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Assessing the Effect of Wal-Mart in Rural Utah Areas

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Walmart in Rural

Utah Areas

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ABSTRACT

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Walmart and other "big box" stores seek to expand in rural markets, possibly due to cheap land and lack of zoning laws. In August 2000, Walmart opened a store in Ephraim, a small rural town in central Utah. It is of interest to understand how Walmart's entrance into the local market changes the sales tax revenue base for Ephraim and for the surrounding municipalities. It is thought that small "Mom and Pop" stores go out of business because they cannot compete with Walmart's prices, leading to a decrease in variety, selection, convenience, and most importantly, sales tax revenue base in areas surrounding Ephraim. This shift in sales tax base is assessed using mixed models.

It is found that the entrance of Walmart in Sanpete County has a significant change on sales tax revenue, specifically in the retail industry. A method of calculating the loss for each city is discussed and a sensitivity analysis is performed.

This project also documents what has been done to assemble the data set. In addition to discussing the assumptions made to clean the data, explanations of area and industry definition exploration are explained and defended.

Keywords: mixed models, sales tax base

ACKNOWLEDGMENTS

As with all large projects, there is a lot of behind the scenes help that made this document happen. In fact, this project would not have been possible except for the help of Dr. Grimshaw and Dr. Nelson. This document is the product of countless hours spent in Dr. Grimshaw's office going over statistical methods and discussing data integrity strategies, in addition to the expert knowledge, data set, and enthusiasm provided by Dr. Nelson.

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CHAPTER 1

INTRODUCTION

1.1 The Walmart Effect

Large retail stores, referred to as "big-box" stores, seek to expand in rural areas. The business incentives for this expansion include less competition, cheap land, and lax zoning laws. As the "big-box" stores have multiple store locations, economy of scale allows these stores to sell at lower prices than local "Mom and Pop" stores. As a result, large retail stores cannibalize the competition and drive local store owners to either specialize (Call 2000) or go out of business.

The immediate effect of a "big-box" store entering a rural market is job creation, but as the local competition is driven out of the market, the economy shrinks. The smaller, supportive industries such as advertising, repairs, inventory, remodeling, and professional services lose the business of the "Mom and Pop" stores (Mitchell 2006).

Figure 1.1: An advertisement found in *Ephraim Enterprise*, a local newspaper.

In terms of generating tax revenue, cities collect a portion of the tax revenue generated within city limits. Accordingly, the city with the "big-box" store collects tax revenue from all the additional people that travel to the city for the "big-box" prices. Thus, the entrance of the "big-box" store pulls tax revenue from surrounding cities.

In August 2000, Walmart opened a store in Ephraim, a rural town in central Utah (Figure 1.1). This event provides a natural experiment to explore the effect of "big-box" stores on sales tax revenue bases. The Sanpete area is a fairly contained area with mountains lining the east and west sides of the valley. US Highway 89 is the main thoroughfare, which goes directly through Ephraim (Figure 1.2). Since Walmart is the first "big-box" store in this contained area, it is not unreasonable to compare pre- and post-Walmart sales tax revenue collection and attribute that change to Walmart.

Figure 1.2: Map of the Sanpete area.

Using tax revenue data from the Utah State Tax Commission (USTC) in a location and under circumstances that permit analysis of this natural experiment, this project analyzes the shift in tax revenue in the area before and after the arrival of Walmart to the Sanpete Valley.

A graph of smoothed total sales tax revenue for the cities near the new Walmart (Figure 1.3) shows an upward trend in the tax revenue generated by Ephraim. Though the upward trend was established during the years previous to Walmart's opening, it continues to grow as other cities' tax revenue decreases. This observation is potentially the Walmart effect. Figure 1.4 focuses on the retail tax revenue, since Walmart would impact tax revenue only on its core business. The pattern in Figure 1.3 is consistent in Figure 1.4.

In Figures 1.3 and 1.4 the upward trend for Ephraim is established before the opening of Walmart; however, the upward trend continues longer than the trends of the other cities, suggesting that Walmart is taking away growth from the retail sales in the other areas. The "big-box" effect is present if there is a significant difference in the amount of tax revenue generated in Ephraim at the expense of the surrounding cities after Walmart opens.

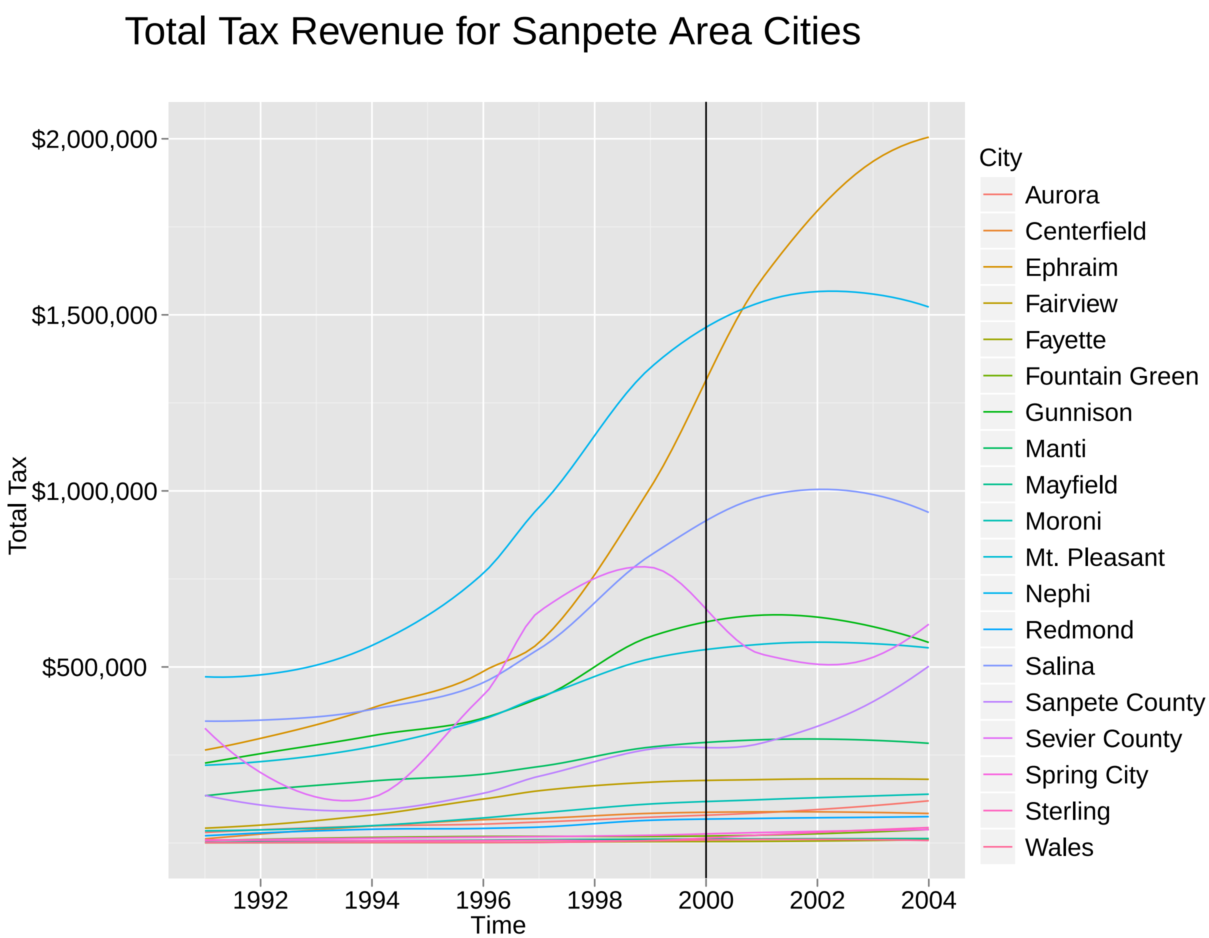

Figure 1.3: Smoothed total tax revenue generated from each city; the vertical line marks when Walmart opens.

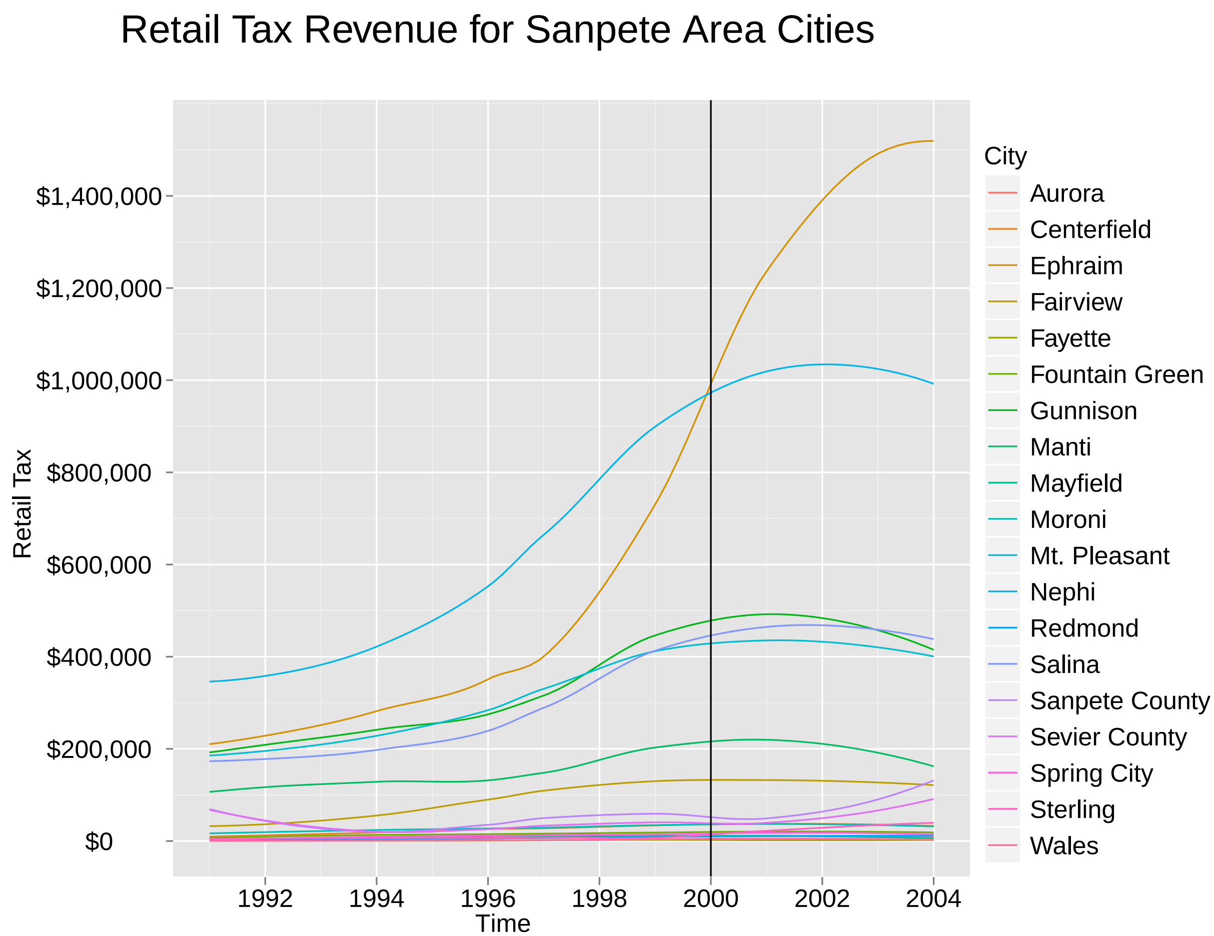

Figure 1.4: Smoothed retail tax revenue generated for each city; the vertical line marks when Walmart opens.

Policy Implications

One of the purposes of local sales tax is to give directly back to the taxpayers. However, in Sanpete County, this is no longer happening. From the perspective of a mayor or a resident from a surrounding city in the area, the apportionment of tax revenue seems narrowly and unjustly distributed. People from outside Ephraim come into the city to purchase at Walmart prices, increasing sales tax revenue in Ephraim and decreasing sales tax revenue in their respective cities. The outsiders pay the tax, but they do not reap any benefit from it because they are residents of other cities. In essence, Ephraim is "robbing" sales tax revenue from the surrounding cities.

This analysis seeks to quantify the shift in sales tax. The results of this analysis could change tax policy in Utah so that the tax revenue generated by "big-box" stores in rural areas is more evenly spread through the region.

Analysis Plan

With the use of mixed models, this project analyzes whether Walmart's entrance into the Sanpete area market has had a significant effect on sales tax revenue. First, a model is built to assess whether there is a significant difference between pre- and post- Walmart sales tax revenue. Second, focusing on the top four revenue producing industries in the area, a second model is used to assess which of the industries are affected by the entrance of Walmart into the market. Third, a method for calculating the expected loss in sales tax revenue for any particular city due to Walmart is explained and implemented.

1.2 Data Description

This project uses point of sale tax data remitted quarterly from 1991 to 2004 as reported to the Utah State Tax Commission. Partial funding for this project was received to accurately clean, merge, and document the original data.

The raw data consisted of a Microsoft Access database with 15 different tables representing the taxes collected for each fiscal year from 1991 to 2005. After combining the tables, there were a total of 2,533,687 observations accounting for $5,442,913,705.90 in tax revenue. A total of $5,533,284,807.10 is recorded, but some values are negative to signify a tax refund of $90,371,101.20.

There are certain observations that have abnormal values. The amount of tax revenue associated with each tax option before and after filtering the abnormal observations, in addition to the proportion of total data filtered, is recorded in the the following tables:

tax revenue totals before filtering are found in Table A.1, tax revenue totals after filtering are found in Table A.2, and finally, the amount and percentage of tax revenue lost due to filtering is found in Table A.3. The filters for abnormal values include city codes without matching city information, extreme year values, invalid month values, non-standard SIC codes, payments paid in advance of filing period, and negative filing period time span. Each abnormality is described along with the frequency and dollar amount associated with the abnormal value in Table A.4. A detailed process of the filtering is found in Section A.3.

After removing observations with obvious data errors, the data are evaluated using two additional criteria: the length of the filing period for each payment, and how soon after the period the payment is received. In anticipation of aggregating data by year, an annual cut-off for filing period duration avoids potential issues of how to separate data recorded over a span of several years. At the end of a filing period, whether quarterly or monthly, a tax remittance payment is due. Understanding how quickly tax payments are paid after the filing period is over is important in understanding the completeness of the data. The decisions for making these cutoffs are found in Section A.4.

Each municipality reports the amount of taxes due for a given filing period under Standard Industrial Classification (SIC) codes. These codes are a standardized way of classifying the type of sale from which the tax revenue is generated. These SIC codes are aggregated into general industry categories following a nested hierarchal structure. At the highest level of detail, the four-digit SIC code can specify the type of store or purchase. At a more general level, the two-digit SIC can be classified into general industry categories, as listed in Table A.5.

This aggregation of SIC codes into general industry categories allows measurement of business categories that Walmart is expected to impact (e.g. Retail) and business categories it Walmart is not expected to impact (e.g. Manufacturing). Simply comparing what happens in SIC 53 will capture the growth of department stores in Ephraim, but from the outlying area, few cities collect tax revenue under SIC code 53. The broad retail category allows for the combined industries in the area to be combined in the same category and department stores and therefore measure the Walmart effect more conveniently and intuitively.

A detailed explanation of the data cleaning process is included in Appendix A. The description of the final data is found in Table 1.1.

Variable	Description
City	Name of municipality
SIC	Standard Industrial Classification code (retail, wholesale, or services)
Time	Quarterly time period to which tax payment corresponds
Tax	Tax revenue collected
Pop	Quarterly population estimates by city

Table 1.1: Description of variables.

This project concentrates on the top four sales tax revenue producing industries in the Sanpete area. In Table 1.2 below, all possible industries are listed with the total tax revenue generated during the window of time of this analysis. The focus for this project is overall tax revenue, as well as revenue from the top four industries: retail, services, wholesale, and manufacturing.

Industry	Tax Revenue
Retail	$40,682,460
Services	7,979,502
Wholesale	5,938,031
Manufacturing	5,464,323
Transportation	2,837,709
Mining	2,404,340
Construction	1,504,848
Administration	1,167,961
Finance	565,126
Agriculture	85,596

Table 1.2: Total revenue for each industry in the Sanpete Valley for fiscal years 1991-2004.

The tax revenue generated under each of the categories by city is listed in Table 1.3. The different variations in defining the area of interest are further explored in Section 2.6, which is the sensitivity analysis portion of this project.

City	Retail	Manufacturing	Services	Wholesale	Total
Ephraim	$10,318,726	$1,250,868	$668,866	$832,105	$13,301,696
Nephi	10,185,554	164,313	2,908,859	282,669	14,538,016
Gunnison	4,990,527	102,821	411,836	218,005	6,348,424
Mt. Pleasant	4,690,886	328,928	573,911	108,002	5,846,206
Salina	4,637,592	147,021	1,149,327	2,969,228	9,218,378
Manti	2,321,677	45,239	472,458	72,133	3,197,743
Fairview	1,353,762	115,876	103,749	4,199	1,844,285
Sanpete County	802,207	719,956	299,838	362,291	3,117,489
Sevier County	640,978	1,059,102	604,286	1,216,714	6,372,410
Moroni	416,978	597,904	200,935	702	1,226,934
Centerfield	383,666	407,856	48,023	5,756	910,838
Fountain Green	227,003	25	24,095	1,367	277,167
Sterling	208,337	574	10,243	50	219,879
Spring City	177,959	1,884	20,977	979	298,382
Mayfield	113,582	537	2,272	394	123,653
Aurora	110,196	144,425	668,991	9,848	949,564
Redmond	103,016	496,350	2,699	10,547	725,615
Wales	37,631	28	4,683	855	67,405
Fayette	22,615	16,232	1,498	1,078	45,814

Table 1.3: Total revenue by industry of all cities in the Sanpete Valley for 1991-2004.

CHAPTER 2

TAX REVENUE MODEL

This project uses point of sale tax remittance payment data as collected by the Utah State Tax Commission (USTC). Each jurisdiction area reports the amount of taxes due for a given filing period under Standard Industrial Classification (SIC) codes assigned by the USTC (Cornia et al. 2010).

If the hypothesized "big box" effect is present, it is expected that after controlling for city, SIC, and population, there will be a significant change in tax revenue before and after Walmart enters the Sanpete market. This "big box" effect is first explored using overall tax revenue to determine whether Walmart's entrance into the market had a significant impact on the overall sales tax revenue. After determining that there is a significant change in overall sales tax revenue, a model is fit to assess which industries are specifically effected by Walmart's store opening. After determining that the retail industry is impacted significantly by Walmart, a method for calculating the expected retail sales tax revenue loss for a particular city due to Walmart's entrance into the market is explained and implemented.

2.1 Dependent Variable

Quarterly tax revenue (TR) is the dependent variable. It is reported by industry category for each city and is available for each quarter. The original data includes monthly, quarterly, and yearly reported taxes, which have been cleaned and combined (see Appendix A).

2.2 Independent Variables

Other variables are included in the model that could explain changes in tax revenue, namely city, population, and time period. After accounting for these variables, the patterns left in the data can be attributed to the Walmart effect.

Cities

Each individual city is thought of as an experimental unit. It is not known how far a person would drive in order to patronize a store with more variety and better prices, so the cities included in the model are those within Sanpete County, and those cities that are reasonably close to the Sanpete county border.

Time

The point in time that a particular tax payment is made is important in the analysis. For each city, there are tax revenue payments for each quarter from 1991 to 2004, resulting in 56 observations per city. These observations are not independent, since they are collected on the same city. It is expected that time periods close together are highly correlated, but time periods far apart are less correlated.

Population

One reason tax revenue may increase is that the population increases. By including the population for each city in the model, the model adjusts for the number of people in a particular area in terms of how much revenue is collected.

Including quarterly city population requires imputation. Population data are available by county for all years of interest, 1990-2004, from the Bureau of Economic Analysis. However, since most cities in this project are from the same county, more detailed data are preferable, namely yearly city population. From the Census Bureau, city population data for 1990 and all years between 2000 and 2004 are available. Using the city population data, a cubic spline is fit to impute the quarterly population change. These imputed population amounts are then used to fill in the missing population data.

Industry

There are ten different possible general SIC categories for which tax revenue is collected. A description of the categorization is found in Section A.5. The model is Section 2.4 investigates tax revenue by industry. In that section, the response variable changes to revenue for a specified industry and an independent variable is added to identify the industry. These industries are retail, services, wholesale, and manufacturing. The model is Section 2.3 uses the top four industries in the county are included, which account for 89% of the sales tax revenue generated in the county. It is expected that Walmart will primarily affect the retail industry. The other three industries are included as controls; in other words, when comparing the pre- and post-Walmart tax revenue amounts, it is expected that there will be a significant difference change in the retail industry and not in the other industries.

2.3 Walmart Effect on Total Tax Revenue

The first question of interest is whether Walmart had an effect on total tax revenue for the cities in Sanpete County. Using logged total sales tax revenue collected in the county as the dependent variable, the model is as follows:

$$log(TR)_{it} = \beta_0 + \beta_1 Pop_{it} + \gamma_t Time_t + \alpha(City)_i + \epsilon_{it}$$

where

$log(TR)_{it}$ = logged overall tax revenue for the ith city in the t th quarter;

Pop_{it} = population for the ith city in the t th quarter;

$Time_t$ = t th time period;

$\alpha(City)_i$ = effect of the ith city;

ϵ_{it} = error term.

Population is estimated as a continuous variable. Time is modeled with a different mean for each time period. City is included as a random effect.

Time measurements are repeated on the same subject and therefore, correlated. This is modeled using an AR(1) covariance structure. It is expected that tax revenue payments collected at adjacent time periods will be more similar than tax revenue collected in time periods further apart. The AR(1) correlation structure assumes that observations that are w time periods apart have a correlation of ρ^w.

City is included as a random effect, $\alpha(City)_i$, allowing each city to have a unique effect on tax revenue. The spread of the city effects is measured $Var[\alpha(City)_i]$, where a $Var[\alpha(City)_i]$=0 signifies that the cities do not have unique effects on revenue after controlling for the fixed effects of population and time (Littell et al. 2006).

Results

The fixed effects, random effect for city, and correlation parameter are estimated using Restricted Maximum Likelihood (REML) in a mixed model framework. This method also assumes that the error term and the random effect for city are normally distributed. The table of results from the overall tax effect model is found in Table B.1. The complete output for the model is found in Appendix B.

There are 56 quarterly time periods in the data, 36 of which occur before the opening of Walmart, and 20 of which occur after. Note that although Walmart opened in August 2000, because the yearly remittance payments are spread throughout the year, it is expected that the effect of Walmart will begin to show up in the first quarter of 2000.

In order to assess the Walmart effect, a contrast statement is written so that the average tax revenue in the time period before Walmart is compared to the average tax revenue time period after Walmart. For the overall model, this contrast can be expressed as

$$\begin{aligned}
& -\frac{1}{36}(\mu_{Q1\text{`}91} + \mu_{Q2\text{`}91} + \cdots + \mu_{\text{`}99Q4}) + \frac{1}{20}(\mu_{Q1\text{`}00} + \mu_{Q2'00} + \cdots + \mu_{Q4'04}) \\
= & -\frac{1}{36}(\gamma_1 + \gamma_2 + \cdots + \gamma_{36}) + \frac{1}{20}(\gamma_{37} + \gamma_{38} + \cdots + \gamma_{56}) \\
= & \left(-\frac{1}{36}, -\frac{1}{36}, \ldots, -\frac{1}{36}, \frac{1}{20}, \frac{1}{20}, \ldots, \frac{1}{20}\right)\gamma = c_1'\gamma,
\end{aligned}$$

where γ_t is the estimate for each time period and $\gamma = (\gamma_1, \ldots \gamma_{56})$. The null hypothesis is $H_0 : c_1' \gamma = 0$, or in other words, there is no difference in tax revenue before and after the entrance of Walmart after accounting for city and population. The results, listed in Table 2.1, show that with 95% confidence, the increase in sales tax revenue before and after Walmart opens is between 87% to 151%.

Effect	Estimate	Lower 95% CI	Upper 95% CI	p-value
Overall Effect	118.15%	87.76%	150.93%	$< .0001$

Table 2.1: Contrast statements comparing overall and industry specific pre- and post-Walmart tax revenue in the Sanpete Area.

The random effects from the model are listed in Table 2.2. Cities with a large estimate are interpreted as having an effect on revenue that is not explained by the model. For instance, the city of Nephi has the largest estimate. This might be because it is located so close to a major freeway. The estimate for the city of Ephraim is also large; this could be because of Snow College, which is located in the city. The effect for the city of Salina is large, perhaps catching the effect of having a large and expanding wholesale industry.

Conversely, the cities of Wales, Fayette, and Mayfield have negative random effects. All three of these cities are very small and do not contribute very much as far as tax revenue goes, but based on the random effects estimate for each of the cities, they produce even less than expected based on time and population. The propensity to spend money in these cities is low.

There are measurements on the same subject 56 different times, resulting in autocorrelation. The impact of autocorrelation is that observations that are closer together in time are more correlated with each other. The estimate for ρ, the autocorrelation between observations, is 0.7977.

The population estimate is positive. As expected, the more people in the city, the more revenue is generated. According to the model, each additional person increases tax revenue by 0.00056%.

Location	Estimate	t values
Nephi	2.3412	3.82
Ephraim	2.1270	3.53
Salina	2.0596	4.61
Gunnison	1.7150	3.88
Mt. Pleasant	1.6071	3.52
Sevier County	1.5556	3.30
Manti	1.0062	2.13
Sanpete County	0.9185	1.83
Fairview	0.4875	1.09
Moroni	0.1028	0.23
Aurora	-0.1018	-0.22
Centerfield	-0.2407	-0.53
Redmond	-0.4086	-0.88
Spring City	-1.2989	-2.85
Fountain Green	-1.3414	-2.93
Sterling	-1.6961	-3.43
Mayfield	-2.2073	-4.58
Wales	-3.1041	-6.25
Fayette	-3.5215	-7.07

Table 2.2: Random Effects Estimates for Model 1

2.4 Walmart Effect on Industry Specific Tax Revenue

After determining that Walmart has a significant effect on overall tax revenue, the next question is which industries are most affected by Walmart. In addition to the effects included in the previous model, there are two additional effects: an industry term and an industry by time interaction term. These are key in isolating the effects of each industry before and after Walmart enters the Sanpete area market.

The model, with a logged dependent variable, is as follows

$$log(TR)_{ijt} = \beta_0 + \beta_1 Pop_{it} + \beta_2 SIC_j + \gamma_t Time_t + \xi_{jt}(SIC \times time)_{jt} + \alpha(City)_i + \epsilon_{it}$$

where

$log(TR)_{ijt}$ = logged tax revenue for the jth industry in the ith city in the t th quarter;

Pop_{it} = population for the ith city in the t th quarter;

SIC_j = effect of the jth industry;

$Time_t = t$ th time period;

$(SIC \times time)_{jt}$ = effect of the jth industry at the tth time;

$\alpha(City)_i$ = effect of the ith city;

ϵ_{ijt} = error term.

The dependent variable is the industry tax revenue for each of the top four industries in the area. Once again, population and time are fixed effects, as well as industry and the industry×time interaction. City is included as a random effect. Industry and the industry×time interaction are factor variables.

Results

The fixed effects, random effect, and correlation parameter are estimated using the same methodology as in Section 2.3. Once again, the effect of Walmart is assessed through contrast statements, one for each specific industry. The estimated effect of Walmart in the top four industries is found in Table 2.3. The complete output for the model is found in Appendix B.

Similar to the overall tax revenue model, the Walmart effect is assessed using a contrast statement. This time, however, it is a more complex statement because of the industry by time interaction. It is written so that for a specific industry the average tax revenue in the time period before Walmart is compared to the average tax revenue time period after Walmart, which is expressed as

$$\begin{aligned} & -\frac{1}{36}(\mu_{Q1\,`91} + \mu_{Q2\,`91} + \cdots + \mu_{`99Q4}) + \frac{1}{20}(\mu_{Q1\,`00} + \mu_{Q2\,'00} + \cdots + \mu_{Q4\,'04}) \\ = & -\frac{1}{36}(\gamma_1 + \xi_{i,1} + \gamma_2 + \xi_{i,2} + \cdots + \gamma_{36} + \xi_{i,36}) + \\ & \frac{1}{20}(\gamma_{37} + \xi_{i,37} + \gamma_{38} + \xi_{i,38} + \cdots + \gamma_{56} + \xi_{i,56}) \\ = & \left(-\frac{1}{36}, -\frac{1}{36}, \ldots, -\frac{1}{36}, \frac{1}{20}, \frac{1}{20}, \ldots, \frac{1}{20}, -\frac{1}{36}, -\frac{1}{36}, \ldots, -\frac{1}{36}, \frac{1}{20}, \frac{1}{20}, \ldots, \frac{1}{20}\right) \begin{pmatrix} \gamma \\ \xi \end{pmatrix} \\ = & c_2' \begin{pmatrix} \gamma \\ \xi \end{pmatrix}, \end{aligned}$$

where γ_t is the estimate for each time period, ξ_{it} is the interaction effect for the ith industry at time t, and $(\gamma, \xi)' = (\gamma_1, \ldots \gamma_{56}, \xi_{i,1}, \ldots \xi_{i,56})$. The null hypothesis is $H_0 : c_2'(\gamma, \xi) = 0$, or in other words, there is no difference in retail tax revenue before and after the entrance of Walmart after accounting for city and population. The results are listed in Table 2.3.

Effect	Estimate	Lower 95% CI	Upper 95% CI	p-value
Retail Effect	596.3%	153.7%	1301.2%	$< .0001$
Manufacturing Effect	-20.7%	-61.3%	66.7%	0.5405
Services Effect	-0.01%	-52.9%	107.92%	0.9997
Wholesale Effect	247.94%	11.1%	449.5%	0.0265

Table 2.3: Contrast statements comparing industry specific pre- and post-Walmart tax revenue in the Sanpete Area.

This significant change between pre- and post-Walmart tax revenue carries over into the retail market, where at 95% confidence, the change in retail tax revenue is between 153% and 1301%. The other three included industries serve as controls. Since the change in retail sales tax revenue is signficant for retail but not for manufacturing or services, this leads to the conclusion that Walmart had a significant impact on the retail industry. It should be noted that the wholesale industry is significant, but there was a major expansion of the wholesale industry, particularly in Salina, during this particular time period.

A table with the random effects estimates for the industry effects model is found in Table 2.4. The order is similar to the city effect estimates in Section 2.3, and similar interpretations apply. It is not surprising that Salina has the largest effect since Salina has a large and expanding wholesale industry. This expansion is not captured in the particular covariates of this model, so the random effect compensates for the otherwise poor explanation. This effect is more evident because wholesale revenue has a larger weight since this model only uses revenue from the top four industries.

Similar to the overall tax model, the population estimate is positive, confirming that an increase in population increases consumption. In this case, an additional person increases the tax revenue by 0.0007%. The covariance parameter estimate, $\hat{\rho}$, is 0.9491.

Location	Estimate	t values
Salina	2.2878	2.66
Sevier County	1.5444	1.77
Ephraim	1.4356	1.54
Mt. Pleasant	1.3948	1.61
Gunnison	1.3616	1.57
Nephi	1.0596	1.13
Sanpete County	0.9623	1.09
Manti	0.6970	0.80
Aurora	0.5725	0.66
Centerfield	0.4955	0.57
Moroni	0.2036	0.23
Fairview	0.1191	0.14
Redmond	-0.2898	-0.32
Spring City	-1.2037	-1.37
Fountain Green	-1.5192	-1.64
Sterling	-1.7900	-1.85
Mayfield	-2.1046	-2.24
Wales	-2.5937	-2.64
Fayette	-2.6328	-2.70

Table 2.4: Random effects estimates for the industry effects model.

2.5 Compensation Estimation

After concluding if Walmart has a significant effect on overall tax revenue and, more specifically, Walmart has a significant effect on the retail industry, it is of interest to determine the amount of tax revenue that Walmart pulls from each specific city.

Using the estimates from industry model in Section 2.4 can be drawn comparing the estimated tax revenue and the actual tax revenue collected for a given industry for a specific city. In Figure 2.1, the actual and estimated values for the cities of Ephraim and Manti are compared for Retail Tax Revenue. The vertical line in 2000 is a visual for when Walmart enters the market. For both Ephraim and Manti, the expected amount of revenue is far below the observed amount of revenue and indicates issues with the prediction performance of the model in Section 2.4 that will be addressed at the end of this section.

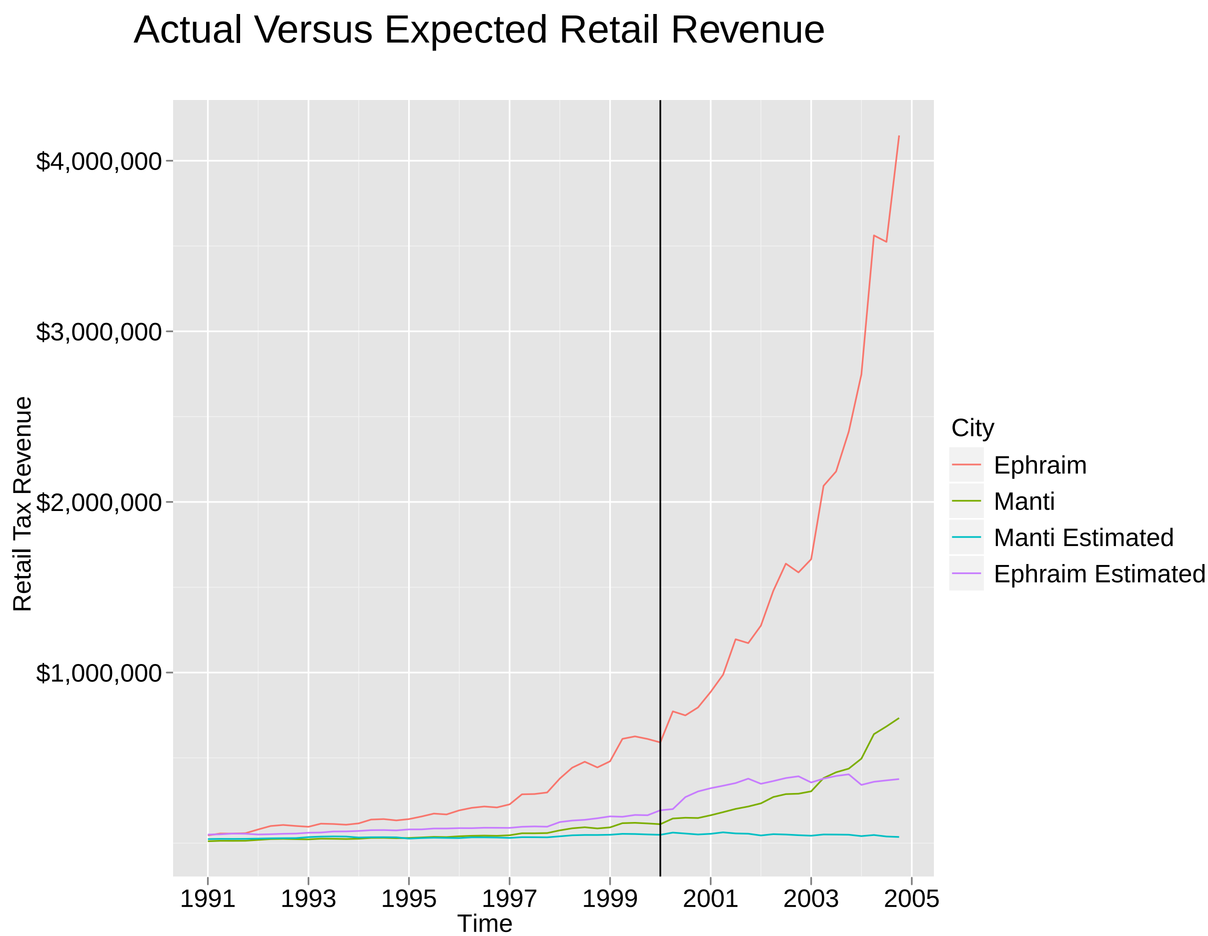

Figure 2.1: Graph through time of actual retail revenue versus expected retail tax revenue for Ephraim and Manti.

In order to calculate the total amount of tax revenue from a given industry that a city loses to Walmart, compute the difference between the observed and expected tax revenue for a particular city, i, $\Delta_{it} = E(Y_{it}|X) - Y_{it}$, for each time period, t. Taking the sum of each of these time periods, Total $\text{Loss}_i = \sum_{t='00Q1}^{'04Q4} \Delta_{it}$, equals the total change in tax revenue after Walmart's entrance into the market. For Manti, the calculated lost retail tax revenue is \$5,480,793, translating into almost \$91 million in retail sales.

In addition to this estimate, a confidence interval for Δ_{it} is calculated based on the confidence interval for $E(Y_{it}|X)$. For each city, i, and time, t, an estimate and a confidence interval are estimated. So for each city and time, there is a confidence interval, $\Delta_{it} \pm \text{ME}_{it}$, for the change in tax revenue. In order to obtain an estimate for the overall change in tax revenue through time (post-Walmart), the upper and lower confidence intervals are calculated as

$$\sum_{t='00Q1}^{'04Q4} (\Delta_{it} \pm \mathrm{ME}_{it}).$$

This effect is visualized in a plot with confidence bands for the total loss due to Walmart (Figure 2.2). It is estimated that the revenue lost is between -\$7,247,117 and \$29,170,289. Since zero is included in the interval, it appears that Manti did not lose a statistically significant amount of retail tax revenue. However, this is a poor estimate, which is likely due to poor model fit.

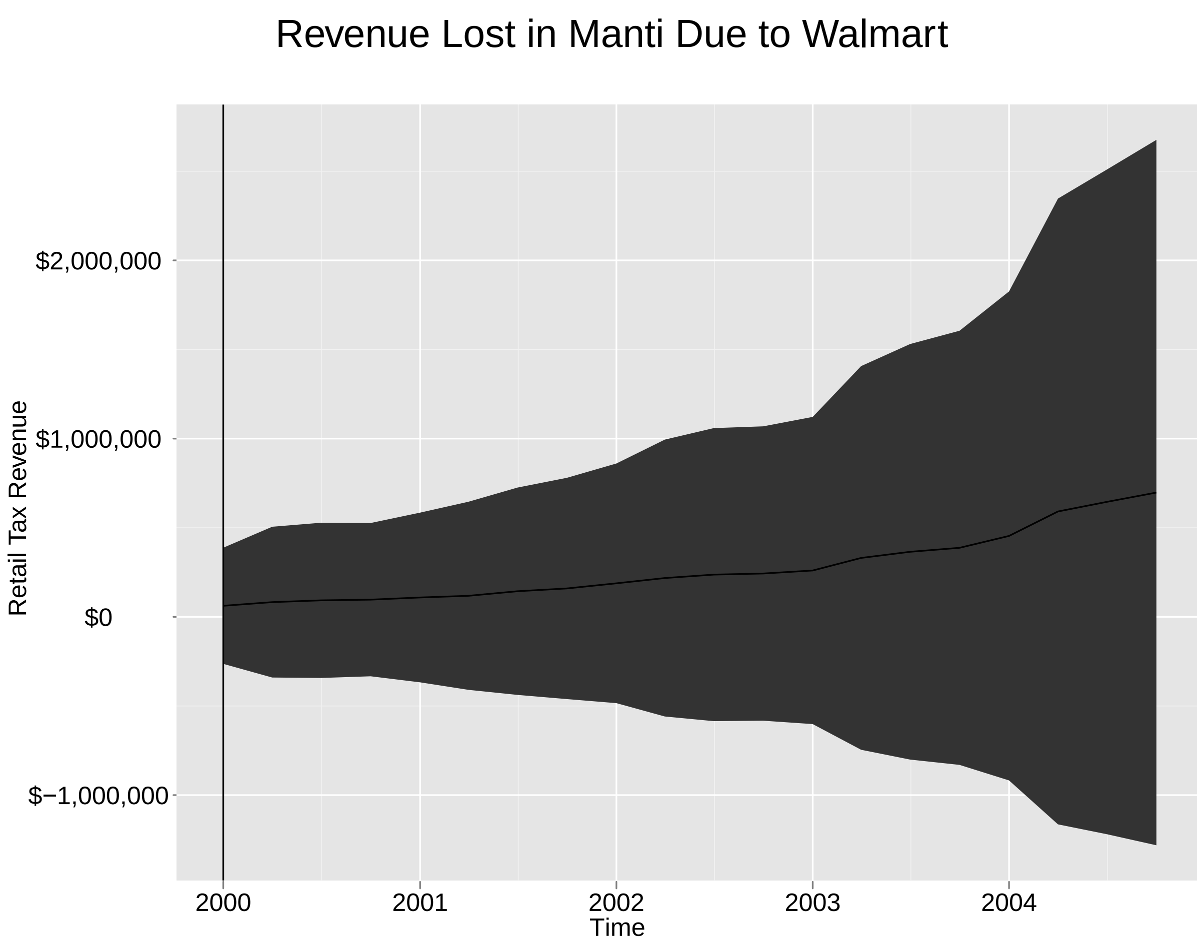

Figure 2.2: Plot of the confidence interval on Manti Lost Retail Tax Revenue.

If the goal is to predict retail sales tax revenue, the noise added by the additional industries leads to a poor model fit and, therefore, poor prediction. This poor model fit is evident in the graph of the predicted values versus the residuals (Figure 2.3) which shows that a majority of the retail residuals are negative. This leads to overestimation of the lost retail sales tax revenue for a given city. A model focusing on estimating the loss in the retail sector is fit with just retail sales tax revenue as the dependent variable in Section 2.6.

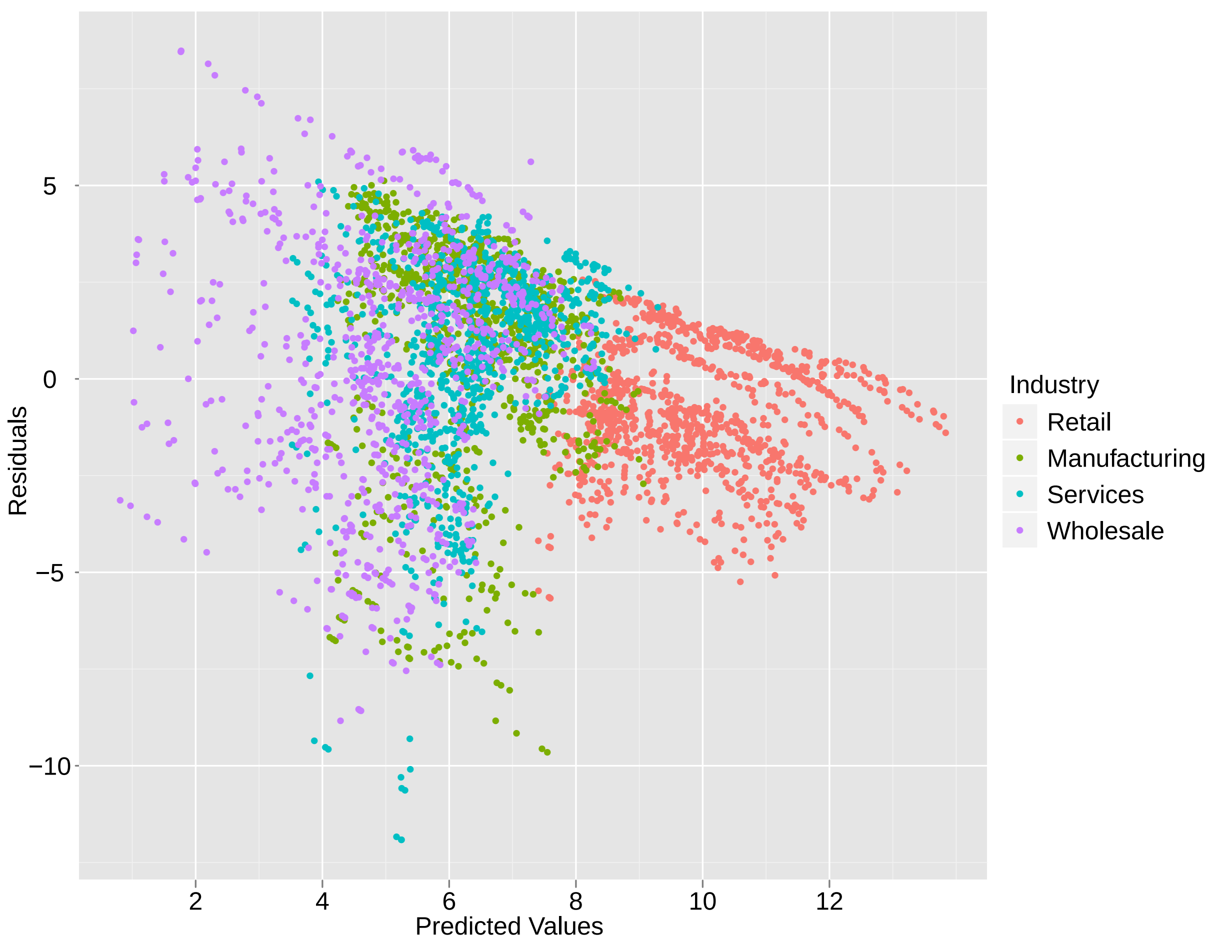

Figure 2.3: Plot of the residuals versus the predicted values.

2.6 Model Sensitivity

The significance of the Walmart effect is influenced by the particular breakdown of the data used. Adjustments to covariance structure parameterization, variable transformation, population, area definition, SIC categorization, and modeling could possibly affect the results of the analysis. The following section explores the effect of changing particular aspects of the model and then testing to see if changing their definition has an influence on the Walmart effect.

Covariance Structure

Due to the autocorrelated nature of the data, it seems natural to fit an AR(1) covariance structure. A compound symmetric covariance structure was fit; however, the Akaike's information criterion (AIC) was much larger for both model 1 and model 2, see Table 2.5. The final models are reported using the AR(1) structure.

Model	CS	AR(1)
Overall	1279.3	333.3
Industry	16293.2	9451.3

Table 2.5: Exploring the effect of changing the covariance structure.

Variable Transformations

The chosen model uses logged tax revenue and logged population. This choice is made after fitting three models: no logs, logged tax revenue, and logged tax revenue and population. To assess the normal errors assumption, a plot of Cholesky residuals for the different models is compared, (Figure 2.4). This plot shows that the model with no variable transformation is the farthest from being normally distributed. The other two models are very similar. For ease of interpretation, the model with both logged tax revenue and logged population was initially preferred; however, this leads to a non-positive G matrix in the estimation of random effects. To avoid this, the model with a log transformation only on tax revenue is used in Sections 2.3 and 2.4.

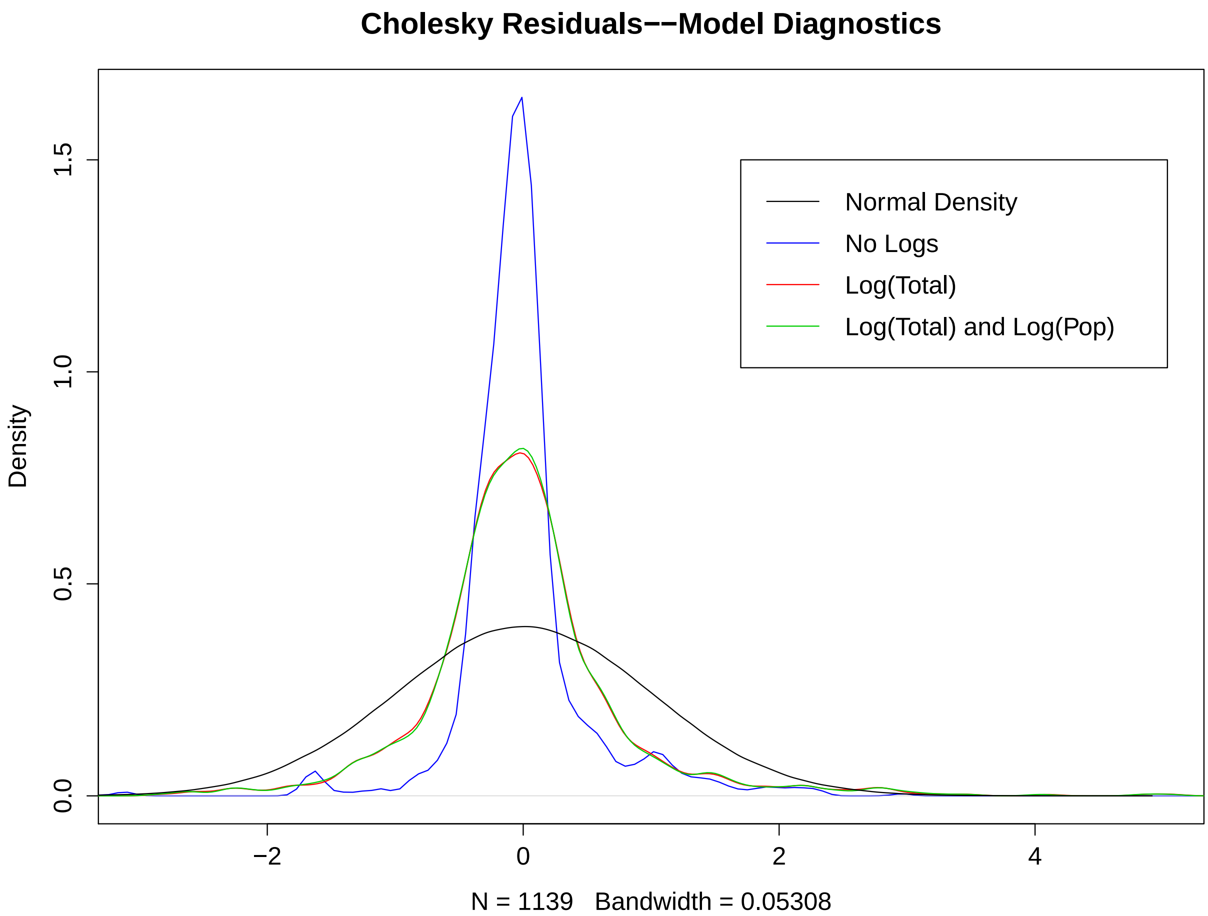

Figure 2.4: Cholesky residuals exploring variable transformations.

Population and Personal Income Imputation

In addition to population, including personal income in the model accounts for more of the demographic changes in the area. While population accounts for the number of people potentially purchasing goods in an area, personal income accounts for how wealthy the average person in an area is. It is assumed that as a person has more income, they have a greater propensity to buy goods and therefore generate more tax revenue.

Both population and personal income data are available by county from the Bureau of Economic Analysis. However, more detailed data, namely quarterly city population and personal income estimates, are preferable because most cities are in the same county. As described in Section 2.2, the quarterly city population estimates are made using yearly city level data from the US Census Bureau. The personal income per city per quarter was imputed using the population variable, where the percentage of the population in the county was calculated using the city quarterly population data, and then the personal income data was divided using those percentages. However, this approach led to multicollinearity and convergence issues.

Time

An alternative approach to modeling the time effect is to treat time as a continuous variable with a cubic effect to allow for the upward and downward trends in the economy; however, the residual plots show that treating time as a continuous variable leads to estimation bias.

Area Effect

Initially, only cities in Sanpete County were included. This appeared to be a good choice because Ephraim is located roughly in the center of Sanpete County. However, there are several cities just outside the border of Sanpete county that might be included as potential patrons of the Walmart in Ephraim. The original choice for the area of analysis included all of Sanpete County plus the reasonably close cities from the surrounding counties.

Another approach to consider in defining how large of an area for the analysis is the LDS temple district. The Manti temple district is more far reaching than the previously defined geographic area for this analysis. It is possible that people from Juab or Emery county stop in Ephraim to make some purchases because they are driving through on their way to Manti to go to the temple. The temple district area definition comprises 58 cities.

Conversely, perhaps it is only the closets surrounding cities that are affected by Walmart. A geographical slice is taken, including the cities of Ephraim, Manti, Sterling, Spring City, Wales, Moroni, and Mt. Pleasant. These cities are all within 16 miles of Ephraim.

Another dimension to the area definition problem is that just because the data exist for all cities does not mean that those cities should be included in the analysis. Only cities with a significant amount of tax revenue in a given industry are chosen for the analysis. This discrimination between large and small cities is imperative because including all possible cities introduces a lot of zeros into the data, leading to problems with the log transformation and convergence issues. Also, some cities have small populations and few industries, and are therefore not substantive competitors. It should be considered whether Wales (total retail tax revenue over a 15 year span = $\$37,631$) really has enough of a retail market to be considered a retail competitor when Walmart opened. Small cities, such as Wales, could be excluded from the data. In the sensitivity analysis, the top six total revenue cities, Ephraim, Nephi, Gunnison, Mt. Pleasant, Salina, and Sevier County, are included in this area definition.

Finally, an area definition considering substantial players in the retail market that have close proximity to Walmart is considered, including Manti, Gunnison, Mt. Pleasant, and Fairview. These cities likely provide the most competition with Walmart.

In summary, although data for the entire state are available, the question of interest only concerns the areas that are potentially affected by the opening of Walmart in Ephraim. There are five area definitions: (1) area1: an intuitive Sanpete Area boundary including cities that are a reasonable traveling distance to the Walmart in Ephraim, (2) temple: the Manti Temple district, (3) geo: the six closest cities to Ephraim, (4) top6: the top six total tax revenue producing cities within the intuitive Sanpete Area boundary, and (5) comp: the main retail industries closest to Ephraim. The p-values from the overall and industry specific models are included in Table 2.6.

By comparing the different area definitions, it is evident that there is always an overall industry effect as well as a retail effect. However, the industries that were supposed to act as controls are also showing up as significant, implying that the model covariates do

Effect	area1	temple	geo	top6	comp
Overall Industry Effect	$< .0001$	$< .0001$	$< .0001$	$< .0001$	$< .0001$
Retail Effect	$< .0001$	NA	0.0068	0.0474	0.0330
Manufacturing Effect	0.5405	NA	$< .0001$	0.0022	0.0093
Services Effect	0.9997	NA	0.1174	0.1757	0.0189
Wholesale Effect	0.0265	NA	0.9098	0.0385	0.0115
Cities included	19	58	7	6	5

Table 2.6: Exploring the effect of changing the area definition on the p-values. The temple district model did not converge for the industry model, most likely due to estimating too many cities that were not distinct from one another, leading to an infinite likelihood.

not capture enough information to sufficiently isolate the Walmart effect. It is unclear how much of what is being modeled is due to other factors.

Notice that depending on the area definition, the wholesale industry has a significant effect. Salina is a large player in the wholesale industry. When Salina is included in the area definition without many other cities to dilute its effect, the wholesale effect p-value is quite small.

Industry Focus

The ability of this analysis to predict retail tax revenue and sales is somewhat hindered by the inclusion of other industries as controls. If a model is fit focusing only on retail, the prediction is greatly improved. The model is estimated as follows

$$log(TR)_{it} = \beta_0 + \beta_1 Time_t + \beta_2 Pop_{it} + \alpha(City)_i + \epsilon_{it}$$

where

$log(TR)_{it}$ = logged retail tax revenue in the ith city in the tth quarter;

$Time_t = t$th time period;

Pop_{it} = population for the ith city in the tth quarter;

$\alpha(City)_i$ = effect of the ith city;

ϵ_{ijt} = error term.

This model is the same as the model fit in Section 2.3 to assess the Walmart effect, except that the dependent variable is retail tax revenue as opposed to overall tax revenue. Using the estimates from this model, a graph can be drawn comparing the estimated retail tax revenue and the actual retail tax revenue collected for a given city. In Figure 2.5, the actual and estimated values for the cities of Ephraim and Manti are compared. The Walmart effect is visible here. The vertical line in 2000 is a visual for when Walmart enters the market.

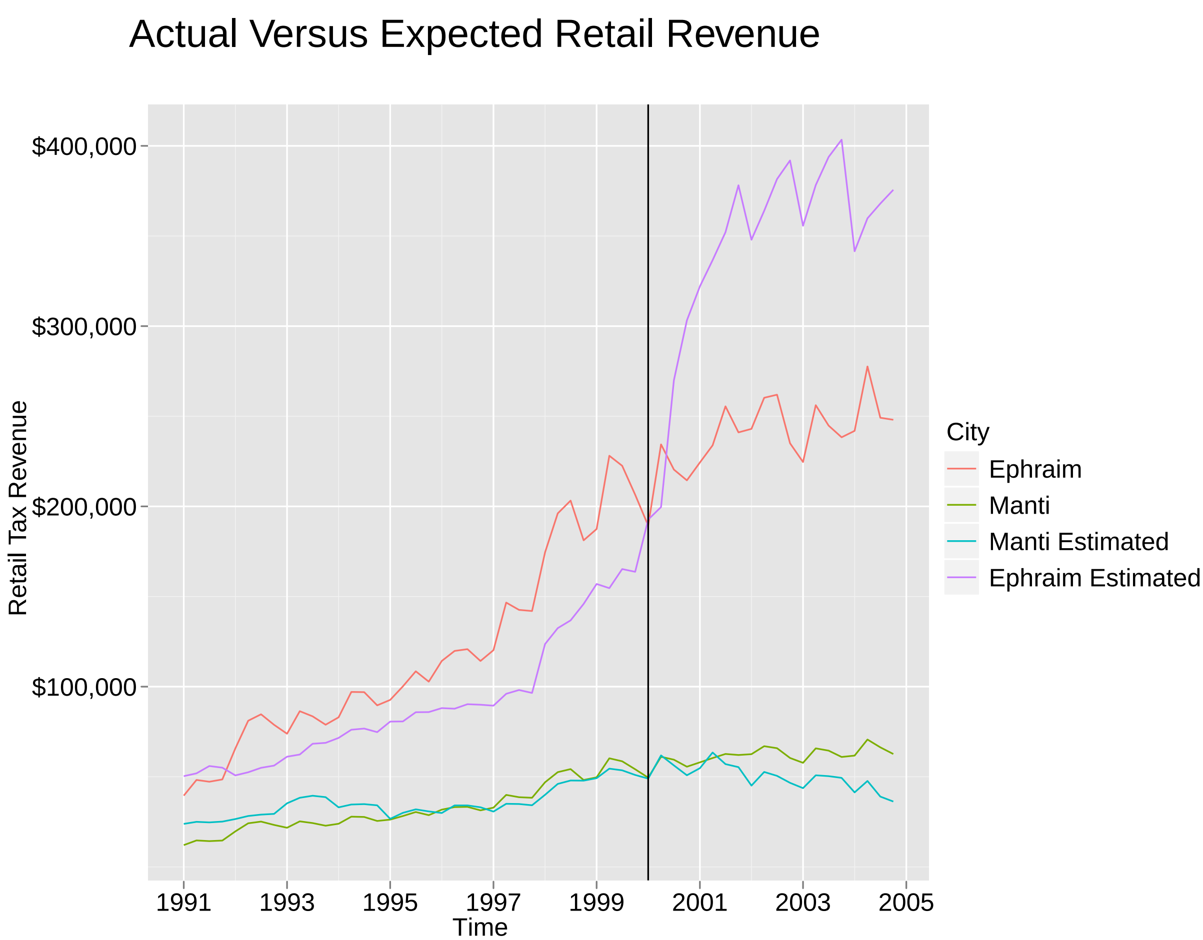

Figure 2.5: Graph through time of actual revenue versus expected revenue in the retail industry.

Again, the total amount of tax revenue that a city loses to Walmart is calculated by finding the difference between the observed and expected tax revenue for a particular city and time period, $\Delta_{it} = E(Y_{it}|X) - Y_{it}$. Taking the sum of each of these time periods,

$\text{Total Loss}_i = \sum_{t='00Q1}^{'04Q4} \Delta_{it}$, equals the total change in tax revenue due to Walmart's entrance into the market. For Manti, this loss is calculated to be $232,882. Using the same method as described in Section 2.5, the confidence bands are calculated for each time period, as seen in Figure 2.6. The 95% confidence interval is (-$231,968 and $1,163,494 using a retail specific model, which is significantly narrower than the 95% confidence interval reported in Section 2.5.

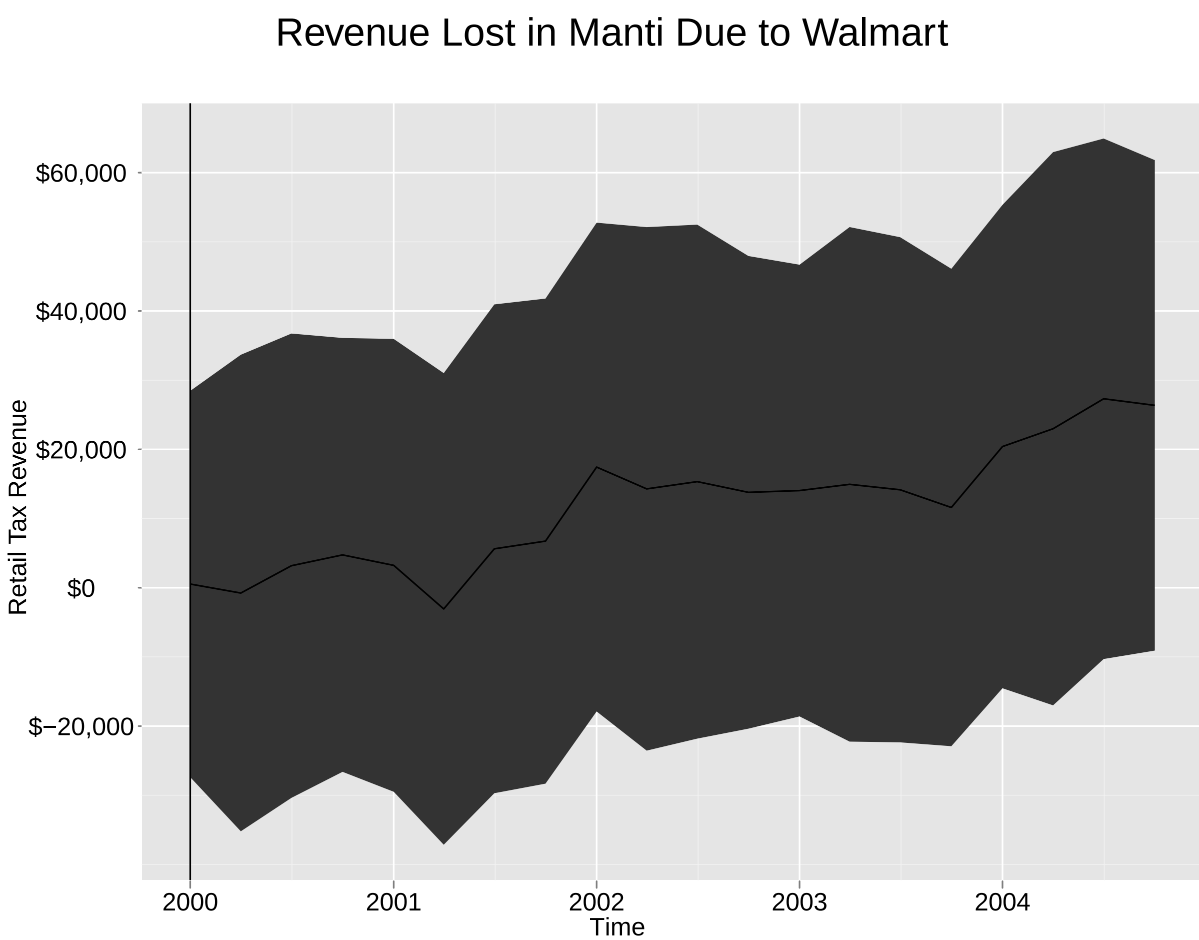

Figure 2.6: Plot of the residuals versus the predicted values.

2.7 Conclusion

As policymakers consider the effect of Walmart in an area, there is evidence that there is indeed a shift in the sales tax base. The first model shows that Walmart has a significant effect in the Sanpete area. The second model identifies the retail and wholesale industries having a significant change pre- and post-Walmart, though the wholesale industry is most likely due to other causes.

The effect can be calculated for individual cities by comparing expected and actual tax revenue during the time period. This comparison of revenue is most credible when using a model that only deals with a specific industry.

Though the model shows that Walmart has a significant effect in the overall tax revenue of the area as well as the retail industry, the sensitivity analysis shows that the results are not dependable. The area definition is a critical, and at this point, somewhat subjective decision. Ideally, the model should be robust to changes in area definition, perhaps through adding additional covariates.

Areas of further research include adding a smoother in order to answer the questions regarding how much revenue Ephraim pulls from other cities, accounting for the seasonality of the data rather than dividing the yearly observations evenly through the quarterly periods, and estimating spatial correlation between cities.

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APPENDICES

APPENDIX A

UTAH STATE TAX COMMISSION DATABASE 1991-2005

A.1 Preface

The following appendix outlines how the raw data from the Utah State Tax Commission was processed in order to create a data set that meets the expectations of the researchers providing the funding.

A.2 Data Description

The raw data from the Utah State Tax Commission consisted of a Microsoft Access database with 15 different tables representing the taxes collected for each fiscal year from 1991 to 2005. After combining the tables, there were a total of 2,533,687 observations accounting for $5,442,913,705.90 in tax revenue. A total of $5,533,284,807.10 is recorded, but some values are negative to signify a tax refund of $90,371,101.20. For the remainder of this section, a tax refund signifies the difference between the total amount and the absolute value of the total amount.

There are a number of abnormal observations. A detailed process of the filtering is found in Section A.3. The amount of tax revenue associated with each tax option before and after filtering the abnormal observations, in addition to the proportion of total data filtered, is recorded in the the following tables: tax revenue totals before filtering are found in Table A.1, tax revenue totals after filtering are found in Table A.2, and finally, the amount and percentage of tax revenue lost due to filtering is found in Table A.3.

Tax Type	Total Revenue	Abs Total Revenue	Tax Refund	Percent
Local	$3,694,741,784.70	$3,761,952,278.70	$ -67,210,494.00	-2.0%
Arts Zoo	131,964,024.02	134,020,894.80	-2,056,870.78	-2.0%
County Opt	553,920,034.41	560,950,453.36	-7,030,418.95	-1.0%
Highway	41,422,146.78	41,705,209.34	-283,062.56	-1.0%
Mass Trans	985,338,145.91	998,836,034.61	-13,497,888.70	-1.0%
Resort	8,168,672.86	8,195,534.70	-26,861.84	0.00%
Rural Hosp	27,310,101.32	27,575,564.54	-265,463.22	-1.0%
Town Opt	48,795.90	48837.02	-41.13	-0.0%
Total	$5,442,913,705.90	$5,533,284,807.10	$-90,371,101.18	2.0%

Table A.1: The amount of tax revenue collected before filtering out abnormal observations.

Tax Type	Total Revenue	Abs Total Revenue	Tax Refund	Percent
Local	$3,563,460,071.30	$3,601,104,753.80	$-37,644,682.50	-1.0%
Arts Zoo	131,362,064.91	132,982,545.53	-1,620,480.62	-1.0%
County Opt	552,080,038.59	557,251,630.33	-5,171,591.74	-1.0%
Highway	41,284,681.61	41,531,495.98	-246,814.38	-1.0%
Mass Trans	958,515,531.60	967,411,513.99	-8,895,982.39	-1.0%
Resort	8,167,966.16	8,194,828.00	-26,861.84	0.0%
Rural Hosp	27,228,763.09	27,440,188.33	-211,425.24	-1.0%
Town Opt	48,793.32	48,834.45	-41.13	-0.0%
Total	$5,282,147,910.60	$5,335,965,790.40	$-53,817,879.80	-1.0%

Table A.2: The amount of tax revenue collected after filtering out abnormal observations.

Data Set Comparison

After all the filtering, the final data set has 2,113,427 observations and $5,282,699,173.40, in comparison to the data set provided for the paper "The Effect of Local Option Sales Taxes on Local Sales," by Cornia et al. (2010), which had 1,766,275 observations and $4,174,877,870.70. A portion of this difference between data sets can be attributed to the fact that the new data include years 1991 to 2005, on a monthly, quarterly, and yearly level, as opposed to the other paper, which used only yearly data from years 1993 to 2005.

Tax Type	Total Revenue	Abs Total Revenue	Tax Refund	Percent
Local	$131,281,713.40	$160,847,524.90	$-29,565,811.50	-18.0%
Arts Zoo	601,959.11	1,038,349.27	-436,390.16	-42.0%
County Opt	1,839,995.82	3,698,823.03	-1,858,827.21	-50.0%
Highway	137,465.17	173,713.36	-36,248.19	-21.0%
Mass Trans	26,822,614.31	31,424,520.62	-4,601,906.31	-15.0%
Resort	706.70	706.70	0.00	0.0%
Rural Hosp	81,338.23	135,376.21	-54,037.98	-40.0%
Town Opt	2.57	2.57	0.00	0.0%
Total	$160,765,795.30	$197,319,016.70	$-36,553,221.40	-19.0%

Table A.3: The amount and percentage of tax revenue data that are lost due to filtering.

A.3 Data Filters

There are certain observations that have abnormal values. These include city codes without matching city information, extreme year values, invalid month values, non-standard SIC codes, payments paid in advance of filing period, and negative filing period time span. Each abnormality is described along with the frequency and dollar amount associated with the abnormal value in Table A.4. Some observations have more than one abnormal issue and are used in the calculations multiple times. For this reason, the sum of the tax revenue for all abnormalities is not the same as the amount of tax data removed from the original data. In other words, the filters in Table A.4 are not mutually exclusive.

Abnormal Value	Obs	Total Tax	Abs Tax	Refund
No City Name	68	$-25,645.59	$83,938.60	$-109,584.19
Invalid Month	26	557.06	$557.06	$0.00
Year in 1991-2005	65,777	133,366,199.73	148,931,956.76	-15,565,757.03
Non-Standard SIC	1,679	603,373.99	651,333.80	-47,959.81
Paid in Advance	1,794	242,947.82	243,314.68	-366.86
Negative Filing Period	42	1,188.69	1,188.69	0.00
Total	68,931	$134,035,811.45	$149,695,428.95	$-15,659,617.50

Table A.4: Dollar amount associated with each filter criteria.

No City Name

A match of the city codes and tax revenues with their corresponding names reveals eight city codes without matching names, found in Table A.5. A special note should be made about citycode 33000. Not only are there 50 observation, but also, the sum of those observations is negative. There may be a story behind these numbers to explain the large refund amount, but no meeting with officials from the Utah State Tax Commission was held to investigate. Since the data account for a small percentage of the overall tax revenue, the problem is noted and the observations are removed from the data set.

City Code	Obs		Tax Amount	% of Tax Amt
03035	1	$	0.00	< 0.01%
04017	10		9,755.12	< 0.01%
06031	1		2,437.25	< 0.01%
06058	1		49.10	< 0.01%
18090	3		67.73	< 0.01%
18160	1		1.27	< 0.01%
33000	50		-37,956.06	(< 0.01)%
99002	1		0.00	< 0.01%
Total	68	$	-25,645.59	< 0.01%

Table A.5: Dollar amount associated with cities that do not have a matching city name.

Date Values

The observations of interest are filed between 1991 and 2005. Some filing periods are for future dates, suggesting that some areas are paying taxes for sales that have not yet occurred. Additionally, some observations have extremely late payments dating back to the 1960's and 1970's. If the filing period of an observation is outside the year range of 1991 to 2005, the observation is removed. This removes 65,777 observations and 2.69% of the total revenue. There are also 26 observations with the monthly values not between "1" and "12." These observations are removed, deleting $557 from the data.

Non-Standard SIC

Standard Industrial Classification (SIC) codes are four digit codes used to classify industries in the United States. If the SIC code for an observation is not a value between "0000" and "9999," the observation is removed. This results in an omission of 1,679 observations and $603,000. Table A.6 below shows the number of observations and tax amount associated with each invalid SIC code. This leaves 1,211 unique SIC codes in our data.

SIC Code	# of Obs	Tax Amount
(Blank)	1,629	$572,152.86
__1581	1	105.92
_091	2	18.02
_538	2	118.06
_812	4	13,260.61
00	1	25.71
594Q	6	3,345.64
A	4	405.82
M947	18	13,543.79
Y121	11	389.46
'721	1	8.11
Total	1,679	$603,373.99

Table A.6: Dollar amount associated with abnormal SIC codes.

Further investigation of the SIC codes show there are 409 codes that correspond to 81,167 observations with 4-digit SIC codes that do not have a valid description, based off the descriptions provided by Dietrich Direct. However, there is still information in these codes. The first two digits of an SIC number correspond to a broader industry. It follows that if the data are classified at a lower granularity of SIC code, these observations would have meaning. For example, there are 10,896 observations with a SIC code of 5811. According to the Dietrich Direct SIC code database, there is no meaningful description of this code, but the first two digits of the code, 58, classify the observations as from the food retail industry.

Filing Period Duration

The filing period variable is the time period for which the tax payment is being made. The raw data comes in the format MMYYMMYY, which can be split into several pieces where "M" represents month and "Y" represents year. The first MMYY marks the beginning month and year of the filing period, and the second MMYY marks the ending month and year of the filing period. Typically, the periods are monthly or quarterly depending on the size of the industry in a particular jurisdiction area; however, some filing periods cover a range of 9 years. There are 42 observations where the reported filing period was negative, i.e. the period was from Mar '99 to Jan '99. Removing these observations results in the deletion of $1,188 in tax revenue.

A.4 Final Subset

After removing observations with obvious data errors, the data are evaluated using two additional criteria: the length of the filing period for each payment, and how soon after the period the payment is received.

The length of the filing period varies from 1 month to 9 years. Table A.7 shows the number of observations and amount of tax revenue collected for filing periods. As expected, over 99% of the data has a filing period less than a year. Table A.8 reports in finer detail the observations with filing periods less than a year. Of the data with less than a year duration, 81% have monthly filing periods and 18% have quarterly filing periods.

In anticipation of aggregating data by year, an annual cut-off for filing period duration avoids potential issues of how to separate data recorded over a span of several years. A choice of a filing period duration of 1 year as a cut-off results in the omission of 17,838 observations where the filing period spans more than 12 months.

At the end of a filing period, whether quarterly or monthly, a tax remittance payment is due. Understanding how quickly tax payments are paid after the filing period is over is important in understanding the completeness of the data.

Year	Number of Obs	Prop	Tax Amount	% of Tax Amt
1	2,448,438	99.0%	$5,283,900,237.00	99.5%
2	1,803	0.00%	430,095.01	0.01%
3	13,421	1.00%	22,526,893.66	0.42%
4	2,012	0.00%	1,253,063.56	0.02%
5	315	0.00%	535,405.78	0.01%
6	162	0.00%	99,686.64	0.00%
7	96	0.00%	360,361.91	0.01%
8	25	0.00%	-33,277.38	(0.00)%
9	1	0.00%	3,898.80	0.00%

Table A.7: Filing period length, by year.

Months	# of Obs	Prop	Tax Amount	% of Tax Amt
1	1,441,715	59.0%	$4,297,747,803.00	81.0%
2	2,255	0.0%	1,803,514.77	0.03%
3	926,544	38.0%	970,842,986.03	18.3%
4	367	0.0%	107,894.39	0.00%
5	169	0.0%	50,265.17	0.00%
6	399	0.0%	-26,284.95	(0.00)%
7	128	0.0%	-42,223.11	(0.00)%
8	182	0.0%	-11,287.62	(0.00)%
9	277	0.0%	-1,597.10	(0.00)%
10	173	0.0%	-61,319.60	(0.00)%
11	83	0.0%	248,130.95	0.0%
12	76,146	3.0%	13,242,355.03	0.25%

Table A.8: The length of the filing period for months 1 – 12

Table A.9, shows the breakdown, where “0” means that that tax for the filing period was paid within the FY, “1” means that that tax incurred for a given FY was paid year later, “2” means the tax was paid 2 years later, etc. Because of late payments, a filing periods 15 years ago is mostly complete; however, a more recent time period is less complete. The data show that 81% of payments are paid within a year of the filing period that they occured, and within 5 years, 99.9% of the payments are made.

Filing Period vs FY	# of Obs	Tax Amount	Proportion
0	1,713,058	$4,323,725,360.01	81.4%
1	609,595	967,519,474.81	18.2%
2	74,832	8,705,385.37	0.16%
3	32,817	4,176,083.08	0.08%
4	14,835	1,734,610.27	0.03%
5	7,226	2,187,544.11	0.04%
6	7,652	466,096.91	0.01%
7	1,819	212,551.24	< 0.01%
8	1,324	72,692.70	< 0.01%
9	933	37,121.34	< 0.01%
10	360	31,477.70	< 0.01%
11	180	5,915.42	< 0.01%
12	107	3,068.92	< 0.01%
13	18	512.55	< 0.01%

Table A.9: The difference between filing period and FY. Most (99%) of the data is reported within 1 year after the filing period is past. (Using the filtered data)

A.5 Data Aggregation

Time Periods

After all filtering and subsetting, there are 2,113,427 observations which consist of 1,253,252 monthly filing period observations, 794,226 quarterly filing period observations, and 65,494 yearly filing period observations. In order to categorize the data into these three aggregation levels, several assumptions needed to be made.

First, if there is a filing period with a two month span that fits nicely into a quarterly span, it is assumed that there is nothing filed for one of the months and that the filing period could very well be quarterly. For example, if a reported filing period is Feb 2002 to Mar 2002, the data can be combined and made into a quarterly filing period from Jan 2002 to Mar 2002.

Second, if there is a filing period with 4 to 12 months within the same year, all monthly data is combined and aggregated to a yearly variable. For example, if a filing period is from April 2002 to Dec 2002, it is combined with the Jan 2002 to Dec 2002 filing period data to become the year 2002 data.

Last, if there is a filing period with 4 to 12 months spanning a year change, we calculate which year has the majority of months, and then aggregate the yearly variable over that time period. For instance, if the filing period is between Sept 2003 and June 2004, the data is aggregated to year 2004 since the majority of the data is in 2004.

The yearly data is incorporated into the quarterly data by evenly spreading the yearly data into each of the quarters. It should be noted that when using the quarterly data set, the yearly data is not incorporated into the data. Also, the data for 2005 is for the fiscal year 2005, which means that the most recently recorded filing periods are June 2005, not December 2005.

Industry Aggregation

The SIC code signifies under what type of sale the tax revenue was generated. The SIC codes have a nested hierarchal structure. At the highest level of detail, the four-digit SIC code can specify the type of store or purchase. At a more general level, the two-digit SIC can be classified into general industry categories, as listed in Table A.5.

For example, SIC 5311 identifies the tax revenue collection as coming from a department store. On a broader level, SIC 53 identifies the tax revenue collected as coming from a general merchandise store. And even more broadly, SIC codes 52-59 are identified as Retail Trade.

Including higher granularity of data here adds issues with convergence due to adding in zeros and missing data as the definition changes. Also, when there are zeros, the logged revenue transformation is no longer possible.

This combination of SIC codes removes a level of complexity out of the model, but it also makes intuitive sense in context of the Walmart problem. Simply comparing what happens in SIC 53 will capture the growth of department stores in Ephraim, but from the

2-digit SIC	Industry
01-09	Agriculture, Forestry, and Fishing
10-14	Mining
15-17	Construction
20-39	Manufacturing
40-49	Transportation, Communications, Electric, Gas, and Sanitary Services
50-51	Wholesale Trade
52-59	Retail Trade
60-67	Finance, Insurance, and Real Estate
70-89	Services
91-99	Public Administration

Table A.10: General Industry Classification for 2-digit SIC codes.

outlying area, few cities collect tax revenue under SIC code 53. The broad retail category allows for the combined industries in the area to be combined in the same category and department stores and therefore measure the Walmart effect more conveniently and intuitively.

A.6 Subsetting for Further Research

The final data set includes the variables listed in Table A.11. From these variables, it is possible to merge in the city code information that links the city with the tax rates. If the analysis is dealing with lower granularity SIC categories (as was done in this project), code can be written to select and combine from the SIC variable.

Variable	Description
cityname	Name of the jurisdiction area
sic	Four digit sic code
time	Quarter and year of payment
SICDescription	Text description of SIC code
tax	Tax remittance payment amount

Table A.11: Possible variables in the USTC database.

APPENDIX B

MODEL OUTPUT

B.1 Overall Tax Revenue Model

$$log(TR)_{it} = \beta_0 + \beta_1 Pop_{it} + \gamma_t Time_t + \alpha(City)_i + \epsilon_{it}$$

where

$log(TR)_{it}$ = logged overall tax revenue for the ith city in the t th quarter;

Pop_{it} = population for the ith city in the t th quarter;

$Time_t$ = t th time period;

$\alpha(City)_i$ = effect of the ith city;

ϵ_{it} = error term.

B.2 Industry Specific Tax Revenue Model

$$log(TR)_{ijt} = \beta_0 + \beta_1 Pop_{it} + \beta_2 SIC_j + \gamma_t Time_t + \xi_{jt}(SIC \times time)_{jt} + \alpha(City)_i + \epsilon_{it}$$

where

$log(TR)_{it}$ = logged tax revenue for the jth industry in the ith city in the t th quarter;

Pop_{it} = population for the ith city in the t th quarter;

SIC_j = effect of the jth industry;

$Time_t$ = t th time period;

$(SIC \times time)_{jt}$ = effect of the jth industry at the t th time;

$\alpha(City)_i$ = effect of the ith city;

ϵ_{ijt} = error term.

Fixed Effect	Estimate	t value	Fixed Effect	Estimate	t value
1991/1	8.6488	18.01	2001/3	10.1977	19.80
1991/2	8.7728	18.23	2001/4	10.1555	19.71
1991/3	8.8421	18.34	2002/1	10.1241	19.64
1991/4	8.8666	18.35	2002/2	10.1936	19.76
1992/1	8.9730	18.53	2002/3	10.1934	19.76
1992/2	9.1247	18.80	2002/4	10.1146	19.58
1992/3	9.1714	18.86	2003/1	10.2416	19.81
1992/4	9.1148	18.70	2003/2	10.3065	19.93
1993/1	9.0559	18.54	2003/3	10.3441	20.02
1993/2	9.2535	18.91	2003/4	10.3314	19.94
1993/3	9.3167	19.00	2004/1	10.3289	19.92
1993/4	9.2103	18.74	2004/2	10.3969	20.04
1994/1	9.2274	18.74	2004/3	10.3458	19.97
1994/2	9.4235	19.10	2004/4	10.3011	19.82
1994/3	9.4303	19.07	Population	0.000072	0.46
1994/4	9.3006	18.77			
1995/1	9.3487	18.83	Random Effect	Estimate	t value
1995/2	9.3765	18.85	Nephi	2.3412	3.82
1995/3	9.5017	19.07	Ephraim	2.1270	3.53
1995/4	9.3658	18.76	Salina	2.0596	4.61
1996/1	9.4336	18.86	Gunnison	1.7150	3.88
1996/2	9.4703	18.90	Mt. Pleasant	1.6071	3.52
1996/3	9.4985	18.92	Sevier County	1.5556	3.30
1996/4	9.4134	18.72	Manti	1.0062	2.13
1997/1	9.4403	18.74	Sanpete County	0.9185	1.83
1997/2	9.6190	19.06	Fairview	0.4875	1.09
1997/3	9.6098	19.01	Moroni	0.1028	0.23
1997/4	9.5885	18.94	Aurora	-0.1018	-0.22
1998/1	9.9085	19.54	Centerfield	-0.2407	-0.53
1998/2	9.9383	19.57	Redmond	-0.4086	-0.88
1998/3	9.9789	19.62	Spring City	-1.2989	-2.85
1998/4	9.8646	19.37	Fountain Green	-1.3414	-2.93
1999/1	9.8753	19.37	Sterling	-1.6961	-3.43
1999/2	10.0209	19.63	Mayfield	-2.2073	-4.58
1999/3	10.0247	19.61	Wales	-3.1041	-6.25
1999/4	9.9671	19.48	Fayette	-3.5215	-7.07
2000/1	9.9169	19.36			
2000/2	10.0827	19.66	Covariance Structure	Estimate	
2000/3	10.1191	19.73	$\hat{\rho}$	0.7977	
2000/4	10.0484	19.56			
2001/1	10.0617	19.57	Contrast Statement	Estimate	Std. Error
2001/2	10.1336	19.69	Overall Walmart Effect	0.7811	0.0720

Table B.1: Output from the Overall Tax Revenue Model.

Fixed Effect	Estimate	Standard Error	t Value
1991/1	3.6339	0.6770	5.37
1991/2	3.4579	0.6966	4.96
1991/3	3.4125	0.7104	4.80
1991/4	3.2356	0.7189	4.50
1992/1	2.5543	0.7298	3.50
1992/2	1.8611	0.7340	2.54
1992/3	1.1204	0.7317	1.53
1992/4	0.5801	0.7228	0.80
1993/1	0.5661	0.7068	0.80
1993/2	0.9889	0.7109	1.39
1993/3	1.5704	0.7116	2.21
1993/4	1.7506	0.7088	2.47
1994/1	2.3838	0.7024	3.39
1994/2	2.5722	0.7036	3.66
1994/3	2.9103	0.7028	4.14
1994/4	3.1925	0.7000	4.56
1995/1	3.2064	0.6952	4.61
1995/2	3.6627	0.6943	5.28
1995/3	3.4318	0.6922	4.96
1995/4	3.6466	0.6890	5.29
1996/1	3.8395	0.7098	5.41
1996/2	3.9316	0.7206	5.46
1996/3	4.0869	0.7220	5.66
1996/4	4.1964	0.7139	5.88
1997/1	4.6931	0.6962	6.74
1997/2	4.8904	0.7005	6.98
1997/3	4.6682	0.7011	6.66
1997/4	4.9591	0.6977	7.11
1998/1	5.7150	0.6905	8.28
1998/2	5.6532	0.6929	8.16
1998/3	5.5749	0.6949	8.02
1998/4	5.6683	0.6964	8.14
1999/1	5.1874	0.7062	7.35
1999/2	5.0324	0.7109	7.08
1999/3	4.7113	0.7145	6.59
1999/4	4.7612	0.7154	6.66
2000/1	5.1366	0.7198	7.14
2000/2	4.9882	0.7250	6.88
2000/3	4.9439	0.7261	6.81
2000/4	5.0870	0.7242	7.02
2001/1	4.8046	0.7181	6.69

Table B.2: Output from the Specific Industry Tax Revenue Model.

Fixed Effect	Estimate	Standard Error	t Value
2001/2	4.5504	0.7175	6.34
2001/3	4.6062	0.7159	6.43
2001/4	4.2933	0.7127	6.02
2002/1	4.3528	0.7116	6.12
2002/2	4.3343	0.7154	6.06
2002/3	4.4492	0.7172	6.20
2002/4	4.3711	0.7178	6.09
2003/1	4.1860	0.7165	5.84
2003/2	4.2242	0.7185	5.88
2003/3	4.2307	0.7194	5.88
2003/4	4.1741	0.7219	5.78
2004/1	4.0978	0.7275	5.63
2004/2	4.1303	0.7326	5.64
2004/3	3.9227	0.7361	5.33
2004/4	3.9346	0.7416	5.31
Population	0.000565	0.000173	3.26
Retail	7.0949	0.6871	10.33
Manufacturing	1.9720	0.7159	2.75
Services	2.5530	0.6554	3.90
Wholesale	0	.	.
Retail × 1991/1	-3.4265	0.9568	-3.58
Retail × 1991/2	-3.0595	0.9676	-3.16
Retail × 1991/3	-3.0417	0.9742	-3.12
Retail × 1991/4	-2.8454	0.9769	-2.91
Retail × 1992/1	-1.8673	0.9821	-1.90
Retail × 1992/2	-0.9698	0.9822	-0.99
Retail × 1992/3	-0.1914	0.9774	-0.20
Retail × 1992/4	0.2727	0.9673	0.28
Retail × 1993/1	0.2169	0.9527	0.23
Retail × 1993/2	-0.05323	0.9519	-0.06
Retail × 1993/3	-0.6708	0.9491	-0.71
Retail × 1993/4	-0.9100	0.9434	-0.96
Retail × 1994/1	-1.4928	0.9349	-1.60
Retail × 1994/2	-1.5245	0.9321	-1.64
Retail × 1994/3	-1.8626	0.9275	-2.01
Retail × 1994/4	-2.2212	0.9212	-2.41
Retail × 1995/1	-2.1982	0.9131	-2.41
Retail × 1995/2	-2.5721	0.9074	-2.83
Retail × 1995/3	-2.2553	0.9005	-2.50
Retail × 1995/4	-2.5177	0.8924	-2.82
Retail × 1996/1	-2.5965	0.9061	-2.87

Table B.3: Output from the Specific Industry Tax Revenue Model.

Fixed Effect	Estimate	Standard Error	t Value
Retail × 1996/2	-2.6311	0.9119	-2.89
Retail × 1996/3	-2.7671	0.9101	-3.04
Retail × 1996/4	-2.9195	0.9006	-3.24
Retail × 1997/1	-3.3508	0.8830	-3.79
Retail × 1997/2	-3.3337	0.8804	-3.79
Retail × 1997/3	-3.1220	0.8744	-3.57
Retail × 1997/4	-3.3977	0.8650	-3.93
Retail × 1998/1	-3.9258	0.8519	-4.61
Retail × 1998/2	-3.7234	0.8438	-4.41
Retail × 1998/3	-3.5840	0.8348	-4.29
Retail × 1998/4	-3.7641	0.8249	-4.56
Retail × 1999/1	-3.2188	0.8256	-3.90
Retail × 1999/2	-2.8350	0.8216	-3.45
Retail × 1999/3	-2.5031	0.8158	-3.07
Retail × 1999/4	-2.5899	0.8072	-3.21
Retail × 2000/1	-3.0108	0.8030	-3.75
Retail × 2000/2	-2.6051	0.7980	-3.26
Retail × 2000/3	-2.5369	0.7889	-3.22
Retail × 2000/4	-2.6948	0.7754	-3.48
Retail × 2001/1	-2.3130	0.7573	-3.05
Retail × 2001/2	-1.9586	0.7414	-2.64
Retail × 2001/3	-1.9081	0.7231	-2.64
Retail × 2001/4	-1.5425	0.7021	-2.20
Retail × 2002/1	-1.5232	0.6840	-2.23
Retail × 2002/2	-1.3608	0.6655	-2.04
Retail × 2002/3	-1.4035	0.6432	-2.18
Retail × 2002/4	-1.3364	0.6167	-2.17
Retail × 2003/1	-1.1082	0.5853	-1.89
Retail × 2003/2	-0.9222	0.5516	-1.67
Retail × 2003/3	-0.8452	0.5133	-1.65
Retail × 2003/4	-0.7439	0.4692	-1.59
Retail × 2004/1	-0.5450	0.4128	-1.32
Retail × 2004/2	-0.3264	0.3423	-0.95
Retail × 2004/3	-0.05953	0.2459	-0.24
Retail × 2004/4	0	.	.
Manufacturing × 1991/1	1.3858	0.9187	1.51
Manufacturing × 1991/2	1.4725	0.9424	1.56
Manufacturing × 1991/3	1.1141	0.9583	1.16
Manufacturing × 1991/4	0.9574	0.9669	0.99
Manufacturing × 1992/1	1.7021	0.9749	1.75
Manufacturing × 1992/2	2.4770	0.9828	2.52

Table B.4: Output from the Specific Industry Tax Revenue Model.

Fixed Effect	Estimate	Standard Error	t Value
Manufacturing × 1992/3	2.9877	0.9843	3.04
Manufacturing × 1992/4	3.2781	0.9795	3.35
Manufacturing × 1993/1	3.3888	0.9752	3.48
Manufacturing × 1993/2	3.0791	0.9814	3.14
Manufacturing × 1993/3	2.5324	0.9807	2.58
Manufacturing × 1993/4	2.1825	0.9732	2.24
Manufacturing × 1994/1	1.4574	0.9585	1.52
Manufacturing × 1994/2	1.3904	0.9564	1.45
Manufacturing × 1994/3	1.1192	0.9515	1.18
Manufacturing × 1994/4	0.5363	0.9437	0.57
Manufacturing × 1995/1	0.6080	0.9329	0.65
Manufacturing × 1995/2	-0.03780	0.9231	-0.04
Manufacturing × 1995/3	0.2271	0.9107	0.25
Manufacturing × 1995/4	-0.2198	0.8955	-0.25
Manufacturing × 1996/1	-0.5109	0.9009	-0.57
Manufacturing × 1996/2	-0.7291	0.9046	-0.81
Manufacturing × 1996/3	-1.0532	0.8987	-1.17
Manufacturing × 1996/4	-1.9885	0.8564	-2.32
Manufacturing × 1997/2	-2.0307	0.8517	-2.38
Manufacturing × 1997/3	-2.0402	0.8414	-2.42
Manufacturing × 1997/4	-2.4925	0.8253	-3.02
Manufacturing × 1998/1	-3.7116	0.8102	-4.58
Manufacturing × 1998/2	-3.6016	0.8037	-4.48
Manufacturing × 1998/3	-3.4835	0.7947	-4.38
Manufacturing × 1998/4	-3.5352	0.7832	-4.51
Manufacturing × 1999/1	-3.0285	0.7993	-3.79
Manufacturing × 1999/2	-2.8177	0.8078	-3.49
Manufacturing × 1999/3	-2.4229	0.8123	-2.98
Manufacturing × 1999/4	-2.4262	0.8116	-2.99
Manufacturing × 2000/1	-2.7842	0.8133	-3.42
Manufacturing × 2000/2	-2.5262	0.8121	-3.11
Manufacturing × 2000/3	-2.3865	0.8047	-2.97
Manufacturing × 2000/4	-2.6452	0.7910	-3.34
Manufacturing × 2001/1	-2.4812	0.7779	-3.19
Manufacturing × 2001/2	-1.9586	0.7633	-2.57
Manufacturing × 2001/3	-1.8593	0.7426	-2.50
Manufacturing × 2001/4	-1.6239	0.7150	-2.27
Manufacturing × 2002/1	-1.5251	0.6856	-2.22
Manufacturing × 2002/2	-1.2545	0.6677	-1.88
Manufacturing × 2002/3	-1.1875	0.6457	-1.84
Manufacturing × 2002/4	-1.1284	0.6194	-1.82

Table B.5: Output from the Specific Industry Tax Revenue Model.

Fixed Effect	Estimate	Standard Error	t Value
Manufacturing × 2003/1	-0.6786	0.5879	-1.15
Manufacturing × 2003/2	-0.5512	0.5540	-0.99
Manufacturing × 2003/3	-0.4909	0.5154	-0.95
Manufacturing × 2003/4	-0.4228	0.4709	-0.90
Manufacturing × 2004/1	-0.2802	0.4140	-0.68
Manufacturing × 2004/2	-0.2623	0.3430	-0.76
Manufacturing × 2004/3	0.1277	0.2462	0.52
Manufacturing × 2004/4	0	.	.
Services × 1991/1	-0.1109	1.1116	-0.10
Services × 1991/2	-0.5142	1.1187	-0.46
Services × 1991/3	-0.9892	1.1209	-0.88
Services × 1991/4	-1.5065	1.1181	-1.35
Services × 1992/1	-1.6901	1.1163	-1.51
Services × 1992/2	-0.9316	1.1135	-0.84
Services × 1992/3	0.02848	1.1066	0.03
Services × 1992/4	0.5203	1.0953	0.48
Services × 1993/1	0.8486	1.0821	0.78
Services × 1993/2	0.8544	1.0778	0.79
Services × 1993/3	0.7847	1.0702	0.73
Services × 1993/4	0.7760	1.0593	0.73
Services × 1994/1	0.6691	1.0449	0.64
Services × 1994/2	0.6369	1.0339	0.62
Services × 1994/3	0.4932	1.0215	0.48
Services × 1994/4	0.1143	1.0076	0.11
Services × 1995/1	0.1429	0.9919	0.14
Services × 1995/2	-0.3671	0.9757	-0.38
Services × 1995/3	0.1140	0.9581	0.12
Services × 1995/4	-0.1866	0.9392	-0.20
Services × 1996/1	-0.4488	0.9582	-0.47
Services × 1996/2	-0.4990	0.9686	-0.52
Services × 1996/3	-0.6122	0.9708	-0.63
Services × 1996/4	-0.9215	0.9647	-0.96
Services × 1997/1	-1.5825	0.9535	-1.66
Services × 1997/2	-1.5697	0.9520	-1.65
Services × 1997/3	-1.4285	0.9454	-1.51
Services × 1997/4	-1.8666	0.9337	-2.00
Services × 1998/1	-2.5733	0.9166	-2.81
Services × 1998/2	-2.5046	0.9033	-2.77
Services × 1998/3	-2.2716	0.8882	-2.56
Services × 1998/4	-2.5177	0.8711	-2.89
Services × 1999/1	-1.9075	0.8717	-2.19

Table B.6: Output from the Specific Industry Tax Revenue Model.

Fixed Effect	Estimate	Standard Error	t Value
Services × 1999/2	-1.7040	0.8701	-1.96
Services × 1999/3	-1.5657	0.8639	-1.81
Services × 1999/4	-1.8134	0.8522	-2.13
Services × 2000/1	-2.3785	0.8425	-2.82
Services × 2000/2	-2.2154	0.8346	-2.65
Services × 2000/3	-2.2713	0.8221	-2.76
Services × 2000/4	-2.7775	0.8048	-3.45
Services × 2001/1	-2.2044	0.7821	-2.82
Services × 2001/2	-1.9261	0.7644	-2.52
Services × 2001/3	-1.8977	0.7443	-2.55
Services × 2001/4	-1.4919	0.7215	-2.07
Services × 2002/1	-1.7681	0.7018	-2.52
Services × 2002/2	-1.6968	0.6807	-2.49
Services × 2002/3	-1.7272	0.6560	-2.63
Services × 2002/4	-1.6567	0.6270	-2.64
Services × 2003/1	-1.6119	0.5931	-2.72
Services × 2003/2	-1.6413	0.5567	-2.95
Services × 2003/3	-1.6517	0.5156	-3.20
Services × 2003/4	-1.6696	0.4684	-3.56
Services × 2004/1	-1.1471	0.4139	-2.77
Services × 2004/2	-0.6366	0.3446	-1.85
Services × 2004/3	-0.2247	0.2483	-0.91
Services × 2004/4	0	.	.
Wholesale × 1991/1	0	.	.
Wholesale × 1991/2	0	.	.
Wholesale × 1991/3	0	.	.
Wholesale × 1991/4	0	.	.
Wholesale × 1992/1	0	.	.
Wholesale × 1992/2	0	.	.
Wholesale × 1992/3	0	.	.
Wholesale × 1992/4	0	.	.
Wholesale × 1993/1	0	.	.
Wholesale × 1993/2	0	.	.
Wholesale × 1993/3	0	.	.
Wholesale × 1993/4	0	.	.
Wholesale × 1994/1	0	.	.
Wholesale × 1994/2	0	.	.
Wholesale × 1994/3	0	.	.
Wholesale × 1994/4	0	.	.
Wholesale × 1995/1	0	.	.
Wholesale × 1995/2	0	.	.

Table B.7: Output from the Specific Industry Tax Revenue Model.

Fixed Effect	Estimate	Standard Error	t Value
Wholesale × 1995/3	0	.	.
Wholesale × 1995/4	0	.	.
Wholesale × 1996/1	0	.	.
Wholesale × 1996/2	0	.	.
Wholesale × 1996/3	0	.	.
Wholesale × 1996/4	0	.	.
Wholesale × 1997/1	0	.	.
Wholesale × 1997/2	0	.	.
Wholesale × 1997/3	0	.	.
Wholesale × 1997/4	0	.	.
Wholesale × 1998/1	0	.	.
Wholesale × 1998/2	0	.	.
Wholesale × 1998/3	0	.	.
Wholesale × 1998/4	0	.	.
Wholesale × 1999/1	0	.	.
Wholesale × 1999/2	0	.	.
Wholesale × 1999/3	0	.	.
Wholesale × 1999/4	0	.	.
Wholesale × 2000/1	0	.	.
Wholesale × 2000/2	0	.	.
Wholesale × 2000/3	0	.	.
Wholesale × 2000/4	0	.	.
Wholesale × 2001/1	0	.	.
Wholesale × 2001/2	0	.	.
Wholesale × 2001/3	0	.	.
Wholesale × 2001/4	0	.	.
Wholesale × 2002/1	0	.	.
Wholesale × 2002/2	0	.	.
Wholesale × 2002/3	0	.	.
Wholesale × 2002/4	0	.	.
Wholesale × 2003/1	0	.	.
Wholesale × 2003/2	0	.	.
Wholesale × 2003/3	0	.	.
Wholesale × 2003/4	0	.	.
Wholesale × 2004/1	0	.	.
Wholesale × 2004/2	0	.	.
Wholesale × 2004/3	0	.	.
Wholesale × 2004/4	0	.	.

Table B.8: Output from the Specific Industry Tax Revenue Model.

Random Effect	Estimate	t value
Salina	2.2878	2.66
Sevier County	1.5444	1.77
Ephraim	1.4356	1.54
Mt. Pleasant	1.3948	1.61
Gunnison	1.3616	1.57
Nephi	1.0596	1.13
Sanpete County	0.9623	1.09
Manti	0.6970	0.80
Aurora	0.5725	0.66
Centerfield	0.4955	0.57
Moroni	0.2036	0.23
Fairview	0.1191	0.14
Redmond	-0.2898	-0.32
Spring City	-1.2037	-1.37
Fountain Green	-1.5192	-1.64
Sterling	-1.7900	-1.85
Mayfield	-2.1046	-2.24
Wales	-2.5937	-2.64
Fayette	-2.6328	-2.70
Covariance Structure	Estimate	
$\hat{\rho}$	0.9491	
Contrast Statement	Estimate	Std. Error
Retail Effect	1.7855	0.4356
Manufacturing	-0.2320	0.3790
Services	-0.00012	0.3734
Wholesale	0.9046	0.4076

Table B.9: Output from the Specific Industry Tax Revenue Model.

APPENDIX C

CODE

```
/*******************************************************************
Code for the Walmart Effect Project


Data Source: Utah State Tax Commission
Written by: Angie Nelson


This code details the process taken to
1) calculate the total observations and tax amt from old dataset
2) clean and filter original records to create new dataset
a) read in files from original data
i)   GC Summary1.mdb
ii)  Combined Rate History.xls
b) filter data that has
i)   years outside range of interest
ii)  no matching city name
iii) invalid month number
iv)  invalid SIC
v)   negative filing period
3) combine filtered data into monthly, quarterly, and yearly data
a) add back in the city code
b) add in SIC information

*******************************************************************/

options ls=120 formdlim="#" errors=5;

%let directory = F:\Bigbox;
```

```
* location of raw data;
libname raw  "&directory.\Raw Data";
* location of saved permanent SAS files;
libname proj "&directory.\Permanent SAS Datasets";
* location of saved analysis files;
libname district "&directory.\SAS Output";
*Also, create a folder titled "Output" for the
SAS data sets that are used for making graphics;

/* Caluating total observations and total tax amount from the data
used in the Local Option Sales Tax paper as comparison.

   There are 1,766,275 obs and $4,174,877,870.7 */

data oldData1;
set raw.alltaxfinal3;
tax =  sum(SumOfArts_Zoo_AMT,
SumOfCnty_Opt_AMT,
SumOfHighway_Opt_AMT,
SumOfLocal_AMT,
SumOfMass_Trans_AMT,
SumOfResort_AMT,
SumOfRural_Hosp_AMT,
SumOfTown_Opt_AMT);
run;
proc sql;
create table oldData as
select sum(tax) as test
from oldData1;
quit;
```

```
/*****************************************************************************************
Using data from the Utah State Tax Commission, we sort through the data, throwing out
  observations that are not abnormal and making note of the assumptions we make. The data
  are reported by Fiscal Year, but for a particular filling period that may not
  neccessarily be part in that same year. For example, a filling period of 01990399
  (Jan 99 to Mar 99) may  be filled a year later, in Fiscal Year 2000.

  The original data files are the Access Database files, GC Summary1.mbd, and
  the file with the city name information and code, Combined Rate History.xls

*****************************************************************************************/

* IMPORTING DATA FROM ACCESS;
%macro accessimport; * Importing the 15 sheets from the access data base;
%do year= 1991 %to 2005;
PROC IMPORT OUT= RAW.FY&year.
            DATATABLE= "FY &year."
            DBMS=ACCESS REPLACE;
     DATABASE="&directory.\Raw Data\GC Summary1.mdb";
     SCANMEMO=YES;
     USEDATE=NO;
     SCANTIME=YES;
RUN;
%end;
%mend accessimport;
%accessimport;
%macro comparison;
* Checking to see if incoming datasets have the same variable names;
%do year= 1991 %to 2005;
proc compare base=raw.fy1991
compare=raw.fy&year.
novalues;
```

```
run;
*** assign return code to another variable for processing;
%let comprc=&sysinfo;
*** data step resets SYSINFO to zero;
data _null_;
comprc=&comprc;
comprcbin=put(comprc,binary16.);
if substr(comprcbin,06,1) then put "WARNING: New dataset is missing a var";
if substr(comprcbin,05,1) then put "WARNING: New dataset has new var";
if substr(comprcbin,03,1) then put "WARNING: Conflicting variable types";
if substr(comprcbin,12,1) then put "WARNING: Variable has different length";
if substr(comprcbin,16,1) then put "WARNING: Data set labels differ";
Run;
%end;
%mend comparison;
%comparison;
*** CHECK LOG FILE **************************************************************;
*** It there are no WARNING messages, then proceed *****************************;

data proj.all (rename = (county_city_code=city des_sic_cd=sic filing_period=period));
set raw.fy1991 (in=raw91) raw.fy1992 (in=raw92)
raw.fy1993 (in=raw93) raw.fy1994 (in=raw94)
raw.fy1995 (in=raw95) raw.fy1996 (in=raw96)
raw.fy1997 (in=raw97) raw.fy1998 (in=raw98)
raw.fy1999 (in=raw99) raw.fy2000 (in=raw00)
raw.fy2001 (in=raw01) raw.fy2002 (in=raw02)
raw.fy2003 (in=raw03) raw.fy2004 (in=raw04)
raw.fy2005 (in=raw05);
length FY 4;
if raw91=1 then FY=1991;   * These statements are to create a year variable for;
else if raw92=1 then FY=1992;  * what FY the payment was actually made;
else if raw93=1 then FY=1993;
else if raw94=1 then FY=1994;   * NOTE: FY 2005 is July 2004 to June 2005;
```

```
else if raw95=1 then FY=1995;   * Pattern follows for all years;
else if raw96=1 then FY=1996;
else if raw97=1 then FY=1997;
else if raw98=1 then FY=1998;
else if raw99=1 then FY=1999;
else if raw00=1 then FY=2000;
else if raw01=1 then FY=2001;
else if raw02=1 then FY=2002;
else if raw03=1 then FY=2003;
else if raw04=1 then FY=2004;
else if raw05=1 then FY=2005;
else FY=0;
run;

data missingtax;
set proj.all; *replace proj.all with data that has zeros rather than missing values;
if sumoflocal_amt = . then sumoflocal_amt = 0;
if sumofmass_trans_amt = . then sumofmass_trans_amt = 0;
if SumOfARTS_ZOO_AMT = . then SumOfARTS_ZOO_AMT = 0;
if SumOfCNTY_OPT_AMT = . then SumOfCNTY_OPT_AMT = 0;
if SumOfHIGHWAY_OPT_AMT = . then SumOfHIGHWAY_OPT_AMT = 0;
if SumOfRESORT_AMT = . then SumOfRESORT_AMT = 0;
if SumOfRURAL_HOSP_AMT = . then SumOfRURAL_HOSP_AMT = 0;
if SumOfTOWN_OPT_AMT = . then SumOfTOWN_OPT_AMT = 0;
run;


* Combing city name data with the city codes from the tax file;
PROC IMPORT OUT= RAW.combinedRateHistory
            DATAFILE= "&directory.\Raw Data\Combined Rate History.xls"
            DBMS=EXCEL REPLACE;
     RANGE="'COMBINED RATE$'";
     GETNAMES=YES;
```

```
     MIXED=NO;
     SCANTEXT=YES;
     USEDATE=YES;
     SCANTIME=YES;
RUN;
data proj.cityname; * transform the city code into character $5. with no dashes;
set raw.combinedRateHistory (keep= location code);
citycode = compress(code,"-");
run;
proc sql;
create table rawcombined as
select  a.*,
b.citycode as citycode, b.location as cityname
from missingtax a left join proj.cityname b
on b.citycode=a.city;
quit;

proc sql;
create table proj.prefilter as
select *, abs(SumOfARTS_ZOO_AMT) as absArts
, abs(SumOfCNTY_OPT_AMT) as absCnty
, abs(SumOfHIGHWAY_OPT_AMT) as absHighway
, abs(SumOfLOCAL_AMT) as absLocal
, abs(SumOfMASS_TRANS_AMT) as absMassTrans
, abs(SumOfRESORT_AMT) as absResort
, abs(SumOfRURAL_HOSP_AMT) as absRural
, abs(SumOfTOWN_OPT_AMT) as absTown
, sum(SumOfARTS_ZOO_AMT,SumOfCNTY_OPT_AMT,SumOfHIGHWAY_OPT_AMT,SumOfLOCAL_AMT,
 SumOfMASS_TRANS_AMT,SumOfRESORT_AMT, SumOfRURAL_HOSP_AMT,
 SumOfTOWN_OPT_AMT)as taxtotal
, abs(sum(calculated absArts, calculated absCnty, calculated absHighway,
calculated absLocal, calculated absMassTrans, calculated absResort,
calculated absRural, calculated absTown)) as absTaxTotal
```

```
from rawcombined  ;
quit;
proc sort data= proj.prefilter; by citycode period sic; run;


* combining the information to create only
one unique observation for each filing period;
data prefiltersums2 (drop = SumOfARTS_ZOO_AMT
SumOfCNTY_OPT_AMT SumOfHIGHWAY_OPT_AMT
SumOfLOCAL_AMT SumOfMASS_TRANS_AMT
SumOfRESORT_AMT SumOfRURAL_HOSP_AMT SumOfTOWN_OPT_AMT taxtotal);
set proj.prefilter;
by citycode period sic;
retain sum_arts sum_cnty sum_highway sum_local sum_massTrans
sum_resort sum_rural sum_town sum_TOTAL
abssum_arts abssum_cnty abssum_highway abssum_local
abssum_massTrans abssum_resort abssum_rural
abssum_town abssum_TOTAL;
countycode =  substr(citycode,1,2) ;
if first.sic then
do;
sum_arts = SumOfARTS_ZOO_AMT;
sum_cnty = SumOfCNTY_OPT_AMT;
sum_highway = SumOfHIGHWAY_OPT_AMT;
sum_local = SumOfLOCAL_AMT;
sum_massTrans = SumOfMASS_TRANS_AMT;
sum_resort = SumOfRESORT_AMT;
sum_rural = SumOfRURAL_HOSP_AMT;
sum_town = SumOfTOWN_OPT_AMT;
sum_TOTAL = taxtotal;
abssum_arts = absARTS;
abssum_cnty = absCNTY;
abssum_highway = absHIGHWAY;
```

```
abssum_local = absLOCAL;
abssum_massTrans = absMASSTRANS;
abssum_resort = absRESORT;
abssum_rural = absRURAL;
abssum_town = absTOWN;
abssum_TOTAL = abstaxtotal;
end;
else
do;
sum_arts = sum_arts + SumOfARTS_ZOO_AMT;
sum_cnty = sum_cnty + SumOfCNTY_OPT_AMT;
sum_highway = sum_highway + SumOfHIGHWAY_OPT_AMT;
sum_local = sum_local + SumOfLOCAL_AMT;
sum_massTrans = sum_massTrans + SumOfMASS_TRANS_AMT;
sum_resort = sum_resort + SumOfRESORT_AMT;
sum_rural = sum_rural + SumOfRURAL_HOSP_AMT;
sum_town = sum_town + SumOfTOWN_OPT_AMT;
sum_TOTAL = taxtotal + sum_TOTAL;
abssum_arts = absARTS+abssum_arts;
abssum_cnty = absCNTY+abssum_cnty;
abssum_highway = absHIGHWAY+abssum_highway;
abssum_local = absLOCAL+abssum_local;
abssum_massTrans = absMASSTRANS+abssum_massTrans;
abssum_resort = absRESORT+abssum_resort;
abssum_rural = absRURAL+abssum_rural;
abssum_town = absTOWN+abssum_town;
abssum_TOTAL = abstaxtotal+abssum_TOTAL;
end;
if last.sic then output;
run;


proc sql;
```

```
create table prefiltersums3 as
select sum(sum_arts) as tabletotalarts,
sum(sum_cnty) as tabletotalcnty,
sum(sum_highway) as tabletotalhighway,
sum(sum_local) as tabletotallocal,
sum(sum_massTrans) as tabletotalmassTrans,
sum(sum_resort) as tabletotalresort,
sum(sum_rural) as tabletotalrural,
sum(sum_town) as tabletotaltown,
sum(sum_TOTAL) as tabletotalTOTAL,
sum(abssum_arts) as tabletotalabsARTS,
sum(abssum_cnty) as tabletotalabsCNTY,
sum(abssum_highway) as tabletotalabsHIGHWAY,
sum(abssum_local) as tabletotalabsLOCAL,
sum(abssum_massTrans) as tabletotalabsMASSTRANS,
sum(abssum_resort) as tabletotalabsRESORT,
sum(abssum_rural) as tabletotalabsRURAL,
sum(abssum_town) as tabletotalabsTOWN,
sum(abssum_total) as tabletotalabsTOTAL
from prefiltersums2;
quit;

*********************** Filtering Data *******************************;
data filtering; *2,533,687 obs;
set proj.prefilter;
period_char = trim(put(period, best8.));
mn1 = substr(period_char,1,2);
yr1 = substr(period_char,3,2);
mn2 = substr(period_char,5,2);
yr2 = substr(period_char,7,2);
period1 = MDY(mn1,1,yr1);
period2 = MDY(mn2,1,yr2);
months = intck('month',period1,period2)+1;
```

```
if months=3 then do;
if mn1 in (1,2,3) then qtr = 1;
else if mn1 in (4,5,6) then qtr = 2;
else if mn1 in (7,8,9) then qtr = 3;
else qtr=4;
end;
qtryr = qtr||'/'||yr1;
sic2 = substr(sic,1,2);
fymatch = substr(put(FY,best4.),3,2);
FYExpand =  MDY(1,1,FY) ;
mondiff=intck("month",period2,FYExpand);
diff=intck("year",period2,FYExpand);
format FYExpand date9. period1 date9. period2 date9.;
siccheck = sic;
run;

* Table of the desciptions of 4 digit sic codes;
PROC IMPORT OUT= RAW.sic4digit
            DATAFILE= "&directory.\Raw Data\SICRaw_Mar4.xls"
            DBMS=EXCEL REPLACE;
     RANGE="ForSAS$";
     GETNAMES=YES;
     MIXED=NO;
     SCANTEXT=YES;
     USEDATE=YES;
     SCANTIME=YES;
RUN;

proc sort data=raw.sic4digit; by sic; run;
data proj.sicunique; * Getting rid of doubles in the excel sic description file;
set raw.sic4digit;
by sic;
if first.sic;
```

```
run;
proc sql;
create table meaningfulSIC as
select a.sic, a.sicdescription, b.*
from proj.sicunique a right join filtering b
on a.sic=b.sic
order by sic;
quit;
data noSICinfo; * how many sic codes don't have a description;
set meaningfulSIC;
if sicdescription = "";
run;
proc sql;
create table SICinfo2 as
select siccheck, count(siccheck) as count
from noSICinfo
group by siccheck;
quit;
data SICinfo; * how many sic codes DO have a description;
set meaningfulSIC;
if sicdescription ne "";
run;
proc sql;
create table SICinfo2 as
select siccheck, count(siccheck) as count
from SICinfo
group by siccheck;
quit;

******************** Codes with no matching city name***************;
* The number in the percent calc is found in work.prefiltersums3,
varaible: tabletotalabsTOTAL;
proc sql;
```

```
create table NoCityName as
select  city,
count(city) as n,
sum(taxtotal) as sum,
sum(taxtotal)/5533284807.1 as percent format percent7.4
from filtering
where city in ('03035','06031','06058','18160','99002','18090','04017','33000')
group by city;
quit;


proc contents data=filtering; run;
* Filter variables and divide into flagged data and normal data.;
* The flagged data will be thrown out of the dataset.;
options error=0;
data flag normal (drop = allflag mnflag yrflag monthsnegflag sicflag) ;
set filtering;
* There numbers are different than those in the original prospectus code
  because of the change in definition of FY in 1990 and 2005;
if city in ("03035","06031","06058","18160","99002","18090","04017","33000")
then do;
nonameflag = 1; allflag = 1; end;
if input(mn1,2.) < 1 or input(mn1,2.) > 12 then do;
mnflag = 1; allflag = 1; test=1;end;
if input(mn2,2.) < 1 or input(mn2,2.) > 12 then do;
mnflag = 1; allflag = 1; test=1; end;
if (input(yr1,2.) < 90 and input(yr1,2.) > 05) then do;
yrflag = 1; allflag = 1; end;
if (input(yr2,2.) < 90 and input(yr2,2.) > 05) then do;
yrflag = 1; allflag = 1; end;
if (input(yr1,2.) = 90) and (input(mn2,2.) in (1,2,3,4,5,6)) then do;
yrflag = 1; allflag = 1; end;
if (input(yr1,2.) = 05) and (input(mn2,2.) in (7,8,9,10,11,12)) then do;
yrflag = 1; allflag = 1; end;
```

```
if months <= 0 then do;
monthsnegflag = 1; allflag=1; end;
if sic = . or sic < "0000" or sic > "9999" then do;
sicflag=1; allflag=1; end;
* The SIC=. logic picks up on more abnormal values,
so we don't say SIC="" (This is purposeful coding.);

if mondiff <= -6 then do; diffflag=1; allflag=1; end;
else do;
if mondiff in (-5:6) then diff_fy = 0;
else if mondiff in (7:18) then diff_fy = 1;
else if mondiff in (19:30) then diff_fy = 2;
else if mondiff in (31:42) then diff_fy = 3;
else if mondiff in (43:54) then diff_fy = 4;
else if mondiff in (55:66) then diff_fy = 5;
else if mondiff in (67:88) then diff_fy = 6;
else if mondiff in (89:100) then diff_fy = 7;
else if mondiff in (101:112) then diff_fy = 8;
else if mondiff in (113:124) then diff_fy = 9;
else if mondiff in (125:136) then diff_fy = 10;
else if mondiff in (137:148) then diff_fy = 11;
else if mondiff in (149:160) then diff_fy = 12;
else if mondiff in (161:172) then diff_fy = 13;
else if mondiff in (173:184) then diff_fy = 14;
else if mondiff >184 then diff_fy = 15;
end;
if allflag=1 then output flag;
if allflag ne 1 then output normal;
run;
options error=5;

*******Assessing the cost of each of the filters*************;
%macro flagsum(flagname);
```

```
proc sql;
create table &flagname.flag as
select  sum(abstaxtotal) as abstotal,
sum(taxtotal) as total,
count(&flagname.flag) as  count,
calculated total - calculated abstotal as refund,
sum(taxtotal)/5533284807.1 as percent format percent7.4
from flag
where &flagname.flag=1
group by &flagname.flag;
quit;
data &flagname.flag; * so that the rows will be identified when data is combined;
set &flagname.flag;
variable =  "&flagname.flag";
run;
%mend;
%flagsum(yr);
%flagsum(noname);
%flagsum(mn);
%flagsum(sic);
%flagsum(diff);
%flagsum(monthsneg);
%flagsum(all);
data proj.flagsummary; *Combining all tables from macro statements together;
set nonameflag mnflag yrflag monthsnegflag sicflag diffflag allflag;
run;

* To make a table to import to latex;
proc sql;
select  variable,
count format comma12.2,
total format dollar15.2,
abstotal format dollar15.2,
```

```
refund format dollar15.2,
percent format percent7.2
from proj.flagsummary;
quit;

****FILLING PERIOD VS FY ;

proc sql;
select sum(taxtotal) format dollar15.2 from normal ;

create table diff1 as
select  diff_fy, count(diff_fy) as n format comma10.,
sum(taxtotal) as totaltax format dollar30.2,
calculated totaltax/5309076364.97 as percent format percent7.2
from normal
group by diff_fy;

quit;



****Duration************* ;
data dur1a;
set normal;
if months in (1:12) then y = 1;
else if months in (13:24) then y = 2;
else if months in (25:36) then y = 3;
else if months in (37:48) then y = 4;
else if months in (49:60) then y = 5;
else if months in (61:72) then y = 6;
else if months in (73:84) then y = 7;
else if months in (85:96) then y = 8;
else if months in (97:108) then y = 9;
else if months >108 then y = 10;
```

```
run;

proc sql;
create table dur1 as
select y, sum(taxtotal) as totaltaxamt, count(y) as n,
calculated totaltaxamt/5309076364.97 as percent format percent7.2
from dur1a
group by y;

select sum(taxtotal) as total  format dollar30.2
from dur1a;

create table dur_1to12months as
select months, sum(taxtotal) as totaltaxamt format dollar20.2,
count(months) as n format comma9.,
calculated totaltaxamt/5309076364.97 as percent format percent7.2
from dur1a
where (months >-1 and months <=12)
group by months ;
quit;

* final filtering based off duration;

proc sql;
create table proj.alldata as
select *
from normal
where months <= 12 and diff_fy < 5;
quit;



proc sort data=proj.alldata; by citycode period sic; run;
data postfiltersums2 (drop =
```

```
SumOfARTS_ZOO_AMT SumOfCNTY_OPT_AMT SumOfHIGHWAY_OPT_AMT
SumOfLOCAL_AMT SumOfMASS_TRANS_AMT
SumOfRESORT_AMT SumOfRURAL_HOSP_AMT SumOfTOWN_OPT_AMT taxtotal
absarts abscnty abshighway abslocal absmassTrans
absresort absrural abstown abstaxTOTAL);
set proj.alldata;
by citycode period sic;
retain sum_arts sum_cnty sum_highway sum_local sum_massTrans
sum_resort sum_rural sum_town sum_TOTAL
abssum_arts abssum_cnty abssum_highway abssum_local
abssum_massTrans abssum_resort abssum_rural
abssum_town abssum_TOTAL;
countycode =  substr(citycode,1,2) ;
if first.sic then
do;
sum_arts = SumOfARTS_ZOO_AMT;
sum_cnty = SumOfCNTY_OPT_AMT;
sum_highway = SumOfHIGHWAY_OPT_AMT;
sum_local = SumOfLOCAL_AMT;
sum_massTrans = SumOfMASS_TRANS_AMT;
sum_resort = SumOfRESORT_AMT;
sum_rural = SumOfRURAL_HOSP_AMT;
sum_town = SumOfTOWN_OPT_AMT;
sum_TOTAL = taxtotal;
abssum_arts = absARTS;
abssum_cnty = absCNTY;
abssum_highway = absHIGHWAY;
abssum_local = absLOCAL;
abssum_massTrans = absMASSTRANS;
abssum_resort = absRESORT;
abssum_rural = absRURAL;
abssum_town = absTOWN;
abssum_TOTAL = abstaxtotal;
```

```
end;
else
do;
sum_arts = sum_arts + SumOfARTS_ZOO_AMT;
sum_cnty = sum_cnty + SumOfCNTY_OPT_AMT;
sum_highway = sum_highway + SumOfHIGHWAY_OPT_AMT;
sum_local = sum_local + SumOfLOCAL_AMT;
sum_massTrans = sum_massTrans + SumOfMASS_TRANS_AMT;
sum_resort = sum_resort + SumOfRESORT_AMT;
sum_rural = sum_rural + SumOfRURAL_HOSP_AMT;
sum_town = sum_town + SumOfTOWN_OPT_AMT;
sum_TOTAL = taxtotal + sum_TOTAL;
abssum_arts = absARTS+abssum_arts;
abssum_cnty = absCNTY+abssum_cnty;
abssum_highway = absHIGHWAY+abssum_highway;
abssum_local = absLOCAL+abssum_local;
abssum_massTrans = absMASSTRANS+abssum_massTrans;
abssum_resort = absRESORT+abssum_resort;
abssum_rural = absRURAL+abssum_rural;
abssum_town = absTOWN+abssum_town;
abssum_TOTAL = abstaxtotal+abssum_TOTAL;
end;
if last.sic then output;
run;

proc sql;
* these numbers are different because of the
alternative definition of FY (july YY to june YY);
create table postfiltersums3 as
select sum(sum_arts) as tabletotalarts,
sum(sum_cnty) as tabletotalcnty,
sum(sum_highway) as tabletotalhighway,
sum(sum_local) as tabletotallocal,
```

```
sum(sum_massTrans) as tabletotalmassTrans,
sum(sum_resort) as tabletotalresort,
sum(sum_rural) as tabletotalrural,
sum(sum_town) as tabletotaltown,
sum(sum_TOTAL) as tabletotalTOTAL,
sum(abssum_arts) as tabletotalabsARTS,
sum(abssum_cnty) as tabletotalabsCNTY,
sum(abssum_highway) as tabletotalabsHIGHWAY,
sum(abssum_local) as tabletotalabsLOCAL,
sum(abssum_massTrans) as tabletotalabsMASSTRANS,
sum(abssum_resort) as tabletotalabsRESORT,
sum(abssum_rural) as tabletotalabsRURAL,
sum(abssum_town) as tabletotalabsTOWN,
sum(abssum_total) as tabletotalabsTOTAL
from postfiltersums2;
quit;

data proj.unique_postfilter;
*before assumptions deal mainly with combining data from wierd filling periods;
set postfiltersums2;
run;



* subsetting the data for working and creating a table;
data area;
set proj.unique_postfilter;
if substr(citycode,1,2) in ('04','08','12','14','20','21','25') ;
*if substr(citycode,1,2) = '20';
run;



data monthly quarterly yearly other;
set area;
```

```
originalperiod1 = period1;
originalperiod2 = period2;
originalmonths = months;
if months = 1 then output monthly;
else if months = 3 and month(period1) in (1,4,7,10) then output quarterly;
else if months = 2 and month(period2) in (3,6,9,12) then do;
period1 = intnx('month',period1,-1)  ;
months=3;
output quarterly;
end;
else if months = 2 and month(period2) in (2,5,8,11) then do;
months=3;
output quarterly;
end;
else if yr2 = yr1+1 or (yr1=99 and yr2=00) then do;
period1months = 12-mn1+1;
if period1months > mn2 then yeardecision = yr1; else yeardecision = yr2;
months=12;
period1 = MDY(1,1,yeardecision);
period2 = MDY(12,1,yeardecision);
output yearly;
end;
else if yr1 = yr2 then do;
months=12;
period1 = MDY(1,1,yr2);
period2 = MDY(12,1,yr2);
output yearly;
end;
else output other;
format originalperiod1 date9. originalperiod2 date9.;
run;
```

```
* in order to make sure that we have all possible periods accounted for, we
  make a master filling period file (PossibleMontlyFillingPeriods.xls) and then
  append the observed data with the master filling period file previous to
  a proc transpose.;

PROC IMPORT OUT= raw.monthlyperiods
            DATAFILE= "&directory.\Raw Data\Monthly.xls"
            DBMS=EXCEL REPLACE;
     RANGE="Sheet1$";
     GETNAMES=YES;
     MIXED=NO;
     SCANTEXT=YES;
     USEDATE=YES;
     SCANTIME=YES;
RUN;

PROC IMPORT OUT= raw.quarterlyperiods
            DATAFILE= "&directory.\Raw Data\Quarterly.xls"
            DBMS=EXCEL REPLACE;
     RANGE="Sheet1$";
     GETNAMES=YES;
     MIXED=NO;
     SCANTEXT=YES;
     USEDATE=YES;
     SCANTIME=YES;
RUN;

PROC IMPORT OUT= raw.yearlyperiods
            DATAFILE= "&directory.\Raw Data\Yearly.xls"
            DBMS=EXCEL REPLACE;
     RANGE="Sheet1$";
     GETNAMES=YES;
     MIXED=NO;
```

```
     SCANTEXT=YES;
     USEDATE=YES;
     SCANTIME=YES;
RUN;

%macro periods(duration);

proc sort data = &duration.; by citycode period1 sic; run;

data unique_sum ;
set &duration.;
by citycode period1 sic;
retain sum_arts2 sum_cnty2 sum_highway2 sum_local2 sum_massTrans2
sum_resort2 sum_rural2 sum_town2 sum_TOTAL2;
if first.sic then
do;
sum_arts2 = sum_arts;
sum_cnty2 = sum_cnty;
sum_highway2 = sum_highway;
sum_local2 = sum_local;
sum_massTrans2 = sum_massTrans;
sum_resort2 = sum_resort;
sum_rural2 = sum_rural;
sum_town2 = sum_town;
sum_TOTAL2 = sum_total;
end;
else
do;
sum_arts2 = sum_arts + sum_arts2;
sum_cnty2 = sum_cnty + sum_cnty2;
sum_highway2 = sum_highway + sum_highway2;
sum_local2 = sum_local + sum_local2;
sum_massTrans2 = sum_massTrans + sum_massTrans2;
```

```
sum_resort2 = sum_resort + sum_resort2;
sum_rural2 = sum_rural + sum_rural2;
sum_town2 = sum_town + sum_town2;
sum_TOTAL2 = sum_total + sum_total2;
end;
if last.sic then output;
run;

data &duration.periods1;
set raw.&duration.periods;
length cityname $ 25 sic $ 6;
period_char = trim(put(periods, best8.));
mn1 = substr(period_char,1,2);
yr1 = substr(period_char,3,2);
mn2 = substr(period_char,5,2);
yr2 = substr(period_char,7,2);
period1 = MDY(mn1,1,yr1);
period2 = MDY(mn2,1,yr2);
format period1 date9. period2 date9.;
cityname = "0";
sic = "0";
run;

data &duration._1;
set unique_sum &duration.periods1 ;
run;

proc sort data= &duration._1;
by cityname sic period1;
run;


%macro calc(tax);
```

```
proc transpose data=&duration._1 out=&tax;
by cityname sic;
id period1;
var sum_&tax.2 ;
run;
proc transpose data=&tax out=&tax;
by cityname sic;
run;
proc sort data=&tax;
by cityname sic _name_;
run;
data &tax;
set &tax;
if sum_&tax.2 = . then sum_&tax.2 = 0;
run;
%mend;

%calc(arts);
%calc(cnty);
%calc(highway);
%calc(local);
%calc(masstrans);
%calc(resort);
%calc(rural);
%calc(town);
%calc(total);

data &duration.comb (rename = (sum_arts2=sum_arts
sum_cnty2=sum_cnty sum_highway2=sum_highway
sum_local2=sum_local sum_massTrans2=sum_massTrans
sum_resort2=sum_resort sum_rural2=sum_rural
sum_town2=sum_town sum_TOTAL2=sum_TOTAL));
merge arts cnty highway local masstrans resort rural town total;
```

```
by cityname sic _name_;
if cityname='0' then delete;
period1=input(substr(_name_,2,9),date9.);
format period1 date9.;
run;

%mend;

%periods(monthly);
%periods(quarterly);
%periods(yearly);

*MONTHLY;
* making the monthly data into quarterly data;

data mnToQtr;
set monthlycomb;
if month(period1) in (1,2,3) then qtr = 1;
else if month(period1) in (4,5,6) then qtr = 2;
else if month(period1) in (7,8,9) then qtr = 3;
else qtr=4;
year = year(period1);
run;
proc sort data=mnToQtr;
by cityname sic year qtr;
run;
data mnToQtrUnique (drop=_name_ sum_total sum_arts sum_cnty
sum_highway sum_local sum_massTrans sum_resort sum_rural
sum_town period1);* These variables are meaningless with the sum now;
set mnToQtr;
by cityname sic year qtr;
retain qtr_TOTAL qtr_arts qtr_cnty qtr_highway qtr_local
qtr_massTrans qtr_resort qtr_rural qtr_town;
```

```
if first.qtr then do;
qtr_TOTAL = sum_total;
qtr_arts = sum_arts;
qtr_cnty = sum_cnty;
qtr_highway = sum_highway;
qtr_local = sum_local;
qtr_massTrans = sum_massTrans;
qtr_resort = sum_resort;
qtr_rural = sum_rural;
qtr_town = sum_town;
end;
else do;
qtr_TOTAL = sum_total + qtr_TOTAL;
qtr_arts = qtr_arts + sum_arts;
qtr_cnty = qtr_cnty + sum_cnty;
qtr_highway = qtr_highway + sum_highway;
qtr_local = qtr_local + sum_local;
qtr_massTrans = qtr_massTrans + sum_massTrans;
qtr_resort = qtr_resort + sum_resort;
qtr_rural = qtr_rural + sum_rural;
qtr_town = qtr_town + sum_town;
end;
if last.qtr then output;
run;


* QUARTERLY;
data quarterlycomb2 (drop=_NAME_);
set quarterlycomb (rename = (sum_total = qtr_total
sum_arts = qtr_arts sum_cnty = qtr_cnty
sum_highway = qtr_highway sum_local = qtr_local
sum_massTrans = qtr_massTrans
sum_resort = qtr_resort sum_rural = qtr_rural
```

```
sum_town = qtr_town));
if month(period1) in (1,2,3) then qtr = 1;
else if month(period1) in (4,5,6) then qtr = 2;
else if month(period1) in (7,8,9) then qtr = 3;
else qtr=4;
year = year(period1);
run;

proc sort data=quarterlycomb2;
by cityname sic year qtr;
run;

*YEARLY;
data yearlycomb2 (rename = (sum_total = mnandqtr_total
sum_arts = mnandqtr_arts sum_cnty = mnandqtr_cnty
sum_highway = mnandqtr_highway
sum_local = mnandqtr_local
sum_massTrans = mnandqtr_massTrans
sum_resort = mnandqtr_resort
sum_rural = mnandqtr_rural
sum_town = mnandqtr_town));
set yearlycomb (drop=_name_);
year=year(period1);
run;

* Combining quarterly data with aggregated monthly data;

data MnQtrComb;
set MnToQtrUnique quarterlycomb2 ;
by cityname sic year qtr;
run;
proc sql;
create table qtrUnique as
```

```
select cityname, sic, year, qtr
, sum(qtr_total) as mnandqtr_total
, sum(qtr_arts) as mnandqtr_arts
, sum(qtr_cnty) as mnandqtr_cnty
, sum(qtr_highway) as mnandqtr_highway
, sum(qtr_local) as mnandqtr_local
, sum(qtr_massTrans) as mnandqtr_massTrans
, sum(qtr_resort) as mnandqtr_resort
, sum(qtr_rural) as mnandqtr_rural
, sum(qtr_town) as mnandqtr_town
from MnQtrComb
group by cityname, sic, year, qtr
order by cityname, sic, year, qtr;
quit;

* Combining yearly data with aggregated yearly data;

data MnQtrYearComb;
set qtrUnique yearlycomb2 ;
by cityname sic year;
run;

proc sql;
create table yearUnique as
select cityname, sic, year
, sum(mnandqtr_total) as year_total
, sum(mnandqtr_arts) as year_arts
, sum(mnandqtr_cnty) as year_cnty
, sum(mnandqtr_highway) as year_highway
, sum(mnandqtr_local) as year_local
, sum(mnandqtr_massTrans) as year_massTrans
, sum(mnandqtr_resort) as year_resort
, sum(mnandqtr_rural) as year_rural
```

```
, sum(mnandqtr_town) as year_town
from MnQtrYearComb
group by cityname, sic, year
order by cityname, sic, year;
quit;

proc sort data=qtrUnique out=temp; by year qtr; run;

* adding in the city code data;
proc sql;
create table YearCity as
select  b.citycode as citycode, b.location as cityname, a.*
from YearUnique a left join proj.cityname b
on b.location=a.cityname;
quit;
proc sql;
create table MnQtrCityComb as
select b.citycode as citycode, b.location as cityname, a.*
from qtrUnique a left join proj.cityname b
on b.location=a.cityname;
quit;


* Where sicunique is from table used before;

proc sql;
create table district.Q_SIC as /* Quarter Year*/
select  a.*,
b.*
from MnQtrCityComb a left join proj.sicunique b
on a.sic=b.sic
/*order by cityname, sic, year*/;
quit;
```

```
proc sql;
create table district.Y_SIC as /*Year*/
select  a.*,
b.*
from YearCity a left join proj.sicunique b
on a.sic=b.sic
where year ne 1990 and year ne 2005
order by cityname, sic, year;
quit;


* Adding city county code information so as to combine population data;

PROC IMPORT OUT=districtInfo
            DATAFILE= "&directory.\Raw Data\CountyCity.xls"
            DBMS=EXCEL REPLACE;
     RANGE="CityCodes$";
     GETNAMES=YES;
     MIXED=NO;
     SCANTEXT=YES;
     USEDATE=YES;
     SCANTIME=YES;
RUN;

proc sql;
create table Quarter as
select a.citycode, a.cityname, a.sic, a.year, a.qtr,
a.mnandqtr_total as tax, a.sicdescription, b.area
from district.q_sic a, districtInfo b
where a.citycode = b.citycode
order by citycode, sic, year, qtr;
```

```
create table Year as
select a.citycode, a.cityname, a.sic, a.year,
a.year_total as tax, a.sicdescription, b.area
from district.y_sic a, districtInfo b
where a.citycode = b.citycode
order by citycode, sic, year;

quit;

* combining quarterly and yearly data;
data qtr ;
set quarter;
time = yyq(year,qtr);
timecont = yyq(year,qtr);
format time yyqs8.;
run;

data yr ;
set year;
time = yyq(year,4);
timecont = yyq(year,4);
format time yyqs8.;
run;

proc sql;
create table all_notspread as
select a.cityname ,a.sic, a.time, a.timecont, a.area/*,
a.county, a.PI, a.POP, a.top90, a.top80, a.top70*/,
a.sicdescription,  sum(a.tax,b.tax) as tax
from qtr a left join yr b
on  a.cityname=b.cityname and a.sic=b.sic and a.time=b.time
order by a.cityname, a.sic, a.time;
quit;
```

```
* for evening out the effect of year;
data qtr_spread ;
set quarter;
time = yyq(year,qtr);
timecont = yyq(year,qtr);
format time yyqs8.;
run;
data yr_spread ;
set year;
time = yyq(year,4);
timecont = yyq(year,4);
format time yyqs8.;
tax_spread = tax/4;
run;

* visual of how the tax is spread;
/*proc sql;
create table temp as
select a.cityname, a.sic, a.time, sum(a.tax,b.tax_spread) as tax,
a.tax as qtrtax, b.tax as yeartax, b.tax_spread as yearspread
from qtr_spread a left join yr_spread b
on a.cityname=b.cityname and a.sic=b.sic and a.year=b.year
order by a.cityname, a.sic, a.time;
quit;
*/

proc sql;
create table all as
select a.cityname, a.sic, a.time, sum(a.tax,b.tax_spread) as tax,
a.timecont, a.area, a.year
from qtr_spread a left join yr_spread b
```

```
on a.cityname=b.cityname and a.sic=b.sic and a.year=b.year
order by a.cityname, a.sic, a.time;
quit;



* Population queries;

%macro ReadIn(sheet,area);
PROC IMPORT OUT=&sheet.
            DATAFILE= "&directory.\Raw Data\UtahPOP_PI.xls"
            DBMS=EXCEL REPLACE;
     RANGE="&sheet.$";
     GETNAMES=YES;
     MIXED=NO;
     SCANTEXT=YES;
     USEDATE=YES;
     SCANTIME=YES;
RUN;
proc sort data=&sheet.; by &area.; run;
data &sheet.;
set &sheet.;
if &area. = "" then delete;
run;
%mend;
%ReadIn(TempleDist,county);
%ReadIn(CensusCityPop,city);
%ReadIn(CensusCountyPop,county);
%ReadIn(PI,county);
%ReadIn(POP,county);
%ReadIn(PCPI,county);

proc transpose data=censuscitypop out=longCityPop
```

```
(drop= _label_ rename=(col1=censusPop));
by city;
run;
proc transpose data=censuscountypop out=longCntyPop
(drop= _label_ rename=(col1=censusPop));
by county;
run;

%macro BEAtranspose(set);
proc transpose data=&set. out=long&set. (drop=_label_ rename=(col1=&set.));
by county;
run;
%mend;
%BEAtranspose(PI);
%BEAtranspose(PCPI);
%BEAtranspose(POP);

proc sql;

* table of county, year, pi, pop, pcpi, cityname;
create table comb as
select a.county, a._name_, a.PI, b.POP, c.PCPI, d.cityname
from longpi a, longpop b, longpcpi c,TempleDist d
where (a.county=b.county=c.county=d.county) and (a._name_=b._name_=c._name_);

* adding in citydata for population
(couldn't do it in step before without nesting);
create table comb2 as
select a.*, e.censusPOP
from comb a left join longcitypop e
on (a.cityname = e.city) and (a._name_=e._name_)
where cityname ne "Hiawatha"
/*Hiawatha is a ghost town, and doesn't show up in the USTC data*/
```

```
order by a.county, a.cityname,a._name_;

* Finding out the difference between city population totals
and county totals for each county;
create table countyTot as
select distinct(_name_), county, pop
 from
   comb2
 order by _name_, county
;

create table cityTot as
 select _name_, county, sum(cityPop) as cityPop
 from (
   select _name_, county, cityname, sum(censusPop) as cityPop
   from comb2
   group by _name_, county,cityname
 ) baz
 group by _name_, county
;

create table popDiff as
select a._name_, a.county, a.pop, b.cityPop, a.pop - b.cityPop as censusPop
from countyTot a left join cityTot b
on (a.county = b.county and a._name_ = b._name_)
;
quit;

* have to rename the county variable to match the city variable when we merge;
data popDiff1;
set popDiff;
cityname = catx(' ',county,'County');
run;
```

```
* combine county population differences with comb3;
proc sql;

create table withCountyPop as
select a.county,a.cityname, a._name_, a.PI, a.POP,
coalesce(a.censusPop,b.censusPop) as censusPop
from comb2 a left join popDiff1 b
on (a.cityname=b.cityname and a._name_ = b._name_)
;

* calculate the percent of city population within each county;
create table NoImputationYet as
select a.*, a.censusPOP/a.POP as percent /*format=percent. */
from withCountyPop a
order by cityname, _name_;
quit;


* averaging;
proc means data=NoImputationYet mean noprint;
* calculates the mean percent of county pop for each city;
var percent;
by cityname;
output out=avePop mean=mean;
run;


proc sql;
* using the average to impute the missing population;
create table impute1 as
select a.*, a.pi*b.mean as cityPI,
round(a.pop*b.mean,1) as cityPOP,
```

```
 coalesce(censusPop, calculated cityPOP) as subPOP
from NoImputationYet a, avePop b
where a.cityname=b.cityname
order by county, cityname, _name_;

quit;

* change year to a numeric variable;
data impute2 (drop=_name_ year1);
set impute1;
year1 = substr(_name_,2,4);
year = input(year1,4.);
run;

* Alternative calculation using splines in R;



PROC EXPORT DATA= WORK.NoImputationYet
            OUTFILE= "&directory.\Output\pop_imputation.csv"
            DBMS=CSV REPLACE;
     PUTNAMES=YES;
RUN;

/* R Code for calculating cubic splines



p.all <- read.csv('pop_imputation.csv', header=T)
p <-na.omit(p.all)
p$year <- substr(p$X_NAME_,2,5)

# writing a loop to calculate city populaton estimates for all data

cities <- unique(p$cityname)
```

```
out <- NULL
for(i in 1:length(cities)){
  subset <- p[p$cityname==cities[i],]
  new <- predict(smooth.spline(subset$year,subset$censusPop,df=4),
  x=seq(1990,2008,length=73))
  cityname <- cities[i]
  out.new <- cbind(levels(cities)[cities[i]],new$x,new$y)
  out <- rbind(out, out.new)
  }
d <- data.frame(matrix(c('Set length so nothing gets cut','','','',''),1,5
,byrow=FALSE))
names(d) <- c('','','','year','qtr')
year <- substr(out[,2],1,4)
qtr <- substr(out[,2],5,7)
out2 <- data.frame(cbind(out,year,qtr))
names(out2) <- c('','','','year','qtr')
out3 <- rbind(d,out2)

write.csv(out3,"pop_out.csv")


# Graphic for paper
test <- p[p$cityname=='Manti',]

plot(test$year,test$censusPop,main="Cubic Spline to Predict Manti Population",
ylab="Predicted Population",xlab="Time")
predict(smooth.spline(test$year,test$censusPop,df=4),x=1990.5)
lines(predict(smooth.spline(test$year,test$censusPop,df=4),
x=seq(1990,2008, length=73)))
*/

PROC IMPORT OUT= WORK.SPLINESPOP3
```

```
            DATAFILE= "&directory.\Output\pop_out.csv"
            DBMS=dlm REPLACE;
delimiter=',';
     GETNAMES=YES;
     DATAROW=2;
RUN;



data splinespop2 ;
set splinespop3 (drop=var1 rename=(Var2=cityname Var4=splinePOP ));
splinepop_rounded = round(input(splinePOP, best12.),1);
if qtr="" then q=1;
else if qtr=".25" then q=2;
else if qtr=".5" then q=3;
else if qtr=".75" then q=4;
time = yyq(year,q);
timecont = yyq(year,q);
format time date9.;
if cityname = "Set length so nothing gets cut" then delete;
run;

proc sql;
create table all_spline as
select *
from  all  a left join splinesPOP2 b
/*Left join keeps not matched data from impute2*/
on (a.cityname=b.cityname) and (a.timecont=b.timecont)
order by a.cityname, a.sic, a.timecont
;
create table all_spline2 as
select *
from all_spline a, impute2 b
```

```
where a.cityname=b.cityname and a.year=b.year;
quit;


* add in the data for the actual years we have;
data all_finalPOP (drop = censusPop);
set all_spline2;
if (censusPOP ne . and  qtr(time)= 3) then finalpop=censusPOP;
*match the 3rd qtr because the census estimates are for 7/1/####;
else finalpop=splinepop_rounded;
run;
data all_finalPI ;
set all_finalPOP;
p = finalPOP/Pop;
citypi = pi*p;
run;


***************************************************************************;
* Data set for estimation;
***************************************************************************;

data district.all_sicCat;
set all_finalPI;
length sicG $ 15.;
sic2 = substr(sic,1,2);
sic1 = substr(sic,1,1);
if sic2 in ('01','02','07','08','09') then sicG = 'Agriculture';
else if sic2 in ('10','12','13','14') then sicG='Mining';
else if sic2 in ('15','16','17') then sicG='Construction';
else if substr(sic,1,1) in ('2','3') then sicG='Manufacturing';
else if substr(sic,1,1) ='4' then sicG='Transportation';
else if sic2 in ('50','51') then sicG='Wholesale';
```

```
else if sic2 in ('52','53','54','55','56','57','58','59') then sicG='1Retail';
else if substr(sic,1,1) ='6' then sicG='Finance';
else if substr(sic,1,1) in ('7','8') then sicG='Services';
else if sic2 in ('91','92','93','94','95','96','97') then sicG='Administration';
else if sic2 ='99' then sicG='NonClassifiable';
subj = catx('/',cityname,sicG);
if timecont < 11323 then delete;
if timecont > 16345 then delete;
* we only want data for years 1991 to 2004 because the fringe data is not complete;
run;

/*  * What does the data look like? GRAPHIC FROM R

bycity <- read.csv('bycity.csv',header=T)

ggplot(bycity, aes(x=year, y=TotalTax, group=cityname)) +
  geom_smooth(aes(color=cityname), se=FALSE) +
  geom_vline(xintercept=2000) +
  opts(title="Total Tax Revenue for Sanpete Area Cities") +
  opts(plot.title = theme_text(size = 25)) +
  xlab("Time")+
  ylab("Total Tax") +
  scale_y_continuous(formatter=dollar)

retailbycity <- read.csv('retailbycity.csv',header=T)

ggplot(retailbycity, aes(x=year, y=TotalTax, group=cityname)) +
  geom_smooth(aes(color=cityname), se=FALSE) +
  geom_vline(xintercept=2000) +
  opts(title="Retail Tax Revenue for Sanpete Area Cities") +
  opts(plot.title = theme_text(size = 25)) +
  xlab("Time")+
  ylab("Retail Tax") +
```

```
  scale_y_continuous(formatter=dollar)

*/

*****************************************************************************;
* is the log transformation appropriate?;

proc sql;
create table total as
select cityname, time, timecont, sum(tax) as tax, log(sum(tax)) as ltax,
finalpop as pop, log(finalpop) as lpop
from area1 where  tax > 0
/*where cityname in ("Nephi","Ephraim","Salina","Sevier County","Gunnison") */
group by cityname, time, timecont,  finalpop;
quit;

title ' ALL AREA 1 CITIES - No Log';
proc mixed data=total ;
class cityname time ;
model tax = time pop time/ s noint vciry outpm=residuals;
repeated / subject=cityname type=ar(1) ;
random cityname /s  ;
run;
proc sql;
create table residuals2 as
select a.cityname, a.time, a.timecont, a.tax, a.pop, a.scaledResid as r
from residuals a ;
quit;
PROC EXPORT DATA= WORK.RESIDUALS2
            OUTFILE= "&directory.\Output\residuals.csv"
            DBMS=CSV REPLACE;
     PUTNAMES=YES;
RUN;
```

```
title ' ALL AREA 1 CITIES - Log Tax ';
proc mixed data=total ;
class cityname time ;
model ltax = time pop time/ s noint vciry outpm=residuals_ltax;
repeated / subject=cityname type=ar(1) ;
random cityname /s  ;
run;
proc sql;
create table residuals2_ltax as
select a.cityname, a.time, a.timecont, a.tax, a.pop, a.scaledResid as r
from residuals_ltax a ;
quit;
PROC EXPORT DATA= WORK.RESIDUALS2_ltax
            OUTFILE= "&directory.\Output\residuals_ltax.csv"
            DBMS=CSV REPLACE;
     PUTNAMES=YES;
RUN;

title ' ALL AREA 1 CITIES - Log Tax and Log Pop';
proc mixed data=total ;
class cityname time ;
model ltax = time lpop time/ s noint vciry outpm=residuals_ltax_lpop;
repeated / subject=cityname type=ar(1) ;
random cityname /s  ;
run;
proc sql;
create table residuals2_ltax_lpop as
select a.cityname, a.time, a.timecont, a.tax, a.pop, a.scaledResid as r
from residuals_ltax_lpop a ;
quit;
PROC EXPORT DATA= WORK.RESIDUALS2_ltax_lpop
            OUTFILE= "&directory.\Output\residuals_ltax_lpop.csv"
            DBMS=CSV REPLACE;
```

```
     PUTNAMES=YES;
RUN;

/* R Code to Compare Residuals

setwd('F:/Bigbox/Output')
library(ggplot2)

# cholesky.R

resid <- read.csv('residuals.csv',header=T)
resid_ltax <- read.csv('residuals_ltax.csv',header=T)
resid_ltax_lpop <- read.csv('residuals_ltax_lpop.csv',header=T)

plot(density(resid$r),xlim=c(-3,5),
main="Cholesky Residuals--Model Diagnostics",col=4)
lines(density(resid_ltax$r),col=2)
lines(density(resid_ltax_lpop$r),col=3)
lines(density(rnorm(1000000,0,1)),col=1)
legend(x=1.7,y=1.5,c("Normal Density","No Logs","Log(Total)",
"Log(Total) and Log(Pop)"),col=c(1,4,2,3),lty=c(1,1,1,1))


*/

*******************************************************************;


* The Model;

%macro model(dataset);

title "Overall Tax Effect, Area Definition: &dataset";
```

```
proc mixed data=&dataset._total ;
class cityname time ;
model ltax = time qtrpop time/ s noint ;
repeated / subject=cityname type=ar(1) ;
random cityname / s  ;
estimate 'Walmart Time Effect' time  -0.0277777
-0.0277777 -0.0277777 -0.0277777 -0.0277777 -0.0277777
-0.0277777 -0.0277777 -0.0277777 -0.0277777 -0.027777
-0.027777 -0.027777 -0.027777 -0.027777 -0.027777
-0.027777 -0.027777 -0.027777 -0.027777 -0.027777
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-0.027777 -0.027777 -0.027777 -0.027777 -0.027777
-0.027777 -0.027777 -0.027777 -0.027777 -0.027777
0.05 0.05 0.05 0.05 0.05  0.05 0.05 0.05 0.05 0.05
0.05 0.05 0.05 0.05 0.05  0.05 0.05 0.05 0.05 0.05/ cl;
run;


title "By Industry Effect, Area Definition: area1";
proc mixed data=&dataset._industries ;
class cityname sicG time ;
model ltax = time qtrpop sicG time*sicG/ s noint;
repeated / subject=cityname type=ar(1);
random cityname / s;
estimate 'Walmart Time Effect' time  -0.0277777
-0.0277777 -0.0277777 -0.0277777 -0.0277777 -0.0277777
-0.0277777 -0.0277777 -0.0277777 -0.0277777 -0.027777
-0.027777 -0.027777 -0.027777 -0.027777 -0.027777
-0.027777 -0.027777 -0.027777 -0.027777 -0.027777
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-0.027777 -0.027777 -0.027777 -0.027777 -0.027777
-0.027777 -0.027777 -0.027777 -0.027777 -0.027777
0.05 0.05 0.05 0.05 0.05  0.05 0.05 0.05 0.05 0.05
```

```
0.05 0.05 0.05 0.05 0.05  0.05 0.05 0.05 0.05 0.05 / cl;
estimate 'pre-post retail' time  -0.0277777
-0.0277777 -0.0277777 -0.0277777 -0.0277777 -0.0277777
-0.0277777 -0.0277777 -0.0277777 -0.0277777 -0.0277777
-0.0277777 -0.0277777 -0.0277777 -0.0277777 -0.0277777
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-0.0277777 -0.0277777 -0.0277777 -0.0277777 -0.0277777
-0.0277777 -0.0277777 -0.0277777 -0.0277777 -0.0277777
0.05 0.05 0.05 0.05 0.05  0.05 0.05 0.05 0.05 0.05
0.05 0.05 0.05 0.05 0.05  0.05 0.05 0.05 0.05 0.05
time*sicG  -0.0277777
-0.0277777 -0.0277777 -0.0277777 -0.0277777 -0.0277777
-0.0277777 -0.0277777 -0.0277777 -0.0277777 -0.0277777
-0.0277777 -0.0277777 -0.0277777 -0.0277777 -0.0277777
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-0.0277777 -0.0277777 -0.0277777 -0.0277777 -0.0277777
0.05 0.05 0.05 0.05 0.05  0.05 0.05 0.05 0.05 0.05
0.05 0.05 0.05 0.05 0.05  0.05 0.05 0.05 0.05 0.05 / cl;
estimate 'pre-post manufacturing' time  -0.0277777
-0.0277777 -0.0277777 -0.0277777 -0.0277777 -0.0277777
-0.0277777 -0.0277777 -0.0277777 -0.0277777 -0.0277777
-0.0277777 -0.0277777 -0.0277777 -0.0277777 -0.0277777
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-0.0277777 -0.0277777 -0.0277777 -0.0277777 -0.0277777
0.05 0.05 0.05 0.05 0.05  0.05 0.05 0.05 0.05 0.05
0.05 0.05 0.05 0.05 0.05  0.05 0.05 0.05 0.05 0.05
time*sicG 0 0 0 0 0  0 0 0 0 0  0 0 0 0 0   0 0 0 0 0
0 0 0 0 0  0 0 0 0 0   0 0 0 0 0  0 0 0 0 0  0 0 0 0 0
```

```
0 0 0 0 0  0 0 0 0 0 0
-0.0277777   -0.0277777 -0.0277777 -0.0277777 -0.0277777 -0.0277777
-0.0277777 -0.0277777 -0.0277777 -0.0277777 -0.0277777
-0.0277777 -0.0277777 -0.0277777 -0.0277777 -0.0277777
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-0.0277777 -0.0277777 -0.0277777 -0.0277777 -0.0277777
0.05 0.05 0.05 0.05 0.05  0.05 0.05 0.05 0.05 0.05
0.05 0.05 0.05 0.05 0.05  0.05 0.05 0.05 0.05 0.05
/ cl;
estimate 'pre-post services' time  -0.0277777
-0.0277777 -0.0277777 -0.0277777 -0.0277777 -0.0277777
-0.0277777 -0.0277777 -0.0277777 -0.0277777 -0.0277777
-0.0277777 -0.0277777 -0.0277777 -0.0277777 -0.0277777
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-0.0277777 -0.0277777 -0.0277777 -0.0277777 -0.0277777
-0.0277777 -0.0277777 -0.0277777 -0.0277777 -0.0277777
-0.0277777 -0.0277777 -0.0277777 -0.0277777 -0.0277777
0.05 0.05 0.05 0.05 0.05  0.05 0.05 0.05 0.05 0.05
0.05 0.05 0.05 0.05 0.05  0.05 0.05 0.05 0.05 0.05
time*sicG  0 0 0 0 0   0 0 0 0 0   0 0 0 0 0   0 0 0 0 0  0 0 0 0 0
0 0 0 0 0  0 0 0 0 0  0 0 0 0 0  0 0 0 0 0  0 0 0 0 0  0 0 0 0 0  0
0 0 0 0 0   0 0 0 0 0   0 0 0 0 0   0 0 0 0 0  0 0 0 0 0  0 0 0 0 0
0 0 0 0 0  0 0 0 0 0  0 0 0 0 0  0 0 0 0 0  0 0 0 0 0  0
-0.0277777   -0.0277777 -0.0277777 -0.0277777 -0.0277777 -0.0277777
-0.0277777 -0.0277777 -0.0277777 -0.0277777 -0.0277777
-0.0277777 -0.0277777 -0.0277777 -0.0277777 -0.0277777
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-0.0277777 -0.0277777 -0.0277777 -0.0277777 -0.0277777
0.05 0.05 0.05 0.05 0.05  0.05 0.05 0.05 0.05 0.05
```

```
0.05 0.05 0.05 0.05 0.05  0.05 0.05 0.05 0.05 0.05
/  cl;
estimate 'pre-post wholesale' time  -0.0277777
-0.0277777 -0.0277777 -0.0277777 -0.0277777 -0.0277777
-0.0277777 -0.0277777 -0.0277777 -0.0277777 -0.0277777
-0.0277777 -0.0277777 -0.0277777 -0.0277777 -0.0277777
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0.05 0.05 0.05 0.05 0.05  0.05 0.05 0.05 0.05 0.05
0.05 0.05 0.05 0.05 0.05  0.05 0.05 0.05 0.05 0.05
time*sicG 0 0 0 0 0   0 0 0 0 0   0 0 0 0 0   0 0 0 0 0  0 0 0 0 0
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0 0 0 0 0   0 0 0 0 0   0 0 0 0 0   0 0 0 0 0  0 0 0 0 0  0 0 0 0 0
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0 0 0 0 0   0 0 0 0 0   0 0 0 0 0   0 0 0 0 0  0 0 0 0 0  0 0 0 0 0
0 0 0 0 0  0 0 0 0 0  0 0 0 0 0  0 0 0 0 0  0 0 0 0 0  0
-0.0277777   -0.0277777 -0.0277777 -0.0277777 -0.0277777 -0.0277777
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0.05 0.05 0.05 0.05 0.05  0.05 0.05 0.05 0.05 0.05
/  cl;
run;

%mend;
```

```
* yearly revenue spread across time;


proc sql;
create table taxspread_area2 as
select cityname, sicG, time, timecont, sum(tax) as tax, area,
finalpop as qtrpop, cityPOP as yearpop
from district.all_siccat
where area in (1,2) and timecont >=11323 and timecont <=16345
group by cityname, sicG, time, timecont, area, qtrpop, yearpop
order by cityname, sicG;
quit;

proc sql;
* area 1;
create table area1_total as
select cityname, time, timecont, log(sum(tax)) as ltax,
log(qtrpop) as lpop ,qtrpop
from taxspread_area2
where area = 1 and tax > 0
group by cityname, time, timecont, qtrpop;
create table area1_industries as
select cityname, time, timecont, sicG, log(sum(tax)) as ltax,
log(qtrpop) as lpop ,qtrpop
from taxspread_area2
where  area = 1 and tax > 0 and sicG in ("1Retail","Wholesale",
"Services","Manufacturing")
group by cityname, sicG, time, timecont, qtrpop;

*total6;
create table total6_total as
select cityname, time, timecont, log(sum(tax)) as ltax,
log(qtrpop) as lpop, qtrpop
```

```
from taxspread_area2
where cityname in ("Nephi","Ephraim","Salina","Sevier County",
"Gunnison","Mt. Pleasant")
group by cityname, time, timecont, qtrpop;
create table total6_industries as
select cityname, time, timecont, sicG, log(sum(tax)) as ltax,
log(qtrpop) as lpop, qtrpop
from taxspread_area2
where cityname in ("Nephi","Ephraim","Salina","Sevier County",
"Gunnison","Mt. Pleasant")
and tax > 0 and sicG in ("1Retail","Wholesale","Services",
"Manufacturing")
group by cityname, sicG, time, timecont, qtrpop;

*geo;
create table geo_total as
select cityname, time, timecont, log(sum(tax)) as ltax,
log(qtrpop) as lpop, qtrpop
from taxspread_area2
where cityname in ("Ephraim","Manti","Sterling","Spring City",
"Wales","Moroni","Mt. Pleasant")
group by cityname, time, timecont, qtrpop;
create table geo_industries as
select cityname, time, timecont, sicG, log(sum(tax)) as ltax,
log(qtrpop) as lpop ,qtrpop
from taxspread_area2
where cityname in ("Ephraim","Manti","Sterling","Spring City",
"Wales","Moroni","Mt. Pleasant")
and tax > 0 and sicG in ("1Retail","Wholesale","Services",
"Manufacturing")
group by cityname, sicG, time, timecont, qtrpop;

*comp;
```

```
create table comp_total as
select cityname, time, timecont, log(sum(tax)) as ltax,
log(qtrpop) as lpop, qtrpop
from taxspread_area2
where cityname in ("Ephraim","Manti","Gunnison","Mt. Pleasant","Fairview")
group by cityname, time, timecont, qtrpop;
create table comp_industries as
select cityname, time, timecont, sicG, log(sum(tax)) as ltax,
log(qtrpop) as lpop ,qtrpop
from taxspread_area2
where cityname in  ("Ephraim","Manti","Gunnison",
"Mt. Pleasant","Fairview")
and tax > 0 and sicG in ("1Retail","Wholesale",
"Services","Manufacturing")
group by cityname, sicG, time, timecont, qtrpop;

*temple;
create table temple_total as
select cityname, time, timecont, log(sum(tax)) as ltax,
log(qtrpop) as lpop ,qtrpop
from taxspread_area2
group by cityname, time, timecont, qtrpop;
create table temple_industries as
select cityname, time, timecont, sicG, log(sum(tax)) as ltax,
log(qtrpop) as lpop, qtrpop
from taxspread_area2
where tax > 0 and sicG in ("1Retail","Wholesale","Services",
"Manufacturing")
group by cityname, sicG, time, timecont, qtrpop;
quit;
```

```
%model(area1);
* this is where I get the numbers for the main body of the paper;



* for sensitivity analysis;
%model(temple);
%model(geo);
%model(total6);
%model(comp);




* for Figure 1.3;

proc sql;
create table bycity as
select cityname, year, sum(tax) as TotalTax
from district.all_siccat
where area in (1)
group by cityname, year
order by cityname;
quit;
PROC EXPORT DATA= WORK.bycity
            OUTFILE= "&directory.\Output\bycity.csv"
            DBMS=CSV REPLACE;
     PUTNAMES=YES;
RUN;

* for Figure 1.4;
proc sql;
create table retailbycity as
select cityname, year, sum(tax) as TotalTax
from district.all_siccat
```

```
where area in (1) and sicG="1Retail"
group by cityname, year
order by cityname;
quit;
PROC EXPORT DATA= WORK.retailbycity
            OUTFILE= "&directory.\Output\Retailbycity.csv"
            DBMS=CSV REPLACE;
     PUTNAMES=YES;
RUN;




* output for model 2;

proc mixed data=area1_industries ;
class cityname sicG time ;
model ltax = time qtrpop sicG time*sicG/ s noint outpm=residuals
outpred=predicted_model2;
repeated / subject=cityname type=ar(1);
random cityname / s;
run;
PROC EXPORT DATA= WORK.PREDICTED_model2
            OUTFILE= "&directory.\Output\Model2Predicted.csv"
            DBMS=CSV REPLACE;
     PUTNAMES=YES;
RUN;


* Model 3;
proc sql;
create table area1_retail as
select cityname, time, timecont, sicG, log(sum(tax)) as ltax,
```

```
log(qtrpop) as lpop, qtrpop
from taxspread_area2
where  area = 1 and tax > 0 and sicG in ("1Retail") and
timecont >=11323 and timecont <=16345
group by cityname, sicG, time, timecont, qtrpop;

quit;
%macro model3(dataset);
title "By Retail, Area Definition: area1";
proc mixed data=&dataset. ;
class cityname time ;
model ltax = time qtrpop/  noint s vciry outpm=residuals_model3
outp=predicted_model3;
repeated / subject=cityname type=ar(1);
random cityname / s;
run;
%mend;
%model3(area1_retail);

PROC EXPORT DATA= WORK.PREDICTED_model3
            OUTFILE= "&directory.\Output\Model3Predicted.csv"
            DBMS=CSV REPLACE;
     PUTNAMES=YES;
RUN;



*creating tables for chapter 2;

proc sql;

create table industrytotal_area1 as
select sicG, sum(tax) as totalTax
from district.all_sicCat
```

```
where area in (1)
group by sicG
order by totalTax;

create table industrytotal_area2 as
select sicG, sum(tax) as totalTax
from district.all_sicCat
where area in (1,2)
group by sicG
order by totalTax;

quit;
proc sql;
create table industrytotal_areaCombined as
select a.sicG, a.totalTax as area1 format  dollar15.,
b.totalTax as area2 format dollar15.
from industrytotal_area1 a, industrytotal_area2 b
where a.sicG = b.sicG
order by area2;

quit;
proc sort data=industrytotal_areaCombined; by descending area1; run;
proc print data=industrytotal_areaCombined; run;



proc sql;
create table citysum2 as
select cityname, sum(tax) as Totaltax
from district.all_siccat
where area in (1)
group by cityname
order by cityname;
quit;
```

```
proc sql;
create table citysum as
select cityname, sicG, sum(tax) as tax
from district.all_siccat
where sicG in ('Services','Wholesale','1Retail','Manufacturing')
and area in (1)
group by cityname, sicG
order by cityname, sicG;
quit;
proc transpose data=citysum out=citytable (drop=_name_);
by cityname;
id sicG;
var tax;
run;
proc sql;
create table citysum3 as
select a.cityname, a._1Retail, a.manufacturing, a.services,
a.wholesale, b.totaltax
from citytable a, citysum2 b
where a.cityname=b.cityname;
quit;
proc sort data=citysum3 ; by descending total; run;
proc print data=citysum3 ; format _1retail dollar15. services dollar15.
wholesale dollar15. manufacturing dollar15. totaltax dollar15.; run;



* calculating the percentage of data for the top 4 industries;
data citysum4;
set citysum3;
top4 = _1Retail+ manufacturing+ services+ wholesale;
run;
```

```
proc sql;
create table citysum4 as
select sum(_1Retail, manufacturing, services, wholesale) as top4,
calculated top4/totaltax as percent ,totaltax
from citysum3;
create table citysum5 as
select sum(top4) as top4sum, sum(totaltax)as totalsum,
sum(top4)/sum(totaltax) as percent
from citysum4;
quit;
```

```
# R Code ##############################################################

# Compensation Estimation

# Expected Versus Actual

pred <- read.csv('Model3Predicted.csv',header=T)
# two options here: 'Model2Predicted.csv' or 'Model3Predicted.csv'

cityofchoice <- "Manti"
```

```
# expected values
pred.columns <- c(1,3,4,8)
city.pred <- pred[pred$cityname==cityofchoice & pred$sicG=="1Retail",pred.columns]
ephraim.pred <- pred[pred$cityname=="Ephraim" & pred$sicG=="1Retail",pred.columns]
p <- rbind(city.pred,ephraim.pred)
p$name <- p$cityname
names(p)[4] <- 'ltax'

# actual values
columns  <- c(1,3,4,5)
city <- pred[pred$cityname==cityofchoice & pred$sicG=="1Retail",columns]
ephraim <- pred[pred$cityname=="Ephraim" & pred$sicG=="1Retail",columns]
p2 <- rbind(city,ephraim)
p2$name <- paste(p2$cityname, "Estimated")

# combining predicted and actual
d <- rbind(p,p2)
d$name <- factor(d$name)

d$tax <- exp(d$ltax)

ggplot(d,aes(timecont,tax),group=name)  +
  geom_line(aes(color=name)) +
  geom_vline(xintercept=14610) +
  opts(title="Actual Versus Expected Retail Revenue") +
  opts(plot.title = theme_text(size = 25)) +
  xlab("Time")+
  ylab("Retail Tax Revenue") +
  scale_y_continuous(formatter=dollar) +
  scale_x_continuous(breaks=c(11323,12054,12784,13515,
  14245,14976,15706,16437),
      labels=c("1991","1993","1995","1997","1999","2001","2003","2005")) +
  scale_colour_hue("City")
```

```
# Estimate for Lost Revenue

pred.columns <- c(1,3,4,5,8,12,13)
pred$tax <- exp(pred$ltax)
pred$UL <- exp(pred$Upper)
pred$LL <- exp(pred$Lower)
pred$width <- (pred$UL-pred$LL)/2
pred$delta <- exp(pred$Pred)-pred$tax
pred$ymax <- pred$delta+pred$width
pred$ymin <- pred$delta-pred$width

# post Walmart predictions (why there is a time cutoff)
city.pred <- pred[pred$cityname==cityofchoice &
pred$sicG=="1Retail" & pred$timecont >=14610,]
ephraim.pred <- pred[pred$cityname=="Ephraim" &
pred$sicG=="1Retail" & pred$timecont >=14610,]


ggplot(city.pred,aes(timecont,delta),group=cityname)  +
  geom_ribbon(aes(ymin=ymin,ymax=ymax))+
  geom_line(aes(y=delta))  +
  geom_vline(xintercept=14610) +
  opts(title=paste("Revenue Lost in ",cityofchoice," Due to Walmart \n")) +
  opts(plot.title = theme_text(size = 25)) +
  xlab("Time")+
  ylab("Retail Tax Revenue") +
  scale_y_continuous(formatter=dollar) +
  scale_x_continuous(breaks=c(11323,12054,12784,13515,14245,
  14610,14976,15341,15706,16071,16437),
      labels=c("1991","1993","1995","1997","1999","2000",
      "2001","2002","2003","2004","2005"))
```

```
# calculating City's loss

sum(city.pred$delta)
sum(city.pred$delta)*100/.6

sum(city.pred$delta)+sum(city.pred$ymax)
sum(city.pred$delta)+sum(city.pred$ymin)
```

APPENDIX D

DATA SET

------------------------------------ Location=Aurora ----------------------------

Obs	Time	Tax	LogTax	Pop	LogPop
1	1991/1	5271.91	8.5701	917	6.82111
2	1991/2	5675.67	8.6439	919	6.82329
3	1991/3	5984.60	8.6969	920	6.82437
4	1991/4	8238.11	9.0165	921	6.82546
5	1992/1	11194.90	9.3232	923	6.82763
6	1992/2	10458.83	9.2552	924	6.82871
7	1992/3	10223.22	9.2324	925	6.82979
8	1992/4	11488.50	9.3491	927	6.83195
9	1993/1	10619.14	9.2704	928	6.83303
10	1993/2	12316.68	9.4187	929	6.83411
11	1993/3	11828.38	9.3783	930	6.83518
12	1993/4	11980.87	9.3911	932	6.83733
13	1994/1	13657.55	9.5220	933	6.83841
14	1994/2	12227.93	9.4115	934	6.83948
15	1994/3	12740.02	9.4525	935	6.84055
16	1994/4	11230.04	9.3263	936	6.84162
17	1995/1	11438.42	9.3447	937	6.84268
18	1995/2	12432.13	9.4280	938	6.84375
19	1995/3	12448.73	9.4294	939	6.84482
20	1995/4	11206.41	9.3242	939	6.84482
21	1996/1	13857.60	9.5366	940	6.84588
22	1996/2	14146.22	9.5572	941	6.84694
23	1996/3	14437.60	9.5776	942	6.84801
24	1996/4	14179.68	9.5596	942	6.84801

25	1997/1	13555.45	9.5145	943	6.84907
26	1997/2	14038.33	9.5495	943	6.84907
27	1997/3	14394.00	9.5746	943	6.84907
28	1997/4	13456.04	9.5072	944	6.85013
29	1998/1	15971.95	9.6786	944	6.85013
30	1998/2	16375.38	9.7035	944	6.85013
31	1998/3	15683.92	9.6604	944	6.85013
32	1998/4	18752.76	9.8391	944	6.85013
33	1999/1	18023.76	9.7994	944	6.85013
34	1999/2	18698.95	9.8362	944	6.85013
35	1999/3	19329.71	9.8694	944	6.85013
36	1999/4	21015.73	9.9530	943	6.84907
37	2000/1	20019.99	9.9045	943	6.84907
38	2000/2	20932.49	9.9491	943	6.84907
39	2000/3	19674.99	9.8871	946	6.85224
40	2000/4	20683.29	9.9371	941	6.84694
41	2001/1	20770.00	9.9413	940	6.84588
42	2001/2	19365.96	9.8713	940	6.84588
43	2001/3	19801.87	9.8935	942	6.84801
44	2001/4	20369.06	9.9218	938	6.84375
45	2002/1	21329.63	9.9679	937	6.84268
46	2002/2	22179.01	10.0069	936	6.84162
47	2002/3	25677.12	10.1534	940	6.84588
48	2002/4	24233.02	10.0955	934	6.83948
49	2003/1	24621.51	10.1114	933	6.83841
50	2003/2	24746.29	10.1164	933	6.83841
51	2003/3	27612.31	10.2260	930	6.83518
52	2003/4	26070.04	10.1685	931	6.83626
53	2004/1	30215.55	10.3161	931	6.83626
54	2004/2	33462.26	10.4182	931	6.83626
55	2004/3	29328.48	10.2863	933	6.83841
56	2004/4	29891.74	10.3053	931	6.83626

--------------------------------- Location=Centerfield ----------------------------

Obs	Time	Tax	LogTax	Pop	LogPop
57	1991/1	3862.69	8.2591	805	6.69084
58	1991/2	4772.15	8.4706	814	6.70196
59	1991/3	4553.59	8.4237	822	6.71174
60	1991/4	4200.70	8.3430	831	6.72263
61	1992/1	4561.04	8.4253	840	6.73340
62	1992/2	6469.95	8.7749	849	6.74406
63	1992/3	6097.83	8.7157	857	6.75344
64	1992/4	5082.01	8.5335	866	6.76388
65	1993/1	2697.24	7.9000	874	6.77308
66	1993/2	6178.94	8.7289	883	6.78333
67	1993/3	9000.10	9.1050	891	6.79234
68	1993/4	6297.19	8.7479	899	6.80128
69	1994/1	11211.16	9.3247	907	6.81014
70	1994/2	26559.49	10.1871	915	6.81892
71	1994/3	16610.01	9.7178	922	6.82655
72	1994/4	12919.44	9.4665	930	6.83518
73	1995/1	12712.64	9.4504	937	6.84268
74	1995/2	15870.93	9.6722	944	6.85013
75	1995/3	22082.07	10.0025	951	6.85751
76	1995/4	15698.37	9.6613	958	6.86485
77	1996/1	9898.38	9.2001	965	6.87213
78	1996/2	13746.60	9.5285	971	6.87833
79	1996/3	14612.25	9.5896	977	6.88449
80	1996/4	12589.00	9.4406	983	6.89061
81	1997/1	13623.98	9.5196	989	6.89669
82	1997/2	20410.22	9.9238	994	6.90174
83	1997/3	21324.61	9.9676	999	6.90675
84	1997/4	16642.22	9.7197	1004	6.91175
85	1998/1	17388.65	9.7636	1009	6.91672

86	1998/2	22636.98	10.0273	1013	6.92067
87	1998/3	21560.59	9.9786	1017	6.92461
88	1998/4	19934.43	9.9002	1020	6.92756
89	1999/1	15999.25	9.6803	1024	6.93147
90	1999/2	20082.65	9.9076	1027	6.93440
91	1999/3	20571.58	9.9317	1030	6.93731
92	1999/4	18117.33	9.8046	1032	6.93925
93	2000/1	20302.02	9.9185	1034	6.94119
94	2000/2	28054.51	10.2419	1036	6.94312
95	2000/3	32820.46	10.3988	1046	6.95273
96	2000/4	22249.88	10.0101	1038	6.94505
97	2001/1	17436.05	9.7663	1039	6.94601
98	2001/2	21120.99	9.9580	1039	6.94601
99	2001/3	20254.45	9.9161	1040	6.94698
100	2001/4	18325.01	9.8160	1040	6.94698
101	2002/1	18415.20	9.8209	1040	6.94698
102	2002/2	26010.95	10.1663	1040	6.94698
103	2002/3	22805.90	10.0348	1038	6.94505
104	2002/4	19481.78	9.8772	1040	6.94698
105	2003/1	18375.54	9.8188	1040	6.94698
106	2003/2	23185.60	10.0513	1039	6.94601
107	2003/3	26201.92	10.1736	1042	6.94890
108	2003/4	22255.04	10.0103	1040	6.94698
109	2004/1	18671.74	9.8348	1040	6.94698
110	2004/2	24714.15	10.1151	1041	6.94794
111	2004/3	22501.39	10.0213	1038	6.94505
112	2004/4	17595.58	9.7754	1042	6.94890

----------------------------------- Location=Ephraim ------------------------------

Obs	Time	Tax	LogTax	Pop	LogPop
113	1991/1	64104.99	11.0683	3522	8.16678

114	1991/2	66126.71	11.0993	3560	8.17752
115	1991/3	73188.06	11.2008	3597	8.18786
116	1991/4	69784.18	11.1532	3635	8.19836
117	1992/1	63775.27	11.0631	3673	8.20876
118	1992/2	67841.87	11.1249	3710	8.21879
119	1992/3	68290.91	11.1315	3747	8.22871
120	1992/4	69799.40	11.1534	3784	8.23854
121	1993/1	77125.04	11.2532	3821	8.24827
122	1993/2	83732.02	11.3354	3857	8.25764
123	1993/3	89409.75	11.4010	3893	8.26694
124	1993/4	94417.12	11.4555	3929	8.27614
125	1994/1	99118.93	11.5041	3964	8.28501
126	1994/2	104220.20	11.5543	3999	8.29380
127	1994/3	103228.41	11.5447	4034	8.30251
128	1994/4	107557.11	11.5858	4069	8.31115
129	1995/1	114361.19	11.6471	4102	8.31923
130	1995/2	114551.66	11.6488	4136	8.32748
131	1995/3	116941.69	11.6694	4169	8.33543
132	1995/4	119762.15	11.6933	4202	8.34332
133	1996/1	121428.49	11.7071	4234	8.35090
134	1996/2	122570.68	11.7164	4265	8.35820
135	1996/3	124899.79	11.7353	4296	8.36544
136	1996/4	126341.73	11.7467	4326	8.37240
137	1997/1	118442.24	11.6822	4356	8.37931
138	1997/2	132679.44	11.7957	4385	8.38594
139	1997/3	133165.74	11.7993	4414	8.39254
140	1997/4	132596.93	11.7951	4442	8.39886
141	1998/1	170795.57	12.0482	4469	8.40492
142	1998/2	185529.25	12.1310	4495	8.41072
143	1998/3	194266.45	12.1770	4521	8.41649
144	1998/4	202774.33	12.2198	4546	8.42200
145	1999/1	228143.39	12.3377	4570	8.42727
146	1999/2	226245.11	12.3294	4594	8.43251

147	1999/3	241281.68	12.3937	4616	8.43728
148	1999/4	243746.60	12.4039	4638	8.44204
149	2000/1	269960.79	12.5060	4659	8.44656
150	2000/2	281061.55	12.5463	4679	8.45084
151	2000/3	361214.98	12.7972	4582	8.42989
152	2000/4	401414.81	12.9028	4715	8.45850
153	2001/1	417263.85	12.9415	4731	8.46189
154	2001/2	427746.81	12.9663	4744	8.46464
155	2001/3	439805.66	12.9941	4894	8.49577
156	2001/4	459346.07	13.0376	4767	8.46947
157	2002/1	431606.52	12.9753	4776	8.47136
158	2002/2	455469.98	13.0291	4784	8.47303
159	2002/3	483415.46	13.0886	4837	8.48405
160	2002/4	486613.62	13.0952	4800	8.47637
161	2003/1	461350.09	13.0419	4808	8.47804
162	2003/2	486133.74	13.0942	4818	8.48011
163	2003/3	506877.01	13.1360	4740	8.46379
164	2003/4	514238.68	13.1504	4841	8.48488
165	2004/1	459547.70	13.0380	4855	8.48776
166	2004/2	488434.02	13.0990	4870	8.49085
167	2004/3	490739.67	13.1037	4746	8.46506
168	2004/4	507839.40	13.1379	4908	8.49862

---------------------------------- Location=Fairview ------------------------------

Obs	Time	Tax	LogTax	Pop	LogPop
169	1991/1	8923.00	9.0964	989	6.89669
170	1991/2	9943.27	9.2047	995	6.90274
171	1991/3	12483.05	9.4321	1002	6.90975
172	1991/4	11353.08	9.3372	1008	6.91572
173	1992/1	11026.47	9.3081	1015	6.92264
174	1992/2	11751.16	9.3717	1021	6.92854

175	1992/3	13340.70	9.4986	1027	6.93440
176	1992/4	13364.15	9.5003	1034	6.94119
177	1993/1	14796.19	9.6021	1040	6.94698
178	1993/2	15805.37	9.6681	1046	6.95273
179	1993/3	18063.98	9.8017	1052	6.95845
180	1993/4	19072.59	9.8560	1058	6.96414
181	1994/1	16272.29	9.6972	1064	6.96979
182	1994/2	17512.08	9.7706	1069	6.97448
183	1994/3	21185.12	9.9611	1075	6.98008
184	1994/4	19159.70	9.8606	1080	6.98472
185	1995/1	19407.44	9.8734	1086	6.99026
186	1995/2	19964.41	9.9017	1091	6.99485
187	1995/3	24799.72	10.1186	1096	6.99942
188	1995/4	24222.05	10.0950	1101	7.00397
189	1996/1	29878.75	10.3049	1105	7.00760
190	1996/2	32871.57	10.4004	1110	7.01212
191	1996/3	36563.64	10.5068	1114	7.01571
192	1996/4	33973.99	10.4334	1118	7.01930
193	1997/1	34279.12	10.4423	1122	7.02287
194	1997/2	38237.13	10.5516	1126	7.02643
195	1997/3	40173.59	10.6010	1130	7.02997
196	1997/4	37418.52	10.5299	1133	7.03262
197	1998/1	37274.05	10.5261	1136	7.03527
198	1998/2	41202.54	10.6263	1139	7.03791
199	1998/3	46863.60	10.7550	1142	7.04054
200	1998/4	43215.89	10.6740	1144	7.04229
201	1999/1	38070.31	10.5472	1146	7.04403
202	1999/2	41746.96	10.6394	1148	7.04578
203	1999/3	47729.06	10.7733	1150	7.04752
204	1999/4	44122.33	10.6947	1151	7.04839
205	2000/1	38858.81	10.5677	1152	7.04925
206	2000/2	43508.36	10.6807	1153	7.05012
207	2000/3	45917.86	10.7346	1163	7.05876

208	2000/4	43107.38	10.6714	1154	7.05099
209	2001/1	40835.35	10.6173	1154	7.05099
210	2001/2	44434.69	10.7018	1154	7.05099
211	2001/3	53825.14	10.8935	1155	7.05186
212	2001/4	43029.74	10.6696	1154	7.05099
213	2002/1	44354.16	10.7000	1154	7.05099
214	2002/2	47872.65	10.7763	1153	7.05012
215	2002/3	48955.42	10.7987	1152	7.04925
216	2002/4	42787.82	10.6640	1153	7.05012
217	2003/1	41104.94	10.6239	1152	7.04925
218	2003/2	45118.66	10.7171	1152	7.04925
219	2003/3	47231.72	10.7628	1156	7.05272
220	2003/4	44496.59	10.7032	1152	7.04925
221	2004/1	43427.67	10.6789	1152	7.04925
222	2004/2	48820.26	10.7959	1152	7.04925
223	2004/3	47690.07	10.7725	1150	7.04752
224	2004/4	42841.10	10.6653	1154	7.05099

----------------------------------- Location=Fayette ------------------------------

Obs	Time	Tax	LogTax	Pop	LogPop
225	1991/1	25.25	3.22869	186	5.22575
226	1991/2	25.25	3.22869	187	5.23111
227	1991/3	25.25	3.22869	187	5.23111
228	1991/4	126.23	4.83813	188	5.23644
229	1992/1	234.64	5.45807	189	5.24175
230	1992/2	292.36	5.67798	189	5.24175
231	1992/3	308.79	5.73267	190	5.24702
232	1992/4	378.87	5.93719	190	5.24702
233	1993/1	292.48	5.67840	191	5.25227
234	1993/2	271.04	5.60227	192	5.25750
235	1993/3	299.27	5.70134	192	5.25750

236	1993/4	184.05	5.21521	193	5.26269
237	1994/1	193.44	5.26498	193	5.26269
238	1994/2	405.66	6.00553	194	5.26786
239	1994/3	444.61	6.09720	195	5.27300
240	1994/4	184.92	5.21993	195	5.27300
241	1995/1	507.17	6.22885	196	5.27811
242	1995/2	479.07	6.17185	196	5.27811
243	1995/3	534.98	6.28223	197	5.28320
244	1995/4	223.44	5.40912	197	5.28320
245	1996/1	303.70	5.71605	198	5.28827
246	1996/2	268.86	5.59418	198	5.28827
247	1996/3	144.70	4.97465	198	5.28827
248	1996/4	118.22	4.77252	199	5.29330
249	1997/1	270.86	5.60160	199	5.29330
250	1997/2	604.63	6.40462	200	5.29832
251	1997/3	395.53	5.98022	200	5.29832
252	1997/4	655.60	6.48556	200	5.29832
253	1998/1	398.35	5.98734	200	5.29832
254	1998/2	681.37	6.52411	201	5.30330
255	1998/3	450.32	6.10995	201	5.30330
256	1998/4	247.74	5.51239	201	5.30330
257	1999/1	1656.16	7.41226	201	5.30330
258	1999/2	2549.87	7.84380	202	5.30827
259	1999/3	1486.04	7.30387	202	5.30827
260	1999/4	1492.99	7.30853	202	5.30827
261	2000/1	569.91	6.34548	202	5.30827
262	2000/2	826.54	6.71725	202	5.30827
263	2000/3	1142.15	7.04067	203	5.31321
264	2000/4	1154.12	7.05109	202	5.30827
265	2001/1	895.77	6.79769	202	5.30827
266	2001/2	688.21	6.53409	202	5.30827
267	2001/3	1021.45	6.92898	202	5.30827
268	2001/4	677.76	6.51879	201	5.30330

269	2002/1	1251.29	7.13193	201	5.30330
270	2002/2	1027.35	6.93474	201	5.30330
271	2002/3	1066.97	6.97258	201	5.30330
272	2002/4	907.11	6.81026	201	5.30330
273	2003/1	1452.14	7.28079	201	5.30330
274	2003/2	1740.56	7.46196	201	5.30330
275	2003/3	1758.40	7.47216	202	5.30827
276	2003/4	2783.91	7.93161	201	5.30330
277	2004/1	2226.44	7.70816	201	5.30330
278	2004/2	2871.10	7.96245	201	5.30330
279	2004/3	2234.01	7.71156	201	5.30330
280	2004/4	2357.19	7.76523	201	5.30330

------------------------------ Location=Fountain Green ---------------------------

Obs	Time	Tax	LogTax	Pop	LogPop
281	1991/1	1256.92	7.13642	628	6.44254
282	1991/2	1544.89	7.34271	640	6.46147
283	1991/3	2096.71	7.64813	651	6.47851
284	1991/4	1784.64	7.48697	663	6.49677
285	1992/1	2455.66	7.80615	674	6.51323
286	1992/2	2610.52	7.86731	686	6.53088
287	1992/3	3631.89	8.19751	697	6.54679
288	1992/4	2683.70	7.89495	708	6.56244
289	1993/1	2672.36	7.89072	719	6.57786
290	1993/2	3142.28	8.05270	730	6.59304
291	1993/3	3531.08	8.16936	741	6.60800
292	1993/4	3187.18	8.06689	751	6.62141
293	1994/1	3195.19	8.06940	762	6.63595
294	1994/2	4139.86	8.32842	772	6.64898
295	1994/3	4023.96	8.30002	782	6.66185
296	1994/4	3599.57	8.18857	791	6.67330

297	1995/1	4621.36	8.43844	801	6.68586
298	1995/2	5260.01	8.56789	810	6.69703
299	1995/3	5397.75	8.59374	819	6.70808
300	1995/4	4743.50	8.46453	828	6.71901
301	1996/1	4114.53	8.32228	837	6.72982
302	1996/2	4337.85	8.37513	845	6.73934
303	1996/3	5322.77	8.57975	853	6.74876
304	1996/4	4328.66	8.37301	861	6.75809
305	1997/1	4029.05	8.30129	868	6.76619
306	1997/2	4367.63	8.38198	875	6.77422
307	1997/3	4647.55	8.44409	882	6.78219
308	1997/4	4996.09	8.51641	888	6.78897
309	1998/1	4928.55	8.50280	894	6.79571
310	1998/2	4457.22	8.40228	899	6.80128
311	1998/3	5255.01	8.56694	905	6.80793
312	1998/4	4917.59	8.50057	909	6.81235
313	1999/1	4075.04	8.31264	914	6.81783
314	1999/2	5125.80	8.54204	918	6.82220
315	1999/3	5671.43	8.64320	921	6.82546
316	1999/4	4594.07	8.43252	924	6.82871
317	2000/1	4017.26	8.29836	927	6.83195
318	2000/2	5474.75	8.60790	929	6.83411
319	2000/3	5350.37	8.58492	942	6.84801
320	2000/4	4416.13	8.39302	932	6.83733
321	2001/1	4840.12	8.48469	933	6.83841
322	2001/2	5164.91	8.54964	934	6.83948
323	2001/3	5558.36	8.62306	935	6.84055
324	2001/4	5161.84	8.54905	935	6.84055
325	2002/1	5729.37	8.65336	935	6.84055
326	2002/2	6334.38	8.75375	935	6.84055
327	2002/3	5952.45	8.69156	932	6.83733
328	2002/4	5964.76	8.69362	934	6.83948
329	2003/1	8106.77	9.00045	934	6.83948

330	2003/2	8448.14	9.04170	934	6.83948
331	2003/3	10599.59	9.26857	935	6.84055
332	2003/4	9068.34	9.11254	934	6.83948
333	2004/1	10024.19	9.21276	934	6.83948
334	2004/2	9818.09	9.19198	934	6.83948
335	2004/3	7920.22	8.97717	931	6.83626
336	2004/4	8545.41	9.05315	935	6.84055

---------------------------------- Location=Gunnison ------------------------------

Obs	Time	Tax	LogTax	Pop	LogPop
337	1991/1	50560.09	10.8309	1425	7.26193
338	1991/2	57702.64	10.9631	1455	7.28276
339	1991/3	59446.26	10.9928	1486	7.30384
340	1991/4	55390.37	10.9222	1516	7.32383
341	1992/1	57707.88	10.9631	1546	7.34343
342	1992/2	62629.76	11.0450	1576	7.36265
343	1992/3	61346.86	11.0243	1605	7.38088
344	1992/4	63547.03	11.0595	1635	7.39940
345	1993/1	66340.67	11.1026	1664	7.41698
346	1993/2	78489.00	11.2707	1694	7.43485
347	1993/3	77157.64	11.2536	1723	7.45182
348	1993/4	75797.22	11.2358	1751	7.46794
349	1994/1	75151.84	11.2273	1780	7.48437
350	1994/2	82970.94	11.3262	1808	7.49998
351	1994/3	81437.40	11.3076	1836	7.51534
352	1994/4	84827.72	11.3484	1863	7.52994
353	1995/1	79553.09	11.2842	1891	7.54486
354	1995/2	86875.85	11.3722	1917	7.55852
355	1995/3	87862.94	11.3835	1944	7.57250
356	1995/4	86258.96	11.3651	1970	7.58579
357	1996/1	83264.63	11.3298	1996	7.59890

358	1996/2	87890.75	11.3838	2021	7.61135
359	1996/3	87704.00	11.3817	2046	7.62364
360	1996/4	87664.15	11.3813	2071	7.63579
361	1997/1	86842.45	11.3719	2095	7.64731
362	1997/2	97728.49	11.4899	2118	7.65823
363	1997/3	93106.35	11.4415	2141	7.66903
364	1997/4	94826.33	11.4598	2164	7.67971
365	1998/1	112368.25	11.6295	2186	7.68983
366	1998/2	126505.32	11.7480	2207	7.69939
367	1998/3	127305.64	11.7543	2228	7.70886
368	1998/4	121122.66	11.7046	2248	7.71780
369	1999/1	133038.58	11.7984	2268	7.72665
370	1999/2	158436.05	11.9731	2287	7.73500
371	1999/3	169877.90	12.0428	2305	7.74284
372	1999/4	155972.69	11.9574	2323	7.75061
373	2000/1	162143.49	11.9962	2340	7.75791
374	2000/2	173587.02	12.0644	2356	7.76472
375	2000/3	167241.01	12.0272	2389	7.77863
376	2000/4	159112.34	11.9774	2387	7.77779
377	2001/1	153356.47	11.9405	2403	7.78447
378	2001/2	177077.54	12.0843	2418	7.79070
379	2001/3	168427.61	12.0343	2383	7.77612
380	2001/4	164900.82	12.0131	2448	7.80303
381	2002/1	140438.48	11.8525	2463	7.80914
382	2002/2	145130.86	11.8854	2479	7.81561
383	2002/3	145875.25	11.8905	2440	7.79975
384	2002/4	136059.56	11.8208	2511	7.82844
385	2003/1	144415.35	11.8804	2527	7.83479
386	2003/2	150355.63	11.9208	2544	7.84149
387	2003/3	150877.56	11.9242	2501	7.82445
388	2003/4	155489.38	11.9543	2578	7.85477
389	2004/1	147521.72	11.9017	2594	7.86096
390	2004/2	151299.71	11.9270	2611	7.86749

391	2004/3	155959.04	11.9573	2652	7.88307
392	2004/4	144447.11	11.8807	2645	7.88043

------------------------------------ Location=Manti -------------------------------

Obs	Time	Tax	LogTax	Pop	LogPop
393	1991/1	29867.67	10.3045	2362	7.76726
394	1991/2	32143.87	10.3780	2385	7.77695
395	1991/3	33751.49	10.4268	2407	7.78614
396	1991/4	32877.47	10.4005	2429	7.79523
397	1992/1	33410.82	10.4166	2451	7.80425
398	1992/2	36674.39	10.5098	2473	7.81319
399	1992/3	38412.92	10.5561	2495	7.82204
400	1992/4	36685.57	10.5101	2516	7.83043
401	1993/1	42786.34	10.6640	2538	7.83913
402	1993/2	47363.24	10.7656	2559	7.84737
403	1993/3	49893.00	10.8176	2580	7.85554
404	1993/4	47861.60	10.7761	2601	7.86365
405	1994/1	44161.14	10.6956	2622	7.87169
406	1994/2	47310.07	10.7645	2642	7.87929
407	1994/3	45365.90	10.7225	2662	7.88683
408	1994/4	45749.80	10.7309	2682	7.89432
409	1995/1	41539.40	10.6344	2702	7.90175
410	1995/2	45469.83	10.7248	2721	7.90875
411	1995/3	48233.69	10.7838	2740	7.91571
412	1995/4	44000.59	10.6920	2759	7.92262
413	1996/1	43050.44	10.6701	2777	7.92913
414	1996/2	47819.73	10.7752	2795	7.93559
415	1996/3	50719.79	10.8341	2813	7.94201
416	1996/4	48036.83	10.7797	2830	7.94803
417	1997/1	48851.18	10.7965	2846	7.95367
418	1997/2	54935.68	10.9139	2863	7.95963

419	1997/3	53449.16	10.8865	2879	7.96520
420	1997/4	52350.62	10.8657	2894	7.97039
421	1998/1	57248.41	10.9552	2909	7.97556
422	1998/2	63464.92	11.0582	2923	7.98037
423	1998/3	65594.51	11.0912	2937	7.98514
424	1998/4	65587.65	11.0911	2951	7.98990
425	1999/1	66270.76	11.1015	2964	7.99429
426	1999/2	73567.48	11.2060	2976	7.99834
427	1999/3	70202.11	11.1591	2988	8.00236
428	1999/4	69230.65	11.1452	2999	8.00603
429	2000/1	64788.10	11.0789	3010	8.00970
430	2000/2	79371.94	11.2819	3019	8.01268
431	2000/3	72973.98	11.1979	3031	8.01665
432	2000/4	69968.43	11.1558	3038	8.01895
433	2001/1	71706.08	11.1803	3046	8.02158
434	2001/2	81257.85	11.3054	3055	8.02453
435	2001/3	73548.74	11.2057	3044	8.02093
436	2001/4	73774.39	11.2088	3070	8.02943
437	2002/1	59196.94	10.9886	3077	8.03171
438	2002/2	71922.22	11.1833	3084	8.03398
439	2002/3	66950.29	11.1117	3064	8.02748
440	2002/4	66156.18	11.0998	3098	8.03851
441	2003/1	71147.97	11.1725	3105	8.04077
442	2003/2	79898.41	11.2885	3111	8.04270
443	2003/3	81393.02	11.3070	3114	8.04366
444	2003/4	80216.52	11.2925	3124	8.04687
445	2004/1	69777.78	11.1531	3130	8.04879
446	2004/2	80128.89	11.2914	3136	8.05070
447	2004/3	67479.87	11.1196	3152	8.05579
448	2004/4	62149.40	11.0373	3149	8.05484

----------------------------------- Location=Mayfield -------------------------------

Obs	Time	Tax	LogTax	Pop	LogPop
449	1991/1	326.36	5.78800	437	6.07993
450	1991/2	293.29	5.68116	436	6.07764
451	1991/3	354.93	5.87192	436	6.07764
452	1991/4	307.58	5.72873	436	6.07764
453	1992/1	623.07	6.43466	435	6.07535
454	1992/2	997.63	6.90538	435	6.07535
455	1992/3	1152.82	7.04997	435	6.07535
456	1992/4	1138.84	7.03777	435	6.07535
457	1993/1	1823.29	7.50840	434	6.07304
458	1993/2	1710.13	7.44433	434	6.07304
459	1993/3	1497.55	7.31158	434	6.07304
460	1993/4	1454.01	7.28208	433	6.07074
461	1994/1	1124.04	7.02469	433	6.07074
462	1994/2	1379.93	7.22979	433	6.07074
463	1994/3	1435.96	7.26959	432	6.06843
464	1994/4	1043.22	6.95007	432	6.06843
465	1995/1	1577.49	7.36359	432	6.06843
466	1995/2	1839.95	7.51749	431	6.06611
467	1995/3	1946.90	7.57400	431	6.06611
468	1995/4	1924.64	7.56249	431	6.06611
469	1996/1	2073.14	7.63682	430	6.06379
470	1996/2	1905.10	7.55229	430	6.06379
471	1996/3	2337.57	7.75687	429	6.06146
472	1996/4	2180.59	7.68735	429	6.06146
473	1997/1	1993.32	7.59756	429	6.06146
474	1997/2	2227.28	7.70854	428	6.05912
475	1997/3	2735.62	7.91411	428	6.05912
476	1997/4	2289.24	7.73598	428	6.05912
477	1998/1	2528.51	7.83538	427	6.05678
478	1998/2	2669.24	7.88955	427	6.05678
479	1998/3	3050.75	8.02314	427	6.05678

480	1998/4	2542.39	7.84086	426	6.05444
481	1999/1	2653.40	7.88360	426	6.05444
482	1999/2	2895.26	7.97083	425	6.05209
483	1999/3	3177.19	8.06375	425	6.05209
484	1999/4	2587.36	7.85839	425	6.05209
485	2000/1	2309.03	7.74458	424	6.04973
486	2000/2	2871.79	7.96269	424	6.04973
487	2000/3	2601.96	7.86402	426	6.05444
488	2000/4	2604.31	7.86492	423	6.04737
489	2001/1	2722.92	7.90946	423	6.04737
490	2001/2	2954.84	7.99120	422	6.04501
491	2001/3	3523.57	8.16723	422	6.04501
492	2001/4	2967.60	7.99551	422	6.04501
493	2002/1	3949.11	8.28124	421	6.04263
494	2002/2	2649.75	7.88222	421	6.04263
495	2002/3	3179.56	8.06450	421	6.04263
496	2002/4	2311.97	7.74586	421	6.04263
497	2003/1	3046.65	8.02180	421	6.04263
498	2003/2	3157.95	8.05768	421	6.04263
499	2003/3	3064.44	8.02762	422	6.04501
500	2003/4	3490.38	8.15777	421	6.04263
501	2004/1	3296.80	8.10071	421	6.04263
502	2004/2	3231.79	8.08079	421	6.04263
503	2004/3	2978.91	7.99931	421	6.04263
504	2004/4	2942.04	7.98686	421	6.04263

---------------------------------- Location=Moroni ------------------------------

Obs	Time	Tax	LogTax	Pop	LogPop
505	1991/1	8104.35	9.0002	1138	7.03703
506	1991/2	9112.69	9.1174	1144	7.04229
507	1991/3	8242.30	9.0170	1149	7.04665

508	1991/4	9710.74	9.1810	1154	7.05099
509	1992/1	9053.21	9.1109	1159	7.05531
510	1992/2	9082.53	9.1141	1164	7.05962
511	1992/3	8692.84	9.0703	1170	7.06476
512	1992/4	9510.81	9.1602	1175	7.06902
513	1993/1	10206.90	9.2308	1180	7.07327
514	1993/2	10427.87	9.2522	1184	7.07665
515	1993/3	10185.94	9.2288	1189	7.08087
516	1993/4	10899.24	9.2964	1194	7.08506
517	1994/1	11817.17	9.3773	1199	7.08924
518	1994/2	11151.97	9.3194	1203	7.09257
519	1994/3	13134.78	9.4830	1208	7.09672
520	1994/4	12862.30	9.4621	1212	7.10003
521	1995/1	14285.95	9.5670	1216	7.10332
522	1995/2	14533.21	9.5842	1220	7.10661
523	1995/3	15942.88	9.6768	1224	7.10988
524	1995/4	16667.96	9.7212	1228	7.11314
525	1996/1	16562.95	9.7149	1232	7.11639
526	1996/2	16197.83	9.6926	1235	7.11883
527	1996/3	19889.82	9.8980	1239	7.12206
528	1996/4	17320.88	9.7597	1242	7.12448
529	1997/1	18418.21	9.8211	1245	7.12689
530	1997/2	18825.05	9.8429	1248	7.12930
531	1997/3	19652.14	9.8859	1251	7.13170
532	1997/4	20800.52	9.9427	1253	7.13330
533	1998/1	23994.00	10.0856	1256	7.13569
534	1998/2	25494.29	10.1462	1258	7.13728
535	1998/3	30523.08	10.3262	1260	7.13887
536	1998/4	27018.65	10.2043	1262	7.14045
537	1999/1	26778.62	10.1954	1263	7.14125
538	1999/2	29246.56	10.2835	1264	7.14204
539	1999/3	29172.02	10.2810	1266	7.14362
540	1999/4	28835.02	10.2693	1266	7.14362

541	2000/1	28377.58	10.2534	1267	7.14441
542	2000/2	26503.28	10.1850	1267	7.14441
543	2000/3	28756.97	10.2666	1277	7.15227
544	2000/4	27685.46	10.2287	1268	7.14520
545	2001/1	33902.64	10.4312	1267	7.14441
546	2001/2	31750.78	10.3657	1267	7.14441
547	2001/3	32283.51	10.3823	1268	7.14520
548	2001/4	32753.31	10.3968	1266	7.14362
549	2002/1	27927.13	10.2374	1266	7.14362
550	2002/2	27789.04	10.2324	1265	7.14283
551	2002/3	29364.26	10.2875	1264	7.14204
552	2002/4	29950.74	10.3073	1264	7.14204
553	2003/1	32740.90	10.3964	1264	7.14204
554	2003/2	33239.35	10.4115	1263	7.14125
555	2003/3	32627.14	10.3929	1268	7.14520
556	2003/4	38976.90	10.5707	1263	7.14125
557	2004/1	39746.13	10.5903	1263	7.14125
558	2004/2	36758.61	10.5121	1264	7.14204
559	2004/3	31124.26	10.3457	1262	7.14045
560	2004/4	32320.72	10.3835	1266	7.14362

-------------------------------- Location=Mt. Pleasant ----------------------------

Obs	Time	Tax	LogTax	Pop	LogPop
561	1991/1	48822.30	10.7959	2177	7.68570
562	1991/2	52801.35	10.8743	2197	7.69485
563	1991/3	56787.62	10.9471	2216	7.70346
564	1991/4	53106.06	10.8800	2235	7.71200
565	1992/1	55032.67	10.9157	2255	7.72091
566	1992/2	62688.25	11.0459	2274	7.72930
567	1992/3	62349.32	11.0405	2293	7.73762
568	1992/4	63241.43	11.0547	2311	7.74544

569	1993/1	58158.50	10.9709	2330	7.75362
570	1993/2	63807.29	11.0636	2348	7.76132
571	1993/3	68081.77	11.1285	2366	7.76896
572	1993/4	65567.67	11.0908	2384	7.77654
573	1994/1	62441.21	11.0420	2401	7.78364
574	1994/2	67371.46	11.1180	2418	7.79070
575	1994/3	69485.66	11.1489	2435	7.79770
576	1994/4	67286.11	11.1167	2451	7.80425
577	1995/1	71996.63	11.1844	2467	7.81076
578	1995/2	78232.05	11.2674	2483	7.81722
579	1995/3	81224.89	11.3050	2498	7.82325
580	1995/4	81302.34	11.3059	2512	7.82883
581	1996/1	82371.37	11.3190	2527	7.83479
582	1996/2	87352.80	11.3777	2540	7.83992
583	1996/3	92575.39	11.4358	2553	7.84502
584	1996/4	90121.61	11.4089	2566	7.85010
585	1997/1	87894.84	11.3839	2578	7.85477
586	1997/2	94703.98	11.4585	2590	7.85941
587	1997/3	98438.07	11.4972	2601	7.86365
588	1997/4	96948.08	11.4819	2611	7.86749
589	1998/1	113126.36	11.6363	2621	7.87131
590	1998/2	127692.72	11.7574	2630	7.87474
591	1998/3	134383.36	11.8085	2638	7.87778
592	1998/4	128715.41	11.7654	2646	7.88080
593	1999/1	122457.10	11.7155	2653	7.88345
594	1999/2	134304.25	11.8079	2659	7.88571
595	1999/3	138396.73	11.8379	2665	7.88796
596	1999/4	141117.28	11.8573	2669	7.88946
597	2000/1	132414.31	11.7937	2673	7.89096
598	2000/2	148176.72	11.9062	2676	7.89208
599	2000/3	144733.28	11.8826	2702	7.90175
600	2000/4	135195.77	11.8145	2680	7.89357
601	2001/1	125642.01	11.7412	2682	7.89432

602	2001/2	135896.26	11.8196	2682	7.89432
603	2001/3	140441.61	11.8525	2684	7.89506
604	2001/4	134427.90	11.8088	2682	7.89432
605	2002/1	124253.66	11.7301	2682	7.89432
606	2002/2	137075.04	11.8283	2682	7.89432
607	2002/3	142810.47	11.8693	2677	7.89245
608	2002/4	135974.02	11.8202	2680	7.89357
609	2003/1	141815.58	11.8623	2680	7.89357
610	2003/2	155051.63	11.9515	2679	7.89320
611	2003/3	157270.03	11.9657	2687	7.89618
612	2003/4	151169.63	11.9262	2679	7.89320
613	2004/1	137342.54	11.8302	2680	7.89357
614	2004/2	144761.16	11.8828	2681	7.89395
615	2004/3	133252.13	11.8000	2675	7.89170
616	2004/4	128117.94	11.7607	2685	7.89544

------------------------------------ Location=Nephi --------------------------------

Obs	Time	Tax	LogTax	Pop	LogPop
617	1991/1	106816.28	11.5789	3669	8.20767
618	1991/2	115329.17	11.6555	3705	8.21744
619	1991/3	124803.70	11.7345	3741	8.22711
620	1991/4	114242.90	11.6461	3777	8.23669
621	1992/1	114292.89	11.6465	3813	8.24617
622	1992/2	119129.42	11.6880	3849	8.25557
623	1992/3	128017.79	11.7599	3884	8.26462
624	1992/4	115911.76	11.6606	3920	8.27385
625	1993/1	115912.61	11.6606	3955	8.28274
626	1993/2	137398.67	11.8306	3989	8.29130
627	1993/3	137248.44	11.8295	4023	8.29978
628	1993/4	130243.36	11.7772	4057	8.30820
629	1994/1	137115.05	11.8286	4091	8.31654

630	1994/2	157611.00	11.9679	4124	8.32458
631	1994/3	156976.14	11.9638	4157	8.33255
632	1994/4	148250.72	11.9067	4189	8.34022
633	1995/1	149983.38	11.9183	4220	8.34759
634	1995/2	168594.24	12.0353	4252	8.35514
635	1995/3	177143.79	12.0847	4282	8.36218
636	1995/4	164331.90	12.0096	4312	8.36916
637	1996/1	180446.77	12.1032	4342	8.37609
638	1996/2	193878.61	12.1750	4371	8.38275
639	1996/3	197498.41	12.1935	4399	8.38913
640	1996/4	190092.68	12.1553	4426	8.39525
641	1997/1	181341.17	12.1081	4453	8.40133
642	1997/2	202335.13	12.2177	4479	8.40716
643	1997/3	203307.34	12.2225	4504	8.41272
644	1997/4	199942.56	12.2058	4529	8.41826
645	1998/1	298988.15	12.6082	4553	8.42354
646	1998/2	328061.93	12.7010	4576	8.42858
647	1998/3	345785.10	12.7536	4598	8.43338
648	1998/4	321927.89	12.6821	4619	8.43793
649	1999/1	331293.37	12.7108	4639	8.44225
650	1999/2	358833.81	12.7906	4658	8.44634
651	1999/3	364597.42	12.8065	4677	8.45041
652	1999/4	341947.86	12.7424	4694	8.45404
653	2000/1	342731.96	12.7447	4710	8.45744
654	2000/2	366139.97	12.8108	4726	8.46083
655	2000/3	375372.95	12.8357	4745	8.46485
656	2000/4	352774.00	12.7736	4754	8.46674
657	2001/1	361040.93	12.7967	4766	8.46926
658	2001/2	390617.21	12.8755	4779	8.47199
659	2001/3	386953.15	12.8661	4783	8.47282
660	2001/4	365908.87	12.8101	4801	8.47658
661	2002/1	374189.17	12.8325	4812	8.47887
662	2002/2	400270.54	12.8999	4823	8.48115

663	2002/3	427031.36	12.9646	4818	8.48011
664	2002/4	396707.63	12.8910	4846	8.48591
665	2003/1	355939.80	12.7825	4857	8.48818
666	2003/2	372803.65	12.8288	4870	8.49085
667	2003/3	376462.11	12.8386	4853	8.48735
668	2003/4	355018.78	12.7799	4897	8.49638
669	2004/1	376779.98	12.8394	4912	8.49944
670	2004/2	408920.97	12.9213	4928	8.50269
671	2004/3	405896.70	12.9139	4911	8.49923
672	2004/4	386824.83	12.8657	4965	8.51017

----------------------------------- Location=Redmond ------------------------------

Obs	Time	Tax	LogTax	Pop	LogPop
673	1991/1	3062.53	8.0270	668	6.50429
674	1991/2	3634.77	8.1983	672	6.51026
675	1991/3	6737.14	8.8154	677	6.51767
676	1991/4	5938.93	8.6893	681	6.52356
677	1992/1	4675.57	8.4501	686	6.53088
678	1992/2	6715.51	8.8122	690	6.53669
679	1992/3	8223.76	9.0148	695	6.54391
680	1992/4	5626.12	8.6352	699	6.54965
681	1993/1	6838.28	8.8303	703	6.55536
682	1993/2	12777.95	9.4555	707	6.56103
683	1993/3	15883.73	9.6731	712	6.56808
684	1993/4	9562.12	9.1656	716	6.57368
685	1994/1	6506.62	8.7806	720	6.57925
686	1994/2	10715.40	9.2794	724	6.58479
687	1994/3	12253.16	9.4135	728	6.59030
688	1994/4	8154.99	9.0064	731	6.59441
689	1995/1	7260.91	8.8903	735	6.59987
690	1995/2	8374.09	9.0329	739	6.60530

691	1995/3	13085.74	9.4793	742	6.60935
692	1995/4	8148.91	9.0056	745	6.61338
693	1996/1	12387.29	9.4244	749	6.61874
694	1996/2	9982.23	9.2086	752	6.62274
695	1996/3	13564.67	9.5152	755	6.62672
696	1996/4	13757.94	9.5294	758	6.63068
697	1997/1	7072.99	8.8640	760	6.63332
698	1997/2	10165.62	9.2268	763	6.63726
699	1997/3	9462.88	9.1551	765	6.63988
700	1997/4	10474.50	9.2567	768	6.64379
701	1998/1	11070.86	9.3121	770	6.64639
702	1998/2	13875.57	9.5379	772	6.64898
703	1998/3	16589.27	9.7165	774	6.65157
704	1998/4	14001.17	9.5469	775	6.65286
705	1999/1	10078.75	9.2182	777	6.65544
706	1999/2	14954.46	9.6128	778	6.65673
707	1999/3	14923.59	9.6107	779	6.65801
708	1999/4	14819.84	9.6037	780	6.65929
709	2000/1	17483.89	9.7690	781	6.66058
710	2000/2	21133.94	9.9586	781	6.66058
711	2000/3	31614.92	10.3614	787	6.66823
712	2000/4	18655.39	9.8339	782	6.66185
713	2001/1	12839.06	9.4602	782	6.66185
714	2001/2	18246.21	9.8117	782	6.66185
715	2001/3	22703.29	10.0303	785	6.66568
716	2001/4	17198.20	9.7526	782	6.66185
717	2002/1	10990.87	9.3048	781	6.66058
718	2002/2	18444.13	9.8225	781	6.66058
719	2002/3	13484.02	9.5093	783	6.66313
720	2002/4	14365.45	9.5726	780	6.65929
721	2003/1	12233.04	9.4119	780	6.65929
722	2003/2	15171.80	9.6272	780	6.65929
723	2003/3	17226.47	9.7542	774	6.65157

724	2003/4	15623.49	9.6565	780	6.65929
725	2004/1	16350.69	9.7020	780	6.65929
726	2004/2	26199.46	10.1735	780	6.65929
727	2004/3	26038.97	10.1673	782	6.66185
728	2004/4	18253.43	9.8121	782	6.66185

------------------------------------ Location=Salina --------------------------------

Obs	Time	Tax	LogTax	Pop	LogPop
729	1991/1	76951.27	11.2509	2008	7.60489
730	1991/2	86763.97	11.3709	2023	7.61234
731	1991/3	90146.17	11.4092	2038	7.61972
732	1991/4	82622.63	11.3220	2053	7.62706
733	1992/1	74963.52	11.2248	2067	7.63385
734	1992/2	86476.73	11.3676	2082	7.64108
735	1992/3	92288.13	11.4327	2096	7.64779
736	1992/4	88104.57	11.3863	2111	7.65492
737	1993/1	83412.75	11.3316	2125	7.66153
738	1993/2	98314.98	11.4959	2139	7.66809
739	1993/3	103810.30	11.5503	2152	7.67415
740	1993/4	93798.41	11.4489	2166	7.68064
741	1994/1	97728.43	11.4899	2179	7.68662
742	1994/2	113932.15	11.6434	2192	7.69257
743	1994/3	118241.46	11.6805	2204	7.69803
744	1994/4	102006.33	11.5328	2217	7.70391
745	1995/1	92736.28	11.4375	2229	7.70931
746	1995/2	105309.65	11.5647	2240	7.71423
747	1995/3	115050.43	11.6531	2252	7.71957
748	1995/4	99381.48	11.5067	2263	7.72445
749	1996/1	95507.78	11.4670	2273	7.72886
750	1996/2	108780.81	11.5971	2283	7.73325
751	1996/3	112136.70	11.6275	2293	7.73762

752	1996/4	100406.27	11.5170	2302	7.74153
753	1997/1	114820.54	11.6511	2311	7.74544
754	1997/2	130307.65	11.7777	2320	7.74932
755	1997/3	140589.60	11.8536	2328	7.75276
756	1997/4	125374.50	11.7391	2335	7.75577
757	1998/1	146468.25	11.8946	2342	7.75876
758	1998/2	177984.27	12.0895	2349	7.76174
759	1998/3	189145.40	12.1503	2354	7.76387
760	1998/4	186493.15	12.1361	2360	7.76642
761	1999/1	198389.85	12.1980	2365	7.76853
762	1999/2	218139.11	12.2929	2369	7.77022
763	1999/3	224768.10	12.3228	2372	7.77149
764	1999/4	222067.76	12.3107	2375	7.77275
765	2000/1	213867.49	12.2731	2377	7.77359
766	2000/2	230685.73	12.3488	2379	7.77444
767	2000/3	243578.61	12.4032	2395	7.78114
768	2000/4	221049.31	12.3061	2380	7.77486
769	2001/1	218829.15	12.2960	2380	7.77486
770	2001/2	237998.07	12.3800	2380	7.77486
771	2001/3	265344.13	12.4888	2387	7.77779
772	2001/4	238288.33	12.3812	2377	7.77359
773	2002/1	238010.93	12.3801	2376	7.77317
774	2002/2	259943.49	12.4682	2374	7.77233
775	2002/3	277206.95	12.5325	2381	7.77528
776	2002/4	266424.84	12.4928	2370	7.77065
777	2003/1	223245.10	12.3160	2368	7.76980
778	2003/2	245918.31	12.4128	2366	7.76896
779	2003/3	260707.67	12.4712	2357	7.76514
780	2003/4	244124.54	12.4054	2363	7.76769
781	2004/1	240852.95	12.3919	2362	7.76726
782	2004/2	238725.70	12.3831	2361	7.76684
783	2004/3	234684.96	12.3660	2363	7.76769
784	2004/4	225471.96	12.3260	2360	7.76642

------------------------------ Location=Sanpete County ---------------------------

Obs	Time	Tax	LogTax	Pop	LogPop
785	1991/1	33341.98	10.4146	2346	7.76047
786	1991/2	36676.88	10.5099	2388	7.77821
787	1991/3	33912.48	10.4315	2430	7.79565
788	1991/4	31409.52	10.3549	2472	7.81278
789	1992/1	25257.33	10.1369	2514	7.82963
790	1992/2	29375.57	10.2879	2555	7.84581
791	1992/3	24904.15	10.1228	2597	7.86211
792	1992/4	25848.21	10.1600	2638	7.87778
793	1993/1	18353.21	9.8176	2678	7.89283
794	1993/2	22374.65	10.0157	2719	7.90802
795	1993/3	24597.76	10.1104	2759	7.92262
796	1993/4	25336.54	10.1400	2798	7.93666
797	1994/1	25717.69	10.1549	2837	7.95050
798	1994/2	25457.94	10.1448	2876	7.96416
799	1994/3	29739.47	10.3002	2915	7.97763
800	1994/4	29330.67	10.2864	2952	7.99024
801	1995/1	23344.88	10.0581	2990	8.00303
802	1995/2	27073.33	10.2063	3027	8.01533
803	1995/3	29831.39	10.3033	3063	8.02715
804	1995/4	26946.01	10.2016	3098	8.03851
805	1996/1	29265.96	10.2842	3133	8.04975
806	1996/2	31388.49	10.3542	3168	8.06086
807	1996/3	34616.73	10.4521	3201	8.07122
808	1996/4	33102.88	10.4074	3234	8.08148
809	1997/1	32889.83	10.4009	3267	8.09163
810	1997/2	36735.05	10.5115	3298	8.10107
811	1997/3	41221.91	10.6267	3329	8.11043
812	1997/4	37480.61	10.5316	3359	8.11940

813	1998/1	64935.25	11.0811	3388	8.12800
814	1998/2	76711.28	11.2478	3416	8.13623
815	1998/3	80081.51	11.2908	3444	8.14439
816	1998/4	77418.24	11.2570	3470	8.15191
817	1999/1	65259.44	11.0861	3496	8.15937
818	1999/2	65051.66	11.0829	3520	8.16622
819	1999/3	66423.24	11.1038	3544	8.17301
820	1999/4	70096.76	11.1576	3566	8.17920
821	2000/1	69489.63	11.1489	3588	8.18535
822	2000/2	66943.19	11.1116	3608	8.19091
823	2000/3	67514.66	11.1201	3608	8.19091
824	2000/4	66921.12	11.1113	3646	8.20139
825	2001/1	61803.46	11.0317	3663	8.20604
826	2001/2	69200.36	11.1448	3680	8.21067
827	2001/3	73121.13	11.1999	3672	8.20849
828	2001/4	68750.89	11.1382	3710	8.21879
829	2002/1	58022.81	10.9686	3725	8.22282
830	2002/2	67865.10	11.1253	3738	8.22631
831	2002/3	68936.53	11.1409	3747	8.22871
832	2002/4	65877.71	11.0956	3764	8.23324
833	2003/1	92256.36	11.4323	3777	8.23669
834	2003/2	94429.41	11.4556	3790	8.24012
835	2003/3	99474.92	11.5077	3800	8.24276
836	2003/4	97822.18	11.4909	3816	8.24696
837	2004/1	103583.97	11.5481	3830	8.25062
838	2004/2	112588.21	11.6315	3845	8.25453
839	2004/3	162280.35	11.9971	3810	8.24538
840	2004/4	159098.59	11.9773	3879	8.26333

--------------------------------- Location=Sevier County ----------------------------

Obs	Time	Tax	LogTax	Pop	LogPop

841	1991/1	71375.19	11.1757	2526	7.83439
842	1991/2	88278.16	11.3882	2534	7.83755
843	1991/3	89381.86	11.4007	2542	7.84071
844	1991/4	63023.26	11.0513	2549	7.84346
845	1992/1	44731.35	10.7084	2557	7.84659
846	1992/2	52180.16	10.8625	2565	7.84971
847	1992/3	45294.77	10.7209	2573	7.85283
848	1992/4	39817.42	10.5921	2581	7.85593
849	1993/1	31756.97	10.3659	2589	7.85903
850	1993/2	41964.87	10.6446	2597	7.86211
851	1993/3	46760.70	10.7528	2606	7.86557
852	1993/4	42356.21	10.6539	2614	7.86864
853	1994/1	42812.13	10.6646	2623	7.87207
854	1994/2	51623.42	10.8517	2632	7.87550
855	1994/3	60854.61	11.0162	2641	7.87891
856	1994/4	44991.33	10.7142	2650	7.88231
857	1995/1	99489.39	11.5078	2659	7.88571
858	1995/2	66013.12	11.0976	2669	7.88946
859	1995/3	74501.11	11.2186	2678	7.89283
860	1995/4	65937.51	11.0965	2688	7.89655
861	1996/1	51952.88	10.8581	2698	7.90027
862	1996/2	67186.74	11.1152	2709	7.90433
863	1996/3	61568.12	11.0279	2719	7.90802
864	1996/4	49329.32	10.8063	2730	7.91206
865	1997/1	43787.86	10.6871	2741	7.91608
866	1997/2	50960.02	10.8388	2753	7.92045
867	1997/3	60428.33	11.0092	2765	7.92480
868	1997/4	56176.51	10.9363	2777	7.92913
869	1998/1	913277.57	13.7248	2789	7.93344
870	1998/2	257718.52	12.4596	2801	7.93773
871	1998/3	265737.71	12.4903	2814	7.94236
872	1998/4	254220.53	12.4460	2828	7.94733
873	1999/1	124125.06	11.7290	2841	7.95191

874	1999/2	137884.36	11.8342	2855	7.95683
875	1999/3	140315.59	11.8516	2870	7.96207
876	1999/4	120502.30	11.6994	2884	7.96693
877	2000/1	95320.93	11.4650	2899	7.97212
878	2000/2	127822.30	11.7584	2915	7.97763
879	2000/3	121243.12	11.7056	2878	7.96485
880	2000/4	99191.39	11.5048	2946	7.98820
881	2001/1	103714.99	11.5494	2963	7.99396
882	2001/2	121803.49	11.7102	2979	7.99934
883	2001/3	129738.00	11.7733	2971	7.99665
884	2001/4	98594.80	11.4988	3012	8.01036
885	2002/1	100753.88	11.5204	3029	8.01599
886	2002/2	128211.31	11.7614	3045	8.02126
887	2002/3	140179.86	11.8507	3053	8.02388
888	2002/4	114760.62	11.6506	3078	8.03204
889	2003/1	124857.06	11.7349	3095	8.03754
890	2003/2	134481.34	11.8092	3112	8.04302
891	2003/3	140058.87	11.8498	3099	8.03883
892	2003/4	128070.70	11.7603	3147	8.05420
893	2004/1	137831.39	11.8338	3165	8.05991
894	2004/2	130963.69	11.7827	3184	8.06589
895	2004/3	192366.52	12.1672	3159	8.05801
896	2004/4	184130.91	12.1234	3222	8.07776

---------------------------------- Location=Spring City -----------------------------

Obs	Time	Tax	LogTax	Pop	LogPop
897	1991/1	1659.06	7.41400	744	6.61204
898	1991/2	1612.54	7.38556	751	6.62141
899	1991/3	1516.06	7.32387	758	6.63068
900	1991/4	1579.90	7.36512	765	6.63988
901	1992/1	2098.38	7.64892	772	6.64898

902	1992/2	2545.23	7.84198	779	6.65801
903	1992/3	2813.59	7.94222	785	6.66568
904	1992/4	2656.41	7.88473	792	6.67456
905	1993/1	2778.14	7.92954	799	6.68336
906	1993/2	3023.91	8.01431	806	6.69208
907	1993/3	3345.87	8.11548	812	6.69950
908	1993/4	3078.92	8.03233	819	6.70808
909	1994/1	3180.47	8.06478	825	6.71538
910	1994/2	3449.08	8.14586	832	6.72383
911	1994/3	3548.98	8.17442	838	6.73102
912	1994/4	3390.14	8.12863	844	6.73815
913	1995/1	3745.02	8.22818	850	6.74524
914	1995/2	3524.64	8.16753	856	6.75227
915	1995/3	3853.81	8.25682	862	6.75926
916	1995/4	3539.59	8.17177	868	6.76619
917	1996/1	3840.47	8.25335	874	6.77308
918	1996/2	4699.54	8.45522	880	6.77992
919	1996/3	5025.00	8.52218	885	6.78559
920	1996/4	4433.15	8.39687	891	6.79234
921	1997/1	3896.95	8.26795	896	6.79794
922	1997/2	4092.63	8.31694	901	6.80351
923	1997/3	4404.94	8.39048	906	6.80904
924	1997/4	4518.61	8.41596	911	6.81454
925	1998/1	5597.09	8.63000	916	6.82002
926	1998/2	5665.56	8.64216	921	6.82546
927	1998/3	5161.40	8.54896	926	6.83087
928	1998/4	4495.35	8.41080	930	6.83518
929	1999/1	4829.42	8.48248	934	6.83948
930	1999/2	5194.46	8.55535	938	6.84375
931	1999/3	5632.97	8.63639	942	6.84801
932	1999/4	5196.59	8.55576	946	6.85224
933	2000/1	6037.72	8.70578	950	6.85646
934	2000/2	7469.81	8.91862	953	6.85961

935	2000/3	6470.69	8.77504	953	6.85961
936	2000/4	6119.75	8.71928	959	6.86589
937	2001/1	7272.89	8.89191	962	6.86901
938	2001/2	6986.94	8.85180	965	6.87213
939	2001/3	7491.94	8.92158	961	6.86797
940	2001/4	7156.90	8.87583	970	6.87730
941	2002/1	7882.58	8.97241	973	6.88038
942	2002/2	9489.75	9.15797	975	6.88244
943	2002/3	8448.24	9.04171	975	6.88244
944	2002/4	7906.94	8.97550	979	6.88653
945	2003/1	10783.70	9.28579	981	6.88857
946	2003/2	10814.59	9.28865	983	6.89061
947	2003/3	10748.88	9.28256	986	6.89366
948	2003/4	9623.09	9.17192	986	6.89366
949	2004/1	9402.12	9.14869	988	6.89568
950	2004/2	9040.75	9.10950	990	6.89770
951	2004/3	7902.17	8.97489	992	6.89972
952	2004/4	7708.56	8.95009	993	6.90073

---------------------------------- Location=Sterling ------------------------------

Obs	Time	Tax	LogTax	Pop	LogPop
953	1991/1	1934.02	7.56735	201	5.30330
954	1991/2	2345.68	7.76033	203	5.31321
955	1991/3	2439.86	7.79970	205	5.32301
956	1991/4	2257.78	7.72214	208	5.33754
957	1992/1	1928.14	7.56431	210	5.34711
958	1992/2	2083.48	7.64179	212	5.35659
959	1992/3	2270.40	7.72771	214	5.36598
960	1992/4	1972.19	7.58690	216	5.37528
961	1993/1	1386.71	7.23469	219	5.38907
962	1993/2	1796.89	7.49382	221	5.39816

963	1993/3	1933.31	7.56699	223	5.40717
964	1993/4	1542.45	7.34113	225	5.41610
965	1994/1	1409.96	7.25132	227	5.42495
966	1994/2	1989.09	7.59543	229	5.43372
967	1994/3	1842.63	7.51895	231	5.44242
968	1994/4	1960.19	7.58080	233	5.45104
969	1995/1	1626.29	7.39406	235	5.45959
970	1995/2	1724.35	7.45261	236	5.46383
971	1995/3	1927.77	7.56412	238	5.47227
972	1995/4	1608.77	7.38323	240	5.48064
973	1996/1	1750.65	7.46774	241	5.48480
974	1996/2	1804.05	7.49779	243	5.49306
975	1996/3	1943.24	7.57211	245	5.50126
976	1996/4	1616.02	7.38772	246	5.50533
977	1997/1	1488.48	7.30551	248	5.51343
978	1997/2	1875.48	7.53662	249	5.51745
979	1997/3	1698.32	7.43739	250	5.52146
980	1997/4	1479.92	7.29975	251	5.52545
981	1998/1	1962.24	7.58184	253	5.53339
982	1998/2	2209.23	7.70040	254	5.53733
983	1998/3	2618.32	7.87029	255	5.54126
984	1998/4	2228.97	7.70930	256	5.54518
985	1999/1	2575.62	7.85384	257	5.54908
986	1999/2	2889.57	7.96886	257	5.54908
987	1999/3	2886.59	7.96783	258	5.55296
988	1999/4	2637.18	7.87747	259	5.55683
989	2000/1	1981.44	7.59158	259	5.55683
990	2000/2	2186.20	7.68992	260	5.56068
991	2000/3	2170.74	7.68282	262	5.56834
992	2000/4	1924.33	7.56233	260	5.56068
993	2001/1	1966.88	7.58420	260	5.56068
994	2001/2	2436.69	7.79839	260	5.56068
995	2001/3	2354.36	7.76402	261	5.56452

996	2001/4	2318.92	7.74886	261	5.56452
997	2002/1	11739.55	9.37072	261	5.56452
998	2002/2	15746.19	9.66435	261	5.56452
999	2002/3	11359.03	9.33777	260	5.56068
1000	2002/4	10234.03	9.23347	261	5.56452
1001	2003/1	15285.85	9.63468	261	5.56452
1002	2003/2	13325.98	9.49747	261	5.56452
1003	2003/3	11493.77	9.34956	261	5.56452
1004	2003/4	10240.66	9.23412	261	5.56452
1005	2004/1	8933.63	9.09758	261	5.56452
1006	2004/2	8690.67	9.07001	261	5.56452
1007	2004/3	7563.31	8.93106	260	5.56068
1008	2004/4	6318.44	8.75123	261	5.56452

------------------------------------ Location=Wales -------------------------------

Obs	Time	Tax	LogTax	Pop	LogPop
1009	1991/1	117.82	4.76919	194	5.26786
1010	1991/2	216.59	5.37801	195	5.27300
1011	1991/3	178.72	5.18582	196	5.27811
1012	1991/4	153.17	5.03157	197	5.28320
1013	1992/1	367.31	5.90619	198	5.28827
1014	1992/2	501.63	6.21787	200	5.29832
1015	1992/3	570.82	6.34707	201	5.30330
1016	1992/4	474.85	6.16299	202	5.30827
1017	1993/1	371.33	5.91709	203	5.31321
1018	1993/2	588.34	6.37730	204	5.31812
1019	1993/3	520.43	6.25465	205	5.32301
1020	1993/4	479.76	6.17328	206	5.32788
1021	1994/1	667.40	6.50338	207	5.33272
1022	1994/2	725.19	6.58643	208	5.33754
1023	1994/3	546.71	6.30392	209	5.34233

1024	1994/4	677.28	6.51808	210	5.34711
1025	1995/1	223.23	5.40821	211	5.35186
1026	1995/2	146.90	4.98977	212	5.35659
1027	1995/3	225.81	5.41972	212	5.35659
1028	1995/4	260.57	5.56287	213	5.36129
1029	1996/1	502.77	6.22012	214	5.36598
1030	1996/2	362.10	5.89193	215	5.37064
1031	1996/3	275.14	5.61728	216	5.37528
1032	1996/4	285.04	5.65262	216	5.37528
1033	1997/1	604.06	6.40367	217	5.37990
1034	1997/2	798.85	6.68318	218	5.38450
1035	1997/3	534.42	6.28118	218	5.38450
1036	1997/4	469.36	6.15136	219	5.38907
1037	1998/1	1321.84	7.18678	219	5.38907
1038	1998/2	948.46	6.85484	220	5.39363
1039	1998/3	1051.81	6.95827	220	5.39363
1040	1998/4	618.93	6.42800	221	5.39816
1041	1999/1	411.74	6.02038	221	5.39816
1042	1999/2	591.00	6.38182	221	5.39816
1043	1999/3	567.56	6.34134	222	5.40268
1044	1999/4	504.77	6.22411	222	5.40268
1045	2000/1	901.56	6.80413	222	5.40268
1046	2000/2	1524.02	7.32910	222	5.40268
1047	2000/3	1334.33	7.19619	224	5.41165
1048	2000/4	2026.03	7.61384	223	5.40717
1049	2001/1	4140.36	8.32854	223	5.40717
1050	2001/2	4202.15	8.34335	223	5.40717
1051	2001/3	4240.80	8.35251	223	5.40717
1052	2001/4	11476.68	9.34807	223	5.40717
1053	2002/1	1352.83	7.20995	222	5.40268
1054	2002/2	769.45	6.64567	222	5.40268
1055	2002/3	972.66	6.88004	222	5.40268
1056	2002/4	890.64	6.79194	222	5.40268

1057	2003/1	1543.86	7.34204	222	5.40268
1058	2003/2	1566.17	7.35639	222	5.40268
1059	2003/3	1610.47	7.38428	223	5.40717
1060	2003/4	1629.60	7.39609	222	5.40268
1061	2004/1	2716.75	7.90719	222	5.40268
1062	2004/2	2398.71	7.78268	223	5.40717
1063	2004/3	1878.63	7.53830	222	5.40268
1064	2004/4	2367.72	7.76968	223	5.40717