The Impact of System Development Charges on the Development of Oregon Communities

By:
Mary Del Savio
Ryan Eugenio
Lucas Mulkey

Under the supervision of
Professor Joe Stone

With assistance from The League of Oregon Cities:
Angela Carey (research associate)
Sean O'Day (general counsel)

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1. Introduction

A. Description of Problem

System Development Charges (SDCs) are taxes that are levied on a developer when undergoing construction and are used in order to cover infrastructure costs. The term 'construction' covers renovation to an existing building and constructing a completely new building. The fees are used to fund the costs of developing infrastructure that do not fall under the direct responsibility of the builder. These costs include water mains, sewer lines, storm water drainage pipes, transportation infrastructure, as well as park facilities.

Since SDCs are taxes on real estate development, many believe that they deter new construction and related economic growth in a city. Critics of this point of view may argue that the SDCs have a negligible effect on deterring business, and provide indispensable funds to infrastructure. This paper will explore whether or not cities that implemented measures to reduce the total SDC cost have experienced any effect on the frequency of construction projects.

This research project was proposed and guided by the League of Oregon Cities. In the wake of the 2007 financial crisis it was brought to the attention of the League that city councils were considering SDC discounts, also known as 'accommodations,' as a potential method of spurring development. In the subsequent years SDC surveys done by the League kept track of SDC levels and included questions on accommodations. The goal of this research is to provide some evidence of the effect that SDCs may or may not be having on business development. By examining the correlation between SDC costs and building permits, it will be possible to determine some degree of the tradeoff that may exist between tax revenue and new business ventures in a city.

This research project was completed through a joint effort of The League of Oregon Cities and the UO Economics Department Honors Thesis Program. The League of Oregon Cities (the League) serves as the voice for all of Oregon's 242 cities. Their mission, according to their website is to be "... the go-to place for and about cities as a dynamic resource hub for advocacy, education and best practices." The League provided us with the data for this study, which was collected through surveys taken in from 2007 to 2009 and from 2010 to 2013.

The remainder of this introduction will discuss further background information on the role of System Development Charges, theoretical models that may be applied to this topic, a summary of past literature that has examined the impact of state and local taxes. The hypothesis that concludes this introduction will synthesize the previous information and assess likely outcomes. The introduction will be followed by the Methodology section, which will refine the research question and discuss the specifics of the available data, variables and modeling techniques employed. The following sections will report results and discuss the implications of the findings for city leaders across Oregon.

B. Background Information

Taken from the State of Oregon's website, the passage below summarizes the background information of SDCs:

> *"System Development Charges (SDCs) are one-time charges on new development, and certain types of redevelopment, to help pay for existing and planned infrastructure to serve the development. These charges are one of the many ways available to local governments to finance growth. Under*

ORS 223.297 to 223.314, SDCs may be used for capital improvements for:

- *Water supply, treatment and distribution*
- *Waste water collection, transmission, treatment and disposal*
- *Drainage and flood control*
- *Transportation*
- *Parks and recreation..."*

(see Appendix A)

There are a variety of SDCs. Governments collect SDCs for infrastructure development that include constructing parks, stormwater drains, roads and other transportation related infrastructure, sewer lines both locally and regionally, and water mains. The types of construction where a developer will need to pay SDC charges are expansion of residential, commercial, industrial buildings as well as any new building construction of residential, commercial, industrial buildings. These SDC charges could be waived, reduced or delayed but these measures differ by jurisdiction.

C. Theoretical model:

Historically, taxes have widely been used in the United States as a method of controlling policy and behavior. These policies rely, in part, on theoretical models that predict potential benefits and costs. The theoretical model known as the 'Laffer curve,' which was developed by Arthur Laffer in 1979, suggests that taxes can either by too high or too low for optimal economic growth (revenue collection). The breakdown of the model is fairly simple, the relationship between tax revenue and tax rates is shown with a negative parabola – initially low tax rates are ineffective at collecting revenue, as they increase total revenue rapidly rises, until it plateaus where marginal revenue is equal to zero. At this point no firms (or a minimal number) are incentivized to leave the market but a significant quantity of revenue is being collected and used for public services. After this point the tax burden becomes a disincentive in the productivity of workers and firms, who now find their efforts are better spent in other areas such as leisure time. Increases in the tax rate from this optimal level will lead to an exponential decrease in revenue as firms chose to exit the market. In the context of our study, the Laffer curve suggests that there may be instances when the tax burden is too high and firms are deciding against building in a certain city– in which case lowering it would positively correlate with development.

However, there may be cities whose demand for development is relatively inelastic and would not have business deterred by raising their SDCs. For some, in fact, doing so would provide additional revenue for the city, which could make the it more enticing to business due to increased public services. Obtaining an understanding of the elasticity's of SDCs in the Oregon cities that we examine may help in discerning at what cost a cities inflection point on their Laffer curve may be located.

