column 1 shows that, holding the impact of tax revenue constant across income groups, the impact of general expenditure is smaller or even negative for higher income groups compared to the lowest income group. Column 2 is already presented in Table 4-5, and indicates that, holding the impact of general expenditure constant across income groups, the negative impact of tax revenue is greater (in absolute value) for higher income groups compared to the lowest income group. Column 3 is the result of our interest in this section. Coefficients on expenditure remain the same compared to the results in Column 1. The results for tax revenue are, however, different from the results in Column 2: the negative impact of tax revenue is smaller for higher income groups compared to the lowest. The result suggests that, for the lowest income group, government expenditure has a positive impact on life satisfaction while tax revenue has a negative impact. For other income groups, the positive impact of government expenditure and the negative impact of tax revenue both are smaller (in absolute value). The results also suggest that the coefficients on taxes in Column 2 of this table seem to reflect the negative impact of government expenditure. The new results here imply that the lowest income group depends more on government sector and care about its expenditure and revenue sources than do higher income groups who depend less on the government sector. In other words, the higher income groups care less about public finance than does the lowest income group.

Table 4-10 presents the results of the impacts of both specific expenditures and taxes by income groups. With respect to the expenditure categories, impacts of all categories are smaller or even negative for higher income groups though insignificant for the health expenditure. Although the results are not reported in this chapter, we obtain similar results when we estimate the different impact of specific expenditure by income groups, holding the impact of taxes same across the groups.[50]

The results on tax side are different from the results when keeping the impact of general expenditure constant among income groups. The negative impact of individual income tax is smaller for the third and the fifth income groups while we do not observe significant differences among income groups for the impact of general sales tax. As we discussed in the previous section, the results in Table 4-10 may reflect the impact of overall tax revenue rather than the impact of the size of specific taxes. Thus, we also estimate a model, which includes a share of each tax rather than per capita value.

Table 4-11 presents the results. The impact of the tax revenue itself has a negative impact on life satisfaction of the lowest income group, and it is smaller (in absolute value) for higher income groups as in Table 4-9. Although the impact of shares of individual income tax and general sales tax are positive for the lowest income group, the overall impact of individual income and sales taxes is smaller and even negative for higher income groups. The results on

[50] Table 3-7 in Chapter 3 reports the results.

shares of individual income tax and general sales tax are consistent with the results when we control only the tax structure in the previous section (i.e., the results in Table 4-7).[51]

This section discusses the impact of public finance when both sides of government activities are considered. The results for government expenditure are consistent with what we found when only government expenditure side was considered; however, the results on overall tax revenue changed when we consider only one side or both sides of the government. Moreover, we find that, compared to the lowest income group, the impacts of both overall general expenditure and overall tax revenue are smaller for higher income groups.

4.5 Conclusions

This paper explored the relationships between life satisfaction and revenue side of state public finance in the U.S., and found new empirical evidence on the relationships, summarized as follows.

First, tax revenue size is negatively related to life satisfaction while non-tax form of revenue is positively related. Among different categories of taxes, individual income tax has a negative impact on life satisfaction. Additionally, not-having income tax or sales tax has a positive impact on life satisfaction. Further, with greater individual income tax, higher income groups report lower life satisfaction than does the lowest income group.

[51] I also estimate the model for each income group separately rather than using interaction terms. The results on public finance variables are similar for expenditure categories and income tax while the results for sales tax become all insignificant.

Second, considering the government expenditure and tax structures together, the positive impact of government expenditure and negative impact of overall tax revenue are both smaller for higher income groups.

The results suggest that government revenue structure, which has not been examined in existing literature, are related to individual life satisfaction, and the impact is different across income groups. This is important evidence in the discussion of preference over government activities, especially over tax structure. In particular, our findings imply that people prefer government spending to be financed by sources other than their own taxes.

There is a caveat with our analysis. Since our data is repeated cross sectional data, our estimation might be distorted by unobserved characteristics. Although we try to alleviate this problem by controlling relevant individual characteristics and other explanatory variables, in order to fully overcome this issue, we need panel analysis once a large panel data become available.

Table 4-1: General Revenue and Life Satisfaction

	(1)	(2)	(3)	(4)	(5)	(6)
Taxes (log of per capita $)	-0.0128**		-0.0360***	-0.0593***		-0.0489***
	(0.0053)		(0.0064)	(0.0086)		(0.0089)
Intergovernmental revenue (log of per capita $)		0.0243***	0.0233***		0.0431***	0.0316***
		(0.0044)	(0.0060)		(0.0072)	(0.0075)
Current charges (log of per capita $)			-0.0092**			
			(0.0038)			
Miscellaneous general revenue (log of per capita $)			0.0185***			
			(0.0032)			
General expenditure (log of per capita $)				0.0673***	-0.0326***	0.0234
				(0.0098)	(0.0100)	(0.0143)
Poverty rate (%)	-0.0018***	-0.0036***	-0.0036***	-0.0028***	-0.0040***	-0.0038***
	(0.0006)	(0.0006)	(0.0007)	(0.0006)	(0.0006)	(0.0006)
Log of per capita personal income	-0.1124***	-0.1146***	-0.1186***	-0.0893***	-0.1113***	-0.0890***
	(0.0112)	(0.0109)	(0.0132)	(0.0116)	(0.0109)	(0.0116)
Unemployment rate (%)	-0.0069***	-0.0049***	-0.0056***	-0.0061***	-0.0053***	-0.0058***
	(0.0011)	(0.0011)	(0.0011)	(0.0011)	(0.0011)	(0.0011)
Average annual temperature of the state (℉)	0.0020***	0.0025***	0.0027***	0.0023***	0.0024***	0.0024***
	(0.0002)	(0.0002)	(0.0002)	(0.0002)	(0.0002)	(0.0002)
Observations	1553186	1553186	1553186	1553186	1553186	1553186
Pseudo R-squared	0.07117	0.07118	0.07118	0.07119	0.07118	0.07119

Robust standard errors in parentheses

* significant at 10%; ** significant at 5%; *** significant at 1%

The estimation includes individual characteristics, regional dummies, year dummies, and month dummies.

Table 4-2: Tax Revenue and Life Satisfaction

	(1)	(2)
Individual income tax (log of per capita $)	-0.0046***	-0.0068***
	(0.0005)	(0.0006)
General sales tax (log of per capita $)	-0.0034***	-0.0048***
	(0.0006)	(0.0007)
Other taxes (log of per capita $)	-0.0035	-0.0243***
	(0.0031)	(0.0043)
General expenditure (log of per capita $)		0.0604***
		(0.0084)
Poverty rate (%)	-0.0012**	-0.0023***
	(0.0006)	(0.0006)
Log of per capita personal income	-0.1344***	-0.1400***
	(0.0113)	(0.0114)
Unemployment rate (%)	-0.0066***	-0.0058***
	(0.0011)	(0.0011)
Average annual temperature of the state (℉)	0.0023***	0.0025***
	(0.0002)	(0.0002)
Observations	1553186	1553186
Pseudo R-squared	0.07121	0.07123

Robust standard errors in parentheses

* significant at 10%; ** significant at 5%; *** significant at 1%

The estimation includes individual characteristics, regional dummies, year dummies, and month dummies.

Table 4-3: Composition of Tax Revenue and Life Satisfaction

	(1)	(2)
Taxes (log of per capita $)	-0.0091*	-0.0556***
	(0.0053)	(0.0088)
Individual income tax (% of tax revenue)	-0.0005***	-0.0004***
	(0.0001)	(0.0001)
General sales tax (% of tax revenue)	-0.0001	0.0001
	(0.0001)	(0.0001)
General expenditure (log of per capita $)		0.0681***
		(0.0103)
Poverty rate (%)	-0.0013**	-0.0023***
	(0.0006)	(0.0006)
Log of per capita personal income	-0.1121***	-0.0919***
	(0.0113)	(0.0117)
Unemployment rate (%)	-0.0060***	-0.0054***
	(0.0011)	(0.0011)
Average annual temperature of the state (℉)	0.0022***	0.0023***
	(0.0002)	(0.0002)
Observations	1553186	1553186
Pseudo R-squared	0.07119	0.07121

Robust standard errors in parentheses
* significant at 10%; ** significant at 5%; *** significant at 1%
The estimation includes individual characteristics, regional dummies, year dummies, and month dummies.
The category of other taxes is omitted.

Table 4-4: Not-Having Specific Tax and Life Satisfaction

	(1)	(2)	(3)	(4)	(5)	(6)
Taxes (log of per capita $)	-0.0050	-0.0073	0.0025	-0.0534***	-0.0500***	-0.0403***
	(0.0054)	(0.0054)	(0.0055)	(0.0086)	(0.0091)	(0.0092)
No individual tax dummy	0.0254***		0.0277***	0.0263***		0.0277***
	(0.0031)		(0.0032)	(0.0031)		(0.0032)
No general sales tax dummy		0.0205***	0.0253***		0.0131***	0.0178***
		(0.0043)	(0.0043)		(0.0045)	(0.0045)
General expenditure (log of per capita $)				0.0705***	0.0588***	0.0592***
				(0.0098)	(0.0102)	(0.0102)
Poverty rate (%)	-0.0016***	-0.0018***	-0.0015***	-0.0025***	-0.0026***	-0.0023***
	(0.0006)	(0.0006)	(0.0006)	(0.0006)	(0.0006)	(0.0006)
Log of per capita personal income	-0.1456***	-0.1041***	-0.1383***	-0.1225***	-0.0869***	-0.1211***
	(0.0119)	(0.0113)	(0.0120)	(0.0123)	(0.0117)	(0.0123)
Unemployment rate (%)	-0.0067***	-0.0064***	-0.0059***	-0.0058***	-0.0059***	-0.0054***
	(0.0011)	(0.0011)	(0.0011)	(0.0011)	(0.0011)	(0.0011)
Average annual temperature of the state (℉)	0.0022***	0.0022***	0.0024***	0.0025***	0.0024***	0.0026***
	(0.0002)	(0.0002)	(0.0002)	(0.0002)	(0.0002)	(0.0002)
Observations	1553186	1553186	1553186	1553186	1553186	1553186
Pseudo R squared	0.07119	0.07118	0.07120	0.07121	0.07119	0.07122

Robust standard errors in parentheses

* significant at 10%; ** significant at 5%; *** significant at 1%

The estimation includes individual characteristics and year and month dummies.

Table 4-5: Tax Revenue and Life Satisfaction by Income

	(1)	(2)
Tax revenue (log of per capita $)	0.0144	-0.0323**
	(0.0131)	(0.0148)
Tax revenue * Income category 2 ($15K<Income<35K)	-0.0078	-0.0075
	(0.0145)	(0.0145)
Tax revenue * Income category 3 ($35K<Income<50K)	-0.0202	-0.0203
	(0.0158)	(0.0158)
Tax revenue * Income category 4 ($50K<Income<75K)	-0.0493***	-0.0497***
	(0.0156)	(0.0156)
Tax revenue * Income category 5 ($75K or more)	-0.0474***	-0.0478***
	(0.0148)	(0.0148)
General expenditure (log of per capita $)		0.0678***
		(0.0098)
Poverty rate (%)	-0.0019***	-0.0028***
	(0.0006)	(0.0006)
Log of per capita personal income	-0.1113***	-0.0880***
	(0.0112)	(0.0116)
Unemployment rate (%)	-0.0068***	-0.0060***
	(0.0011)	(0.0011)
Average annual temperature of the state (℉)	0.0021***	0.0023***
	(0.0002)	(0.0002)
Observations	1553186	1553186
Pseudo R-squared	0.07118	0.07119

Robust standard errors in parentheses

* significant at 10%; ** significant at 5%; *** significant at 1%

The estimation includes individual characteristics, regional dummies, year dummies, and month dummies.

The category of the lowest income (Income<$15K) is omitted for the interaction terms.

Table 4-6: Tax Revenue Categories and Life Satisfaction by Income

	(1)	(2)
Individual income tax (log of per capita $)	-0.0009	-0.0031**
	(0.0013)	(0.0013)
Income tax * Income category 2 ($15K<Income<35K)	-0.0032**	-0.0032**
	(0.0014)	(0.0014)
Income tax * Income category 3 ($35K<Income<50K)	-0.0046***	-0.0046***
	(0.0015)	(0.0015)
Income tax * Income category 4 ($50K<Income<75K)	-0.0074***	-0.0074***
	(0.0015)	(0.0015)
Income tax * Income category 5 ($75K or more)	-0.0025*	-0.0026*
	(0.0015)	(0.0015)
General sales tax (log of per capita $)	-0.0019	-0.0032
	(0.0020)	(0.0020)
General sales tax * Income category 2 ($15K<Income<35K)	0.0011	0.0009
	(0.0023)	(0.0023)
General sales tax * Income category 3 ($35K<Income<50K)	-0.0013	-0.0014
	(0.0024)	(0.0024)
General sales tax * Income category 4 ($50K<Income<75K)	-0.0042*	-0.0043*
	(0.0024)	(0.0024)
General sales tax * Income category 5 ($75K or more)	-0.0041*	-0.0041*
	(0.0023)	(0.0023)
Other taxes (log of per capita $)	-0.0087	-0.0288***
	(0.0083)	(0.0088)
Other taxes * Income category 2 ($15K<Income<35K)	0.0125	0.0126
	(0.0093)	(0.0093)
Other taxes * Income category 3 ($35K<Income<50K)	0.0124	0.0120
	(0.0100)	(0.0100)
Other taxes * Income category 4 ($50K<Income<75K)	-0.0009	-0.0018
	(0.0100)	(0.0100)
Other taxes * Income category 5 ($75K or more)	-0.0031	-0.0045
	(0.0096)	(0.0096)

	(1)	(2)
General expenditure (log of per capita $)		0.0600***
		(0.0084)
Poverty rate (%)	-0.0012**	-0.0023***
	(0.0006)	(0.0006)
Log of per capita personal income	-0.1343***	-0.1398***
	(0.0114)	(0.0114)
Unemployment rate (%)	-0.0066***	-0.0058***
	(0.0011)	(0.0011)
Average annual temperature of the state (℉)	0.0024***	0.0026***
	(0.0002)	(0.0002)
Observations	1553186	1553186
Pseudo R-squared	0.07123	0.07124

Robust standard errors in parentheses

* significant at 10%; ** significant at 5%; *** significant at 1%

The estimation includes individual characteristics, regional dummies, year dummies, and month dummies.

The category of the lowest income (Income<$15K) is omitted for the interaction terms.

Table 4-7: Composition of Tax Revenue and Life Satisfaction by Income

	(1)	(2)
Taxes (log of per capita $)	0.0167	-0.0291*
	(0.0138)	(0.0154)
Tax revenue * Income category 2 ($15K<Income<35K)	-0.0028	-0.0029
	(0.0152)	(0.0152)
Tax revenue * Income category 3 ($35K<Income<50K)	-0.0185	-0.0187
	(0.0165)	(0.0165)
Tax revenue * Income category 4 ($50K<Income<75K)	-0.0478***	-0.0481***
	(0.0163)	(0.0163)
Tax revenue * Income category 5 ($75K or more)	-0.0501***	-0.0505***
	(0.0154)	(0.0154)
Income tax (% of tax revenue)	0.0003	0.0004*
	(0.0002)	(0.0002)
Income tax * Income category 2 ($15K<Income<35K)	-0.0007***	-0.0007***
	(0.0003)	(0.0003)
Income tax * Income category 3 ($35K<Income<50K)	-0.0010***	-0.0010***
	(0.0003)	(0.0003)
Income tax * Income category 4 ($50K<Income<75K)	-0.0014***	-0.0014***
	(0.0003)	(0.0003)
Income tax * Income category 5 ($75K or more)	-0.0007***	-0.0007***
	(0.0003)	(0.0003)
General sales tax (% of tax revenue)	0.0003	0.0005*
	(0.0003)	(0.0003)
General sales tax * Income category 2 ($15K<Income<35K)	-0.0002	-0.0002
	(0.0003)	(0.0003)
General sales tax * Income category 3 ($35K<Income<50K)	-0.0005	-0.0005
	(0.0003)	(0.0003)
General sales tax * Income category 4 ($50K<Income<75K)	-0.0006*	-0.0006*
	(0.0003)	(0.0003)
General sales tax * Income category 5 ($75K or more)	-0.0007**	-0.0007**
	(0.0003)	(0.0003)
General expenditure (log of per capita $)		0.0676***
		(0.0103)
Poverty rate (%)	-0.0013**	-0.0023***
	(0.0006)	(0.0006)
Log of per capita personal income	-0.1127***	-0.0926***
	(0.0113)	(0.0117)
Unemployment rate (%)	-0.0058***	-0.0053***
	(0.0011)	(0.0011)
Average annual temperature of the state (℉)	0.0022***	0.0024***
	(0.0002)	(0.0002)
Observations	1553186	1553186
Pseudo R-squared	0.07122	0.07123

Robust standard errors in parentheses

* significant at 10%; ** significant at 5%; *** significant at 1%

The estimation includes individual characteristics, regional dummies, year dummies, and mont

The category of the lowest income (Income<$15K) is omitted for the interaction terms.

Table 4-8: Expenditure, Tax Revenue, and Life Satisfaction

	(1)
Education expenditure (log of per capita $)	0.0122
	(0.0075)
Welfare expenditure (log of per capita $)	-0.0263***
	(0.0090)
Health expenditure (log of per capita $)	0.0112***
	(0.0027)
Other expenditure (log of per capita $)	0.0345***
	(0.0050)
Individual income tax (log of per capita $)	-0.0057***
	(0.0006)
General sales tax (log of per capita $)	-0.0036***
	(0.0007)
Other taxes (log of per capita $)	-0.0207***
	(0.0044)
Poverty rate (%)	-0.0014**
	(0.0006)
Log of per capita personal income	-0.1495***
	(0.0119)
Unemployment rate (%)	-0.0041***
	(0.0012)
Average annual temperature of the state (℉)	0.0021***
	(0.0002)
Observations	1553186
Pseudo R-squared	0.07123

Robust standard errors in parentheses
* significant at 10%; ** significant at 5%; *** significant at 1%
The estimation includes individual characteristics, regional dummies, year dummies, and month dummies.

Table 4-9: Expenditure, Tax Revenue, and Life Satisfaction by Income

	(1)	(2)	(3)
General expenditure (log of per capita $)	0.1490***	0.0678***	0.2201***
	(0.0168)	(0.0098)	(0.0242)
General exp * Income category 2 ($15K<Income<35K)	-0.0561***		-0.1287***
	(0.0167)		(0.0271)
General exp * Income category 3 ($35K<Income<50K)	-0.0876***		-0.1831***
	(0.0183)		(0.0300)
General exp * Income category 4 ($50K<Income<75K)	-0.1178***		-0.1911***
	(0.0181)		(0.0298)
General exp * Income category 5 ($75K or more)	-0.1223***		-0.2087***
	(0.0171)		(0.0282)
Tax revenue (log of per capita $)	-0.0574***	-0.0323**	-0.1369***
	(0.0086)	(0.0148)	(0.0212)
Tax revenue * Income category 2 ($15K<Income<35K)		-0.0075	0.0809***
		(0.0145)	(0.0236)
Tax revenue * Income category 3 ($35K<Income<50K)		-0.0203	0.1054***
		(0.0158)	(0.0260)
Tax revenue * Income category 4 ($50K<Income<75K)		-0.0497***	0.0817***
		(0.0156)	(0.0257)
Tax revenue * Income category 5 ($75K or more)		-0.0478***	0.0953***
		(0.0148)	(0.0243)
Poverty rate (%)	-0.0029***	-0.0028***	-0.0029***
	(0.0006)	(0.0006)	(0.0006)
Log of per capita personal income	-0.0883***	-0.0880***	-0.0888***
	(0.0116)	(0.0116)	(0.0117)
Unemployment rate (%)	-0.0060***	-0.0060***	-0.0060***
	(0.0011)	(0.0011)	(0.0011)
Average annual temperature of the state (℉)	0.0023***	0.0023***	0.0023***
	(0.0002)	(0.0002)	(0.0002)
Observations	1553186	1553186	1553186
Pseudo R-squared	0.07121	0.07119	0.07122

Robust standard errors in parentheses

* significant at 10%; ** significant at 5%; *** significant at 1%

The estimation includes individual characteristics, regional dummies, year dummies, and month dummies.

The category of the lowest income (Income<$15K) is omitted for the interaction terms.

Table 4-10: Expenditure, Tax Revenue, and Life Satisfaction by Income

	(1)
Education expenditure (log of per capita $)	0.0591***
	(0.0188)
Educ exp * Income category 2 ($15K<Income<35K)	-0.0397*
	(0.0208)
Educ exp * Income category 3 ($35K<Income<50K)	-0.0630***
	(0.0227)
Educ exp * Income category 4 ($50K<Income<75K)	-0.0525**
	(0.0226)
Educ exp * Income category 5 ($75K or more)	-0.0593***
	(0.0215)
Welfare expenditure (log of per capita $)	0.0485***
	(0.0180)
Welfare exp * Income category 2 ($15K<Income<35K)	-0.0645***
	(0.0190)
Welfare exp * Income category 3 ($35K<Income<50K)	-0.0961***
	(0.0207)
Welfare exp * Income category 4 ($50K<Income<75K)	-0.0880***
	(0.0205)
Welfare exp * Income category 5 ($75K or more)	-0.0901***
	(0.0194)
Health expenditure (log of per capita $)	0.0117
	(0.0075)
Health exp * Income category 2 ($15K<Income<35K)	0.0085
	(0.0085)
Health exp * Income category 3 ($35K<Income<50K)	0.0028
	(0.0093)
Health exp * Income category 4 ($50K<Income<75K)	-0.0049
	(0.0092)
Health exp * Income category 5 ($75K or more)	-0.0110
	(0.0088)
Other expenditure (log of per capita $)	0.0836***
	(0.0134)
Other exp * Income category 2 ($15K<Income<35K)	-0.0381**
	(0.0153)
Other exp * Income category 3 ($35K<Income<50K)	-0.0506***
	(0.0169)
Other exp * Income category 4 ($50K<Income<75K)	-0.0708***
	(0.0169)
Other exp * Income category 5 ($75K or more)	-0.0760***
	(0.0160)

	(1)
Individual income tax (log of per capita $)	-0.0090***
	(0.0016)
Income tax * Income category 2 ($15K<Income<35K)	0.0028
	(0.0018)
Income tax * Income category 3 ($35K<Income<50K)	0.0041**
	(0.0020)
Income tax * Income category 4 ($50K<Income<75K)	0.0012
	(0.0020)
Income tax * Income category 5 ($75K or more)	0.0067***
	(0.0019)
General sales tax (log of per capita $)	-0.0058***
	(0.0022)
General sales tax * Income category 2 ($15K<Income<35K)	0.0041*
	(0.0024)
General sales tax * Income category 3 ($35K<Income<50K)	0.0035
	(0.0026)
General sales tax * Income category 4 ($50K<Income<75K)	0.0002
	(0.0026)
General sales tax * Income category 5 ($75K or more)	0.0009
	(0.0025)
All other taxes (log of per capita $)	-0.0839***
	(0.0115)
All other taxes * Income category 2 ($15K<Income<35K)	0.0585***
	(0.0129)
All other taxes * Income category 3 ($35K<Income<50K)	0.0820***
	(0.0140)
All other taxes * Income category 4 ($50K<Income<75K)	0.0744***
	(0.0140)
All other taxes * Income category 5 ($75K or more)	0.0799***
	(0.0134)
Poverty rate (%)	-0.0014**
	(0.0006)
Log of per capita personal income	-0.1476***
	(0.0120)
Unemployment rate (%)	-0.0043***
	(0.0012)
Average annual temperature of the state (℉)	0.0022***
	(0.0002)
Observations	1553186
Pseudo R-squared	0.07130

Robust standard errors in parentheses
* significant at 10%; ** significant at 5%; *** significant at 1%
The estimation includes individual characteristics, regional dummies, year dummies, and month dummies.
The category of the lowest income (Income<$15K) is omitted for the

Table 4-11: Expenditure, Composition of Tax Revenue, and Life Satisfaction by Income

	(1)
Education expenditure (log of per capita $)	0.0426**
	(0.0187)
Educ exp * Income category 2 ($15K<Income<35K)	-0.0339
	(0.0206)
Educ exp * Income category 3 ($35K<Income<50K)	-0.0560**
	(0.0227)
Educ exp * Income category 4 ($50K<Income<75K)	-0.0480**
	(0.0225)
Educ exp * Income category 5 ($75K or more)	-0.0478**
	(0.0213)
Welfare expenditure (log of per capita $)	0.0268
	(0.0172)
Welfare exp * Income category 2 ($15K<Income<35K)	-0.0524***
	(0.0177)
Welfare exp * Income category 3 ($35K<Income<50K)	-0.0808***
	(0.0193)
Welfare exp * Income category 4 ($50K<Income<75K)	-0.0762***
	(0.0192)
Welfare exp * Income category 5 ($75K or more)	-0.0704***
	(0.0182)
Health expenditure (log of per capita $)	0.0175**
	(0.0076)
Health exp * Income category 2 ($15K<Income<35K)	0.0031
	(0.0087)
Health exp * Income category 3 ($35K<Income<50K)	-0.0040
	(0.0094)
Health exp * Income category 4 ($50K<Income<75K)	-0.0094
	(0.0094)
Health exp * Income category 5 ($75K or more)	-0.0185**
	(0.0089)
Other expenditure (log of per capita $)	0.0970***
	(0.0140)
Other exp * Income category 2 ($15K<Income<35K)	-0.0480***
	(0.0161)
Other exp * Income category 3 ($35K<Income<50K)	-0.0607***
	(0.0179)
Other exp * Income category 4 ($50K<Income<75K)	-0.0730***
	(0.0178)
Other exp * Income category 5 ($75K or more)	-0.0849***
	(0.0170)

	(1)
Tax revenue (log of per capita $)	-0.1127***
	(0.0215)
Tax revenue * Income category 2 ($15K<Income<35K)	0.0790***
	(0.0237)
Tax revenue * Income category 3 ($35K<Income<50K)	0.1054***
	(0.0261)
Tax revenue * Income category 4 ($50K<Income<75K)	0.0839***
	(0.0259)
Tax revenue * Income category 5 ($75K or more)	0.0961***
	(0.0245)
Income tax (% of tax revenue)	0.0007***
	(0.0002)
Income tax * Income category 2 ($15K<Income<35K)	-0.0008***
	(0.0003)
Income tax * Income category 3 ($35K<Income<50K)	-0.0012***
	(0.0003)
Income tax * Income category 4 ($50K<Income<75K)	-0.0016***
	(0.0003)
Income tax * Income category 5 ($75K or more)	-0.0010***
	(0.0003)
General sales tax (% of tax revenue)	0.0010***
	(0.0003)
General sales tax * Income category 2 ($15K<Income<35K)	-0.0006*
	(0.0003)
General sales tax * Income category 3 ($35K<Income<50K)	-0.0010***
	(0.0004)
General sales tax * Income category 4 ($50K<Income<75K)	-0.0012***
	(0.0004)
General sales tax * Income category 5 ($75K or more)	-0.0013***
	(0.0003)
Poverty rate (%)	-0.0015**
	(0.0006)
Log of per capita personal income	-0.1201***
	(0.0127)
Unemployment rate (%)	-0.0034***
	(0.0012)
Average annual temperature of the state (℉)	0.0019***
	(0.0002)
Observations	1553186
Pseudo R-squared	0.07128

Robust standard errors in parentheses

* significant at 10%; ** significant at 5%; *** significant at 1%

The estimation includes individual characteristics, regional dummies, year dummies, and month dummies.
The category of the lowest income (Income<$15K) is omitted for the
The category of other taxes is omitted.

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APPENDIX A-1

Data Sources and Variable Definitions for Chapter 2

Average Life Satisfaction

- Source: (i) World Value Survey, 2009, OFFICIAL AGGREGATE File, the World Values Survey Association (downloaded at www.worldvaluessurvey.org), and (ii) Human Planet Index 2.0, 2009, The New Economics Foundation
- Average Life Satisfaction (WVS): The data is based on the question "how satisfied are you with your life these days?", which is evaluated on a 1-10 scale (Greater number means greater satisfaction). We computed the average life satisfaction for each country for each year.
- Average Life Satisfaction (HPI): HPI provides an average life satisfaction for each country for each year using various data sources. The variable measures an average life satisfaction on a scale of 0-10, where 0 means dissatisfied and 10 means satisfied.

Control Variables

- Source: Penn World Table 6.3
- Growth rate of real GDP per capita and Real GDP per capita (Chain series): usual definition applied
- Openness to trade: Exports plus Imports divided by GDP

Public Finance Variables

- Government Consumption: Government Share of Real GDP per capita measured in current price [Source: Penn World Table 6.3]
- Government Spending: cash payments for operating activities of the government in providing goods and services. It includes compensation of employees (such as wages and salaries), interest and subsidies, grants, social benefits, and other expenses such as rent and dividends. [Source: World Development Indicators[52]]
- Subsidies and other transfers: Subsidies, grants, and other social benefits include all unrequited, nonrepayable transfers on current account to private and public enterprises; grants to foreign governments, international organizations, and other government units; and social security, social assistance benefits, and employer social benefits in cash and in kind. [Source: World Development Indicators]
- Health expenditure, public: Public health expenditure consists of recurrent and capital spending from government (central and local) budgets, external borrowings and grants (including donations from international agencies and nongovernmental organizations), and social (or compulsory) health insurance funds. [Source: World Development Indicators]
- Government effectiveness: A composite indicators which captures perceptions of the quality of public services, the quality of the civil service and the degree of its independence from political pressures, the quality of policy formulation and implementation, and the credibility of the government's commitment to such policies. The indicator is measured in

[52] All variables from the World Development Indicators are downloaded at http://data.worldbank.org/data-catalog/world-development-indicators.

units ranging from -2.5 to 2.5, with higher values corresponding to better governance. [Source: World Bank, 2010, "World Governance Indicators"[53]]

- Individual Income Tax: Taxes on income, profits and capital gains of individuals measured as percentage of total taxation. [Source: OECD Statistics[54]]
- Corporate Income Tax: Taxes on income, profits and capital gains of corporations measured as percentage of total taxation. [Source: OECD]
- Goods and Service taxes: General taxes on Goods and Services measured as percentage of total taxation. [Source: OECD Statistics]
- Disbursements: total disbursements of general government as a percentage in GDP [Economic Outlook No 92 - December 2012 - OECD Annual Projections[55]]
- Surplus/Deficit: Total Disbursements minus total receipts (author's calculation). [Source of disbursement and receipts: Economic Outlook No 92 - December 2012 - OECD Annual Projections]

[53] Downloaded at http://info.worldbank.org/governance/wgi/index.asp
[54] All variables from OECD Statistics are downloaded at Statistics (downloaded at: http://stats.oecd.org/.
[55] Downloaded at: http://stats.oecd.org/index.aspx?queryid=40203

APPENDIX A-2

Supplemental Tables for Chapter 2

Table A-1: List of Countries Included in WVS and HPI

WVS				HPI
Albania	El Salvador	Latvia	Singapore	Austria
Algeria	Estonia	Lithuania	Slovakia	Belgium
Andorra	Ethiopia	Luxembourg	Slovenia	Denmark
Argentina	Finland	Macedonia	South Africa	Finland
Armenia	France	Malaysia	Spain	France
Australia	Georgia	Mali	Sweden	Germany
Austria	Germany	Malta	Switzerland	Greece
Azerbaijan	Ghana	Mexico	Taiwan	Iceland
Bangladesh	UK	Moldova	Tanzania	Ireland
Belarus	Greece	Morocco	Thailand	Italy
Belgium	Guatemala	Netherlands	Trinidad and Tobago	Luxembourg
Bosnia and Herzegovina	Hong Kong	New Zealand	Turkey	Netherlands
Brazil	Hungary	Nigeria	Uganda	Norway
Bulgaria	Iceland	Norway	Ukraine	Portugal
Burkina faso	India	Pakistan	USA	Spain
Canada	Indonesia	Peru	Uruguay	Sweden
Chile	Iran	Philippine	Venezuela	Switzerland
China	Iraq	Poland	Viet nam	United Kingdom
Colombia	Ireland	Portugal	Zambia	Australia
Croatia	Israel	Puerto rico	Zimbabwe	Japan
Cyprus	Italy	Romania		Korea
Czech rep	Japan	Russia		New Zealand
Denmark	Jordan	Rwanda		Canada
Dominican rep	Korea	Saudi Arabia		USA
Egypt	Kyrgyzstan	Serbia		Mexico

Table A-2: Summary Statistics

Average Life Satisfaction

Variable	Obs	Mean	Std. Dev.	Min	Max
WVS	251	6.700	1.066	3.725	8.494
HPI	1125	7.142	0.710	4.100	8.500

Average Life Satisfaction: By category (WVS)

Variable	Obs	Mean	Std. Dev.	Min	Max
Average Life Satisfaction: 25 OECD countries	85	7.456	0.548	5.615	8.359
Average Life Satisfaction: Non OECD countries	166	6.313	1.061	3.725	8.494
Average Life Satisfaction: low income	113	6.312	1.244	3.450	8.342
Average Life Satisfaction: middle income	113	6.805	1.131	3.854	8.521
Average Life Satisfaction: high income	113	7.216	0.930	4.252	8.634
Average Life Satisfaction: full employed	244	6.829	1.036	4.024	8.484
Average Life Satisfaction: unemployed	242	5.994	1.097	3.000	9.000
Average Life Satisfaction: retired	243	6.612	1.251	3.059	8.716

Explanatory Variables (for the periods where WVS is available)

Variable	Obs	Mean	Std. Dev.	Min	Max
Openness to trade	236	75.330	47.030	12.346	384.865
Log of real GDP per capita	236	9.276	0.895	6.557	10.990
Growth rate of real GDP per capita	233	2.676	5.299	-19.218	32.985
Government consumption (% of GDP)	236	17.869	6.928	3.690	41.741
Government efficiency	105	0.308	1.026	-1.869	2.146
Subsidies and Transfers (% of GDP)	104	52.321	16.077	9.670	81.985
Health Expenditure (% of GDP)	77	4.311	1.884	0.781	8.332

Explanatory Variables (for the periods where HPI is available)

Variable	Obs	Mean	Std. Dev.	Min	Max
Openness to trade	1116	63.397	39.487	9.266	289.095
Log of real GDP per capita	1116	9.808	0.499	7.490	11.173
Growth rate of real GDP per capita	1115	2.848	3.338	-13.562	21.367
Government consumption (% of GDP)	1116	13.990	3.767	5.056	26.145
Govt efficiency (-2.5 to 2.5, 2.5 = most efficient)	175	1.517	0.818	-1.988	2.237
Subsidies and Transfers (% of GDP)	238	58.868	14.665	23.484	82.408
Health Expenditure (% of GDP)	125	5.929	1.354	2.017	8.557
Disbursement (% of GDP)	692	43.576	9.764	17.563	70.541
Tax Revenue (% of GDP)	991	32.650	8.620	12.010	52.256
Taxes on Income etc. of Individuals (% of Tax Rev.)	941	28.904	11.170	6.844	61.606
General Taxes on Goods and Services (% of Tax Rev.)	991	15.708	5.932	0.000	37.924
Taxes on Income etc. of Corporates (% of Tax Rev.)	941	8.415	4.824	0.600	28.126
Deficit (% of GDP)	692	1.908	4.147	-15.374	16.004

APPENDIX B-1

Data Sources and Variables Definitions for Chapter 3

Data from the Behavioral Risk Factor Surveillance System

- Source: Centers for Disease Control and Prevention (CDC). Behavioral Risk Factor Surveillance System Survey Data. Atlanta, Georgia: U.S. Department of Health and Human Services, Centers for Disease Control and Prevention.
- Reported life satisfaction is an answer to the BRFSS life satisfaction question that asks, "In general, how satisfied are you with your life?" People are able to answer "Very satisfied", "Satisfied", "Dissatisfied", or "Very satisfied" (The small "DK/NS" and "Refused" categories are not studied here).
- In the original data, number of children is given as actual number. The author generates dummies of number of children from the number. Those are no child, one child, two children, and three or more children.
- Data on respondent's race comes from RACE2 in the original data set. The original categories are "white", "black or African American", "Native Hawaiian or Other Pacific Islander", "American Indian, Alaska Native", "Multiracial", and "Hispanic". Because sample size is small for some categories and for comparability with earlier study (Oswald and Wu, 2008) which uses the same dataset, we re-categorize samples into "white", "black or African American", "Hispanic", "Native American", "Asian", "Other Minority".

- In original data, there two categories for the unemployed: “unemployed less than a year” or “unemployed more than a year”. This paper treats these categories as a category of “unemployed”.
- The original data has 8 categories for household income. This paper compresses the 8 categories into 5 categories for simplicity. Those are “less than $15,000”, “$15,000 to less than $35,000”, “$35,000 to less than $50,000”, “50,000 to less than $75,000”, and “$75,000 or more”.
- Urban area dummies are based on “MSCODE” which shows metropolitan status code. This paper rearranges original 5 categories into three categories. “In the center city of an MSA” is categorized as “urban”. “Outside the center city of an MSA but inside the county containing the center city”, “Inside a suburban county of the MSA”, and “In an MSA that has no center city” are categorized as “suburban”. “Not in an MSA” is categorizes as “rural”.

Definitions and Sources of Variables (other than those from BRFSS)

BEA regional dummies

- Source: http://www.bea.gov/regional/docs/regions.cfmthe
- New England: Connecticut, Maine, Massachusetts, New Hampshire, Rhode Island, and Vermont
- Mideast: Delaware, Maryland, New Jersey, New York, and Pennsylvania
- Great Lake: Illinois, Indiana, Michigan, Ohio, and Wisconsin
- Plain: Iowa, Kansas, Minnesota, Missouri, Nebraska, North Dakota, and South Dakota

- Southeast: Alabama, Arkansas, Florida, Georgia, Kentucky, Louisiana, Mississippi, North Carolina, South Carolina, Tennessee, Virginia, and West Virginia
- Southwest: Arizona, New Mexico, Oklahoma, and Texas
- Rocky Mountain: Colorado, Idaho, Montana, Utah, and Wyoming
- Far West: Alaska, California, Hawaii, Nevada, Oregon, and Washington

State-level Variables

- Unemployment rate: usual unemployment [Source: the Bureau of Labor Statistics]
- Personal income per capita: Per capita personal income is total personal income divided by total midyear population. All dollar estimates are in current dollars (not adjusted for inflation). [Source: Bureau of Economic Analysis]
- Poverty Rate: number of people in poverty divided by total population[Source: University of Kentucky Center for Poverty Research]
- Population: [Source: University of Kentucky Center for Poverty Research]
- Average Temperature: State average temperature obtained from the website of the NOAA Earth System Research Laboratory (ESRL), the Physical Sciences Division except for Hawaii and Alaska (http://www.esrl.noaa.gov/psd/data/timeseries/). For Hawaii and Alaska, the author obtains monthly temperature for all observation points in the state from NOAA's National Climatic Data Center (NCDC) climate data online, Monthly Surface Data (http://cdo.ncdc.noaa.gov/pls/plclimprod/somdmain.somdwrapper?datasetabbv=DS3220&countryabbv=&georegionabbv=&forceoutside=), and calculated annual average in the state.

Public Finance Variables

- Data Source: the U.S. Census Bureau, "State government finances" (The definitions below are from "2006 Government Finance and Employment Classification Manual," and may be modified for clarification purposes.)
- General Expenditure: All expenditure except for utility, liquor store, or social insurance trust expenditure.
- Health expenditure: Provision of services for the conservation and improvement of public health, other than hospital care, and financial support of other governments' health programs (e.g., expenditures for general health activities, categorical health activities and programs, health-related inspections, community health care programs, regulation of air and water quality, rabies and animal control, and ambulance and emergency medical services only if handled separately from the local fire department).
- Education expenditure: Schools, colleges, and other educational institutions (e.g., for blind, deaf, and other handicapped individuals), and educational programs for adults, veterans, and other special classes.
- Public welfare expenditure: Support of and assistance to needy persons contingent upon their need. This category includes following expenditures. (i) Cash assistance paid directly to needy persons under the categorical programs Old Age Assistance, Temporary Assistance for Needy Families (TANF) and under any other welfare programs, (ii) Vendor payments made directly to private purveyors for medical care, burials, and other commodities and services provided under welfare programs; and provision and operation

by the government of welfare institutions, and (iii) Other public welfare which includes payments to other governments for welfare purposes, amounts for administration, support of private welfare agencies, and other public welfare services.

- Taxes: compulsory contributions exacted by a government for public purposes

APPENDIX B-2

Supplemental Tables for Chapter 3

Table B-1: Summary Statistics

Data from BRFSS

Variable	Mean	Std. Dev.	Min	Max
Life Satisfaction	3.39	0.63	1	4
Age	52.57	15.80	18	85
Male	0.39	0.49	0	1
White	0.81	0.39	0	1
Black	0.07	0.26	0	1
Asian	0.02	0.12	0	1
Native American	0.01	0.12	0	1
Hispanic	0.06	0.24	0	1
Other Minority	0.03	0.16	0	1
Married	0.58	0.49	0	1
Divorced	0.15	0.35	0	1
Widowed	0.11	0.31	0	1
Separated	0.02	0.15	0	1
Never Married	0.12	0.32	0	1
A Member of An Unmarried Couple	0.02	0.15	0	1
Employed for wages	0.49	0.50	0	1
Self-employed	0.09	0.29	0	1
Unemployed	0.04	0.20	0	1
A homemaker	0.07	0.26	0	1
A student	0.02	0.13	0	1
Retired	0.23	0.42	0	1
Unable to work	0.06	0.24	0	1
Less than Grades 9 - 11 (Some high school)	0.09	0.28	0	1

continued to the next page

Data from BRFSS (continued)

Variable	Mean	Std. Dev.	Min	Max
Grade 12 or GED (High school graduate)	0.30	0.46	0	1
College 1 year to 3 years (Some college)	0.27	0.45	0	1
College 4 years or more	0.35	0.48	0	1
less than $15,000	0.11	0.31	0	1
$15,000 to less than $35,000	0.30	0.46	0	1
$35,000 to less than $50,000	0.16	0.37	0	1
$50,000 to less than $75,000	0.17	0.38	0	1
$75,000 or more	0.26	0.44	0	1
No children	0.67	0.47	0	1
# of children: 1	0.13	0.34	0	1
# of children: 2	0.12	0.33	0	1
# of children: ≥3	0.07	0.26	0	1
Urban	0.31	0.46	0	1
Suburban	0.36	0.48	0	1
Rural	0.34	0.47	0	1

Number of observation: 1553186

Public Finance and State Variables

Variable	Obs	Mean	Std. Dev.	Min	Max
Poverty rate	250	12.28	3.11	5.40	23.10
Log per capita personal income	250	10.52	0.15	10.18	10.95
Unemployment rate (%)	250	5.46	2.02	2.50	13.30
Average temperature	250	52.64	8.38	32.65	71.60
New England	250	0.12	0.33	0.00	1.00
Mideast	250	0.10	0.30	0.00	1.00
Great lakes	250	0.10	0.30	0.00	1.00
Plains	250	0.12	0.33	0.00	1.00
Southeast	250	0.24	0.43	0.00	1.00
Southwest	250	0.08	0.27	0.00	1.00
Rocky Mountain	250	0.10	0.30	0.00	1.00
Far east	250	0.12	0.33	0.00	1.00

Variable	Obs	Mean	Std. Dev.	Min	Max
General expenditure	250	5.07	1.48	3.15	14.16
Education	250	1.81	0.44	1.09	3.63
Higher education	250	0.68	0.18	0.32	1.18
Elementary and secondary education	250	1.00	0.31	0.59	2.28
Other education	250	0.13	0.05	0.03	0.29
Public welfare	250	1.30	0.36	0.60	2.44
Cash assistance	250	0.09	0.08	0.01	0.46
Vendor payments	250	0.98	0.30	0.46	1.79
Other welfare	250	0.21	0.10	0.07	0.61
Health	250	0.19	0.10	0.04	0.53
Other expenditure	250	1.78	0.91	0.87	8.29
Taxes	250	2.52	0.95	1.43	12.25

Per capita $ amount (in thousand $)

Table B-2: Coefficients on Regional Dummies and Individual Characteristics for Table 3.1

	(1)	(2)	(3)	(4)
Reginald Dummies				
Mideast Region	-0.0398***	-0.0396***	-0.0446***	-0.0450***
	(0.0041)	(0.0041)	(0.0042)	(0.0042)
Great Lakes Region	-0.0418***	-0.0374***	-0.0590***	-0.0563***
	(0.0048)	(0.0049)	(0.0056)	(0.0056)
Plains Region	-0.0286***	-0.0302***	-0.0466***	-0.0473***
	(0.0049)	(0.0049)	(0.0056)	(0.0056)
Southeast Region	0.0440***	0.0450***	0.0261***	0.0266***
	(0.0058)	(0.0058)	(0.0066)	(0.0066)
Southwest Region	0.0205***	0.0192***	0.0070	0.0052
	(0.0068)	(0.0068)	(0.0076)	(0.0076)
Rocky Mountain Region	0.0363***	0.0362***	0.0026	0.0035
	(0.0049)	(0.0049)	(0.0069)	(0.0069)
Far West Region	0.0101**	0.0124***	-0.0123**	-0.0111**
	(0.0041)	(0.0041)	(0.0057)	(0.0057)
Individual characteristics				
Age	-0.0238***	-0.0238***	-0.0238***	-0.0238***
	(0.0004)	(0.0004)	(0.0004)	(0.0004)
Age squared	0.0003***	0.0003***	0.0003***	0.0003***
	0.0000	0.0000	0.0000	0.0000
Black or African American	0.0711***	0.0699***	0.0702***	0.0695***
	(0.0040)	(0.0040)	(0.0040)	(0.0040)
Asian	-0.1444***	-0.1431***	-0.1435***	-0.1427***
	(0.0076)	(0.0076)	(0.0076)	(0.0076)
Native American	0.0455***	0.0442***	0.0420***	0.0418***
	(0.0081)	(0.0081)	(0.0081)	(0.0081)
Hispanic	0.0746***	0.0747***	0.0752***	0.0752***
	(0.0043)	(0.0043)	(0.0043)	(0.0043)
Other Minority	-0.0690***	-0.0684***	-0.0695***	-0.0690***
	(0.0063)	(0.0063)	(0.0063)	(0.0063)
Male	-0.0725***	-0.0725***	-0.0726***	-0.0726***
	(0.0021)	(0.0021)	(0.0021)	(0.0021)
Divorced	-0.3342***	-0.3342***	-0.3343***	-0.3343***
	(0.0030)	(0.0030)	(0.0030)	(0.0030)
Widowed	-0.2920***	-0.2920***	-0.2920***	-0.2920***
	(0.0037)	(0.0037)	(0.0037)	(0.0037)
Separated	-0.4944***	-0.4947***	-0.4944***	-0.4946***
	(0.0067)	(0.0067)	(0.0067)	(0.0067)
Never married	-0.3439***	-0.3440***	-0.3439***	-0.3440***
	(0.0035)	(0.0035)	(0.0035)	(0.0035)
A member of an unmarried couple	-0.2477***	-0.2477***	-0.2478***	-0.2478***
	(0.0062)	(0.0062)	(0.0062)	(0.0062)

Self-employed	0.0631***	0.0630***	0.0630***	0.0629***
	(0.0035)	(0.0035)	(0.0035)	(0.0035)
Unemployed	-0.3897***	-0.3898***	-0.3897***	-0.3898***
	(0.0050)	(0.0050)	(0.0050)	(0.0050)
A homemaker	0.0551***	0.0550***	0.0553***	0.0553***
	(0.0041)	(0.0041)	(0.0041)	(0.0041)
A student	0.0760***	0.0760***	0.0763***	0.0762***
	(0.0079)	(0.0079)	(0.0079)	(0.0079)
Retired	0.0955***	0.0955***	0.0956***	0.0955***
	(0.0034)	(0.0034)	(0.0034)	(0.0034)
Unable to work	-0.5727***	-0.5728***	-0.5724***	-0.5725***
	(0.0047)	(0.0047)	(0.0047)	(0.0047)
Grade 12 or GED (High school graduate)	0.0610***	0.0610***	0.0607***	0.0608***
	(0.0038)	(0.0038)	(0.0038)	(0.0038)
College 1 year to 3 years (Some college)	0.0726***	0.0726***	0.0723***	0.0723***
	(0.0040)	(0.0040)	(0.0040)	(0.0040)
College 4 years or more	0.1979***	0.1978***	0.1977***	0.1976***
	(0.0041)	(0.0041)	(0.0041)	(0.0041)
$15,000 to less than $35,000	0.1560***	0.1561***	0.1559***	0.1559***
	(0.0036)	(0.0036)	(0.0036)	(0.0036)
$35,000 to less than $50,000	0.3345***	0.3344***	0.3343***	0.3342***
	(0.0042)	(0.0042)	(0.0042)	(0.0042)
$50,000 to less than $75,000	0.4662***	0.4661***	0.4661***	0.4660***
	(0.0044)	(0.0044)	(0.0044)	(0.0044)
$75,000 or more	0.6793***	0.6792***	0.6792***	0.6791***
	(0.0045)	(0.0045)	(0.0045)	(0.0045)
# of children: 1	-0.0679***	-0.0680***	-0.0680***	-0.0680***
	(0.0031)	(0.0031)	(0.0031)	(0.0031)
# of children: 2	-0.0417***	-0.0417***	-0.0416***	-0.0416***
	(0.0034)	(0.0034)	(0.0034)	(0.0034)
# of children: ≥3	-0.0155***	-0.0154***	-0.0154***	-0.0153***
	(0.0041)	(0.0041)	(0.0041)	(0.0041)
Suburban	0.0225***	0.0224***	0.0228***	0.0228***
	(0.0024)	(0.0024)	(0.0024)	(0.0024)
Rural	0.0682***	0.0684***	0.0665***	0.0667***
	(0.0025)	(0.0025)	(0.0025)	(0.0025)
Observations	1553186	1553186	1553186	1553186

[a] Robust standard errors in parentheses

[b] * significant at 10%; ** significant at 5%; *** significant at 1%

[c] The estimation includes individual characteristics, regional dummies, year dummies, and month dummies.

[d] The category of the lowest income (Income<$15K) is omitted for the interaction terms.

Table B-3: Composition of General Expenditure and Life Satisfaction

	(1)	(2)
General expenditure (log of per capita $)	-0.0216***	0.0202*
	(0.0071)	(0.0113)
Education expenditure (% in general exp)	-0.0016***	-0.0013***
	(0.0002)	(0.0003)
Welfare expenditure (% in general exp)	-0.0032***	-0.0030***
	(0.0004)	(0.0004)
Health expenditure (% in general exp)	0.0030***	0.0032***
	(0.0008)	(0.0008)
Taxes (log of per capita $)		-0.0427***
		(0.0090)
Poverty rate (%)	-0.0014**	-0.0015**
	(0.0006)	(0.0006)
Log of per capita personal income	-0.1455***	-0.1196***
	(0.0114)	(0.0126)
Unemployment rate (%)	-0.0028**	-0.0034***
	(0.0012)	(0.0012)
Average annual temperature of the state (℉)	0.0017***	0.0017***
	(0.0002)	(0.0002)
Observations	1553186	1553186
Pseudo R-squared	0.07121	0.07122

Robust standard errors in parentheses

* significant at 10%; ** significant at 5%; *** significant at 1%

The estimation includes individual characteristics, regional dummies, year dummies, and month dummies.

The category of the lowest income (Income<$15K) is omitted for the interaction terms.

Other expenditure categories are omitted.

Table B-4: Unemployment Rate and Life Satisfaction by Job Status

	(1)
Unemployment rate (%)	-0.0081***
	(0.0012)
Unemployment rate (%) * Self-Employed	-0.0032*
	(0.0017)
Unemployment rate (%) * Unemployed	0.0113***
	(0.0022)
Unemployment rate (%) * Homemaker	0.0034*
	(0.0019)
Unemployment rate (%) * Student	-0.0086**
	(0.0037)
Unemployment rate (%) * Retired	0.0021*
	(0.0012)
Unemployment rate (%) * Unable to work	0.0087***
	(0.0020)
Poverty rate (%)	-0.0021***
	(0.0006)
Log of per capita personal income	-0.1181***
	(0.0109)
Average annual temperature of the state (℉)	0.0021***
	(0.0002)
Observations	1553186
Pseudo R-squared	0.0712

Robust standard errors in parentheses

* significant at 10%; ** significant at 5%; *** significant at 1%

The category of "employed for wage" is omitted.

Table B-5: Per Capita Income and Life Satisfaction by Income Category

	(1)
Log of per capita personal income	-0.0176
	(0.0221)
Log of per capita personal income * Income category 2 ($15K<Income<35K)	-0.0459**
	(0.0233)
Log of per capita personal income * Income category 3 ($35K<Income<50K)	-0.1129***
	(0.0259)
Log of per capita personal income * Income category 4 ($50K<Income<75K)	-0.1673***
	(0.0257)
Log of per capita personal income * Income category 5 ($75K or more)	-0.1485***
	(0.0240)
Poverty rate (%)	-0.0019***
	(0.0006)
Unemployment rate (%)	-0.0062***
	(0.0011)
Average annual temperature of the state (℉)	0.0021***
	(0.0002)
Observations	1553186
Pseudo R-squared	0.0712

Robust standard errors in parentheses

* significant at 10%; ** significant at 5%; *** significant at 1%

The category of the lowest income (less than $15K) is omitted.

Table B-6: Poverty Rate and Life Satisfaction by Income Group

	(1)
Poverty rate (%)	0.0014
	(0.0010)
Poverty rate (%) * Income category 2 ($15K<Income<35K)	-0.0028**
	(0.0011)
Poverty rate (%) * Income category 3 ($35K<Income<50K)	-0.0033***
	(0.0012)
Poverty rate (%) * Income category 4 ($50K<Income<75K)	-0.0051***
	(0.0012)
Poverty rate (%) * Income category 5 ($75K or more)	-0.0053***
	(0.0012)
Unemployment rate (%)	-0.0063***
	(0.0011)
Log of per capita personal income	-0.1187***
	(0.0109)
Average annual temperature of the state (℉)	0.0021***
	(0.0002)
Observations	1553186
Pseudo R-squared	0.0712

Robust standard errors in parentheses

* significant at 10%; ** significant at 5%; *** significant at 1%

The category of the lowest income (less than $15K) is omitted.

Table B-7: Composition of General Expenditure and Life Satisfaction by Income

	(1)	(2)
General expenditure (log of per capita $)	0.0614***	0.1012***
	(0.0168)	(0.0189)
General exp * Income category 2 ($15K<Income<35K)	-0.0555***	-0.0557***
	(0.0184)	(0.0184)
General exp * Income category 3 ($35K<Income<50K)	-0.0935***	-0.0931***
	(0.0201)	(0.0201)
General exp * Income category 4 ($50K<Income<75K)	-0.1193***	-0.1188***
	(0.0199)	(0.0199)
General exp * Income category 5 ($75K or more)	-0.1129***	-0.1122***
	(0.0190)	(0.0190)
Education expenditure (% of general exp)	-0.0022***	-0.0018***
	(0.0007)	(0.0007)
Educ exp * Income category 2 ($15K<Income<35K)	0.0005	0.0005
	(0.0008)	(0.0008)
Educ exp * Income category 3 ($35K<Income<50K)	0.0001	0.0001
	(0.0009)	(0.0009)
Educ exp * Income category 4 ($50K<Income<75K)	0.0006	0.0006
	(0.0008)	(0.0008)
Educ exp * Income category 5 ($75K or more)	0.0011	0.001
	(0.0008)	(0.0008)
Welfare expenditure (% of general exp)	-0.0019**	-0.0017**
	(0.0008)	(0.0008)
Welfare exp * Income category 2 ($15K<Income<35K)	-0.0012	-0.0012
	(0.0009)	(0.0009)
Welfare exp * Income category 3 ($35K<Income<50K)	-0.0022**	-0.0022**
	(0.0009)	(0.0009)
Welfare exp * Income category 4 ($50K<Income<75K)	-0.0022**	-0.0022**
	(0.0009)	(0.0009)
Welfare exp * Income category 5 ($75K or more)	-0.0007	-0.0008
	(0.0009)	(0.0009)

	(1)	(2)
Health expenditure (% of general exp)	0.0017	0.002
	(0.0022)	(0.0022)
Health exp * Income category 2 ($15K<Income<35K)	0.0044*	0.0044*
	(0.0025)	(0.0025)
Health exp * Income category 3 ($35K<Income<50K)	0.0023	0.0022
	(0.0027)	(0.0027)
Health exp * Income category 4 ($50K<Income<75K)	0.0012	0.0011
	(0.0027)	(0.0027)
Health exp * Income category 5 ($75K or more)	-0.0023	-0.0025
	(0.0026)	(0.0026)
Taxes (log of per capita $)		-0.0409***
		(0.0090)
Poverty rate (%)	-0.0015**	-0.0016**
	(0.0006)	(0.0006)
Log of per capita personal income	-0.1432***	-0.1184***
	(0.0114)	(0.0126)
Unemployment rate (%)	-0.0027**	-0.0033***
	(0.0012)	(0.0012)
Average annual temperature of the state (°F)	0.0017***	0.0018***
	(0.0002)	(0.0002)
Observations	1553186	1553186
Pseudo R-squared	0.07125	0.07125

Robust standard errors in parentheses

* significant at 10%; ** significant at 5%; *** significant at 1%

The estimation includes individual characteristics, regional dummies, year dummies, and month dummies.

The category of the lowest income (Income<$15K) is omitted for the interaction terms.

Other expenditure is omitted.

APPENDIX C-1

Data Sources and Variables Definitions

Public Finance Variables: Revenues[56]

- Data Source: the U.S. Census Bureau, "State government finances" (The definitions below are from "2006 Government Finance and Employment Classification Manual," and may be modified for clarification purposes.)
- General Revenue: all revenue except for liquor store, utility, or insurance trust revenue.
- Intergovernmental revenue: monies from other governments, including grants, shared taxes, and contingent loans and advances for support of particular functions or for general financial support
- Current Charges: charges imposed for providing current services or for the sale of products in connection with general government activities (Utility service charges are excluded)
- Miscellaneous General Revenue: all other general revenue of governments from their own sources other than liquor stores, utilities, and social insurance trust revenue (e.g. sale of property, interest earnings, and donation from private sector)
- Taxes: compulsory contributions exacted by a government for public purposes
- Individual income tax: taxes on individuals measured by net income and taxes on special types of income
- General sales tax: taxes applicable with only specified exceptions to sales of all types of goods and services or to all gross receipts, whether at a single rate or at classified rates

[56] Variables from BRFSS, state control variables, and government expenditure variables are same as in Chapter 3. Definitions and sources of those variables are presented in Appendix B-1.

APPENDIX C-2

Supplemental Tables for Chapter 4

Table C- 1: Summary Statistics[57]

Variable	Obs	Mean	Std. Dev.	Min	Max
Intergovernmental revenue	250	1.61	0.58	0.70	4.17
Taxes	250	2.52	0.95	1.43	12.25
Current charges	250	0.54	0.19	0.22	1.19
Miscellaneous general revenue	250	0.58	0.78	0.14	6.84

Per capita $ amount (in thousand $)

Variable	Obs	Mean	Std. Dev.	Min	Max
Individual income tax	250	0.77	0.47	0.00	2.12
General sales tax	250	0.73	0.37	0.00	1.97
Other taxes	250	1.02	1.01	0.31	12.25

Per capita $ amount (in thousand $)

Variable	Obs	Mean	Std. Dev.	Min	Max
Individual income tax	250	31.15	17.29	0.00	73.25
General sales tax	250	30.50	14.98	0.00	63.17

Percentage in tax revenue

[57] Summary statistics for individual characteristics, state control variables, and government expenditure is available in Appendix B-1.

Table C-2: Coefficients on Regional Dummies and Individual Characteristics for Table 4-1

	(1)	(2)	(3)	(4)	(5)	(6)
Reginald Dummies						
Mideast Region	-0.0406***	-0.0386***	-0.0381***	-0.0396***	-0.0385***	-0.0381***
	(0.0041)	(0.0041)	(0.0041)	(0.0041)	(0.0041)	(0.0041)
Great Lakes Region	-0.0458***	-0.0381***	-0.0380***	-0.0374***	-0.0392***	-0.0380***
	(0.0047)	(0.0049)	(0.0049)	(0.0049)	(0.0049)	(0.0049)
Plains Region	-0.0375***	-0.0265***	-0.0327***	-0.0302***	-0.0318***	-0.0327***
	(0.0048)	(0.0047)	(0.0050)	(0.0049)	(0.0049)	(0.0050)
Southeast Region	0.0389***	0.0455***	0.0395***	0.0450***	0.0423***	0.0395***
	(0.0058)	(0.0058)	(0.0059)	(0.0058)	(0.0058)	(0.0059)
Southwest Region	0.0123*	0.0240***	0.0078	0.0192***	0.0204***	0.0078
	(0.0067)	(0.0067)	(0.0072)	(0.0068)	(0.0068)	(0.0072)
Rocky Mountain Region	0.0299***	0.0373***	0.0302***	0.0362***	0.0328***	0.0302***
	(0.0048)	(0.0047)	(0.0050)	(0.0049)	(0.0049)	(0.0050)
Far West Region	0.0102**	0.0134***	0.0166***	0.0124***	0.0155***	0.0166***
	(0.0041)	(0.0041)	(0.0042)	(0.0041)	(0.0042)	(0.0042)
Individual characteristics						
Age	-0.0238***	-0.0238***	-0.0238***	-0.0238***	-0.0238***	-0.0238***
	(0.0004)	(0.0004)	(0.0004)	(0.0004)	(0.0004)	(0.0004)
Age squared	0.0003***	0.0003***	0.0003***	0.0003***	0.0003***	0.0003***
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Black or African American	0.0714***	0.0705***	0.0710***	0.0699***	0.0705***	0.0710***
	(0.0040)	(0.0040)	(0.0040)	(0.0040)	(0.0040)	(0.0040)
Asian	-0.1409***	-0.1451***	-0.1431***	-0.1431***	-0.1431***	-0.1431***
	(0.0076)	(0.0076)	(0.0076)	(0.0076)	(0.0076)	(0.0076)
Native American	0.0466***	0.0447***	0.0422***	0.0442***	0.0453***	0.0422***
	(0.0081)	(0.0081)	(0.0081)	(0.0081)	(0.0081)	(0.0081)
Hispanic	0.0751***	0.0749***	0.0748***	0.0747***	0.0756***	0.0748***
	(0.0043)	(0.0043)	(0.0043)	(0.0043)	(0.0043)	(0.0043)
Other Minority	-0.0672***	-0.0693***	-0.0687***	-0.0684***	-0.0682***	-0.0687***
	(0.0063)	(0.0063)	(0.0063)	(0.0063)	(0.0063)	(0.0063)
Male	-0.0725***	-0.0725***	-0.0725***	-0.0725***	-0.0725***	-0.0725***
	(0.0021)	(0.0021)	(0.0021)	(0.0021)	(0.0021)	(0.0021)
Divorced	-0.3342***	-0.3342***	-0.3344***	-0.3342***	-0.3342***	-0.3344***
	(0.0030)	(0.0030)	(0.0030)	(0.0030)	(0.0030)	(0.0030)
Widowed	-0.2919***	-0.2920***	-0.2921***	-0.2920***	-0.2920***	-0.2921***
	(0.0037)	(0.0037)	(0.0037)	(0.0037)	(0.0037)	(0.0037)
Separated	-0.4943***	-0.4944***	-0.4947***	-0.4947***	-0.4943***	-0.4947***
	(0.0067)	(0.0067)	(0.0067)	(0.0067)	(0.0067)	(0.0067)
Never married	-0.3436***	-0.3439***	-0.3440***	-0.3440***	-0.3437***	-0.3440***
	(0.0035)	(0.0035)	(0.0035)	(0.0035)	(0.0035)	(0.0035)
A member of an unmarried couple	-0.2475***	-0.2477***	-0.2479***	-0.2477***	-0.2476***	-0.2479***
	(0.0062)	(0.0062)	(0.0062)	(0.0062)	(0.0062)	(0.0062)

	(1)	(2)	(3)	(4)	(5)	(6)
Self-employed	0.0631***	0.0631***	0.0630***	0.0630***	0.0630***	0.0630***
	(0.0035)	(0.0035)	(0.0035)	(0.0035)	(0.0035)	(0.0035)
Unemployed	-0.3898***	-0.3896***	-0.3897***	-0.3898***	-0.3897***	-0.3897***
	(0.0050)	(0.0050)	(0.0050)	(0.0050)	(0.0050)	(0.0050)
A homemaker	0.0549***	0.0552***	0.0552***	0.0550***	0.0551***	0.0552***
	(0.0041)	(0.0041)	(0.0041)	(0.0041)	(0.0041)	(0.0041)
A student	0.0759***	0.0761***	0.0762***	0.0760***	0.0760***	0.0762***
	(0.0079)	(0.0079)	(0.0079)	(0.0079)	(0.0079)	(0.0079)
Retired	0.0954***	0.0956***	0.0955***	0.0955***	0.0956***	0.0955***
	(0.0034)	(0.0034)	(0.0034)	(0.0034)	(0.0034)	(0.0034)
Unable to work	-0.5728***	-0.5726***	-0.5725***	-0.5728***	-0.5726***	-0.5725***
	(0.0047)	(0.0047)	(0.0047)	(0.0047)	(0.0047)	(0.0047)
Grade 12 or GED (High school graduate)	0.0611***	0.0610***	0.0609***	0.0610***	0.0611***	0.0609***
	(0.0038)	(0.0038)	(0.0038)	(0.0038)	(0.0038)	(0.0038)
College 1 year to 3 years (Some college)	0.0727***	0.0726***	0.0726***	0.0726***	0.0727***	0.0726***
	(0.0040)	(0.0040)	(0.0040)	(0.0040)	(0.0040)	(0.0040)
College 4 years or more	0.1980***	0.1979***	0.1980***	0.1978***	0.1980***	0.1980***
	(0.0041)	(0.0041)	(0.0041)	(0.0041)	(0.0041)	(0.0041)
$15,000 to less than $35,000	0.1560***	0.1561***	0.1561***	0.1561***	0.1561***	0.1561***
	(0.0036)	(0.0036)	(0.0036)	(0.0036)	(0.0036)	(0.0036)
$35,000 to less than $50,000	0.3345***	0.3345***	0.3346***	0.3344***	0.3346***	0.3346***
	(0.0042)	(0.0042)	(0.0042)	(0.0042)	(0.0042)	(0.0042)
$50,000 to less than $75,000	0.4664***	0.4662***	0.4663***	0.4661***	0.4664***	0.4663***
	(0.0044)	(0.0044)	(0.0044)	(0.0044)	(0.0044)	(0.0044)
$75,000 or more	0.6796***	0.6793***	0.6795***	0.6792***	0.6796***	0.6795***
	(0.0045)	(0.0045)	(0.0045)	(0.0045)	(0.0045)	(0.0045)
# of children: 1	-0.0679***	-0.0679***	-0.0679***	-0.0680***	-0.0679***	-0.0679***
	(0.0031)	(0.0031)	(0.0031)	(0.0031)	(0.0031)	(0.0031)
# of children: 2	-0.0416***	-0.0417***	-0.0416***	-0.0417***	-0.0416***	-0.0416***
	(0.0034)	(0.0034)	(0.0034)	(0.0034)	(0.0034)	(0.0034)
# of children: ≥3	-0.0154***	-0.0154***	-0.0152***	-0.0154***	-0.0153***	-0.0152***
	(0.0041)	(0.0041)	(0.0041)	(0.0041)	(0.0041)	(0.0041)
Suburban	0.0227***	0.0225***	0.0231***	0.0224***	0.0227***	0.0231***
	(0.0024)	(0.0024)	(0.0024)	(0.0024)	(0.0024)	(0.0024)
Rural	0.0692***	0.0672***	0.0678***	0.0684***	0.0673***	0.0678***
	(0.0025)	(0.0025)	(0.0025)	(0.0025)	(0.0025)	(0.0025)
Observations	1553186	1553186	1553186	1553186	1553186	1553186

Robust standard errors in parentheses

* significant at 10%; ** significant at 5%; *** significant at 1%

Table C-3: Property Tax (Per Capita) and Life Satisfaction Using State and Local Public Finance Data

	(1)	(2)
Property tax (log of per capita $)	0.0098***	0.0057***
	(0.0017)	(0.0018)
Individual income tax (log of per capita $)	-0.0043***	-0.0054***
	(0.0005)	(0.0005)
General sales tax (log of per capita $)	-0.0018***	-0.0038***
	(0.0007)	(0.0007)
Other taxes (log of per capita $)	-0.0115***	-0.0317***
	(0.0043)	(0.0053)
General expenditure (log of per capita $)		0.0856***
		(0.0131)
Poverty rate (%)	(0.0008)	-0.0020***
	(0.0006)	(0.0006)
Log of per capita personal income	-0.1124***	-0.1514***
	(0.0124)	(0.0138)
Unemployment rate (%)	-0.0055***	-0.0065***
	(0.0011)	(0.0012)
Average annual temperature of the state (℉)	0.0025***	0.0024***
	(0.0002)	(0.0002)
Observations	1553186	1553186
Pseudo R squared	0.07121	0.07123

Robust standard errors in parentheses

* significant at 10%; ** significant at 5%; *** significant at 1%

Table C-4: Property Tax (% in Taxes) and Life Satisfaction Using State and Local Public Finance Data

	(1)	(2)
Taxes (log of per capita $)	-0.0045	-0.0810***
	(0.0092)	(0.0143)
Property sales tax (% of tax revenue)	-0.0005**	-0.0001
	(0.0002)	(0.0002)
Individual income tax (% of tax revenue)	-0.0011***	-0.0008***
	(0.0001)	(0.0002)
General sales tax (% of tax revenue)	-0.0002	0.0001
	(0.0002)	(0.0002)
General expenditure (log of per capita $)		0.1093***
		(0.0155)
Poverty rate (%)	-0.0016***	-0.0026***
	(0.0006)	(0.0006)
Log of per capita personal income	-0.1222***	-0.1013***
	(0.0158)	(0.0160)
Unemployment rate (%)	-0.0053***	-0.0058***
	(0.0012)	(0.0012)
Average annual temperature of the state (℉)	0.0024***	0.0024***
	(0.0002)	(0.0002)
Observations	1553186	1553186
Pseudo R squared	0.07120	0.07122

Robust standard errors in parentheses

* significant at 10%; ** significant at 5%; *** significant at 1%