D. Synthesis of Literature Reviews:

The true impact of tax policy on economic growth is a controversial and inconclusive topic in the United States (Bartik, 1991). Many strongly believe that businesses are very sensitive, or elastic, to tax changes, while others claim that their effects are negligible in comparison to other business costs. The views of politicians and voters on this issue have inevitable consequences on policy decisions so it is important to understand what previous research has indicated about their effects. Skeptics of the influence of taxes claim that because tax credits do not significantly affect investment decisions the only consequence is a reduction in government revenue (Buss, 2001). Other studies have found a link between tax revenue and economic growth, although some have measured this effect to be positive, while others were negative. Some of this variety of findings may be explained with the Laffer curve, although most studies have complexities that go beyond the simplicity of this model. This next section will examine some of the previous studies of tax impacts and assess how the sample population and statistical techniques used have influenced the findings.

One well-known instance of positive growth resulting from lowered taxes comes from New Jersey in the mid-1990s. In response to the recession of the early '90s the conservative administration of Governor Christine Whitman implemented a 30% reduction in the personal income tax over the period between 1994 and 1996 (Reed and Rogers, 2004). This policy change offered an interesting opportunity to study the impacts of tax reductions – as many other northeastern states had experienced the recession similarly but decided not to drastically reduce taxes as Whitman had. According to the authors, an OLS estimate indicated that employment in the period after the tax cuts (1994-1997) was 1.5 percentage points greater annually than in the period before. However a more meticulous study of the results of the tax change, carried out by Robert Reed and Cynthia Rogers at the University of Oklahoma, used time series, cross section (or panel data) techniques to identify trends in the unemployment rate that were happening concurrently with the policy change, and which made contributions to the rising employment rates. Essentially, they found that unemployment rates had previously been declining in the surrounding area, and this trend, as well as the policy was responsible for what was seen subsequently. Although the impact of this tax reduction was initially overestimated, these later findings did maintain that the effect on economic growth was still positive.

Despite popular success stories of tax reduction, some empirical findings have suggested that introducing lower tax rates to select firms does not necessarily translate into growth – it can even mean the opposite. A 2002 study by Todd Gabe and David Kraybill examined both manufacturing and nonmanufacturing firms in Ohio and their participation in a program that offered tax incentives in exchange for positive projections for job creation. The program studied 366 Ohio firms and observed both their predicted and actual employment growth over a two-year period from 1993-1995. Firms had to apply for the incentive from the government in exchange for estimations that the credit would have on the ability to create jobs. The authors estimated that some self-selection bias might have occurred in the study. They speculated that companies with historically high growth would be more likely to feel qualified for and apply to the program; at the same time, these firms would be more likely to be chosen by the government due to high past performance. This would lead to an upwards bias of the effect of incentives.

In spite of an awareness of this potential bias and an attempt to control for 'non-incentive growth factors' such as the average growth of the county, and metropolitan vs. nonmetropolitan areas, Gabe and Kraybill surprisingly found a disincentive effect of the tax discounts. They found 'that the effect of incentives on establishments that receive incentives was a decrease in 10.5 jobs per establishment.' Not surprisingly however, the study did find that participation in the incentive program had a 'substantial positive effect on announced employment growth.' The estimated that participating firms announced on average 26.7 more jobs than they would have if they had not engaged in the program. Although these findings come as a surprise, the authors offer some explanation: it may be the case that companies that invested time in looking for ways to dodge taxes exhibited rent-seeking behavior. Rent-seeking companies that participated in this program may have been encouraged by this payoff and then continued to inefficiently spend time looking for similar breaks, rather than working on the efficiency and output of their company.

One of the most important examinations of the effect of state and local taxes comes from Timothy Bartik's 1991 book 'Who Benefits from State and Local Economic Development Policies?' The book is a meta-analysis of the effect of local economic policies on their communities. Bartik begins his discussion of taxes with a quote from Richard Pomp, a law professor from the University of Connecticut. Pomp outlines several beliefs supporting the negligible impact of state and local tax policy. His arguments include the view that local taxes are insignificant when considering other costs to business, that higher taxes reflect better social services, which also affect business decisions, and that there will be fluxes in taxes due to local politics that will be frequent enough so that businesses will not try to predict them. Bartik examines some hypothetical scenarios in which each of Pomp's circumstances would affect business decisions, but finally states that it is up to empirical evidence to decide whether these pros and cons of local taxes end up outweighing each other.

This meta-analysis uses studies dating back to 1979 and up until 1991. Bartik points out that the impacts seen in these studies, which are primarily from the 1980s, stand in contrast to earlier findings on tax impacts from the 1950s, 60s and 70s. While earlier years had argued that the impact of taxes did not influence business decisions, a majority of those found in more recent years disagree. A total of 84 studies were examined and organized by type of community and by statistical techniques used. The two community types were intermetropolitan areas – or areas where towns were more isolated, and intrametropolitan areas – where cities and towns were more clustered. Bartik also distinguishes whether the studies used fixed effects or controls for public services. Overall he found the greatest elasticity of statistically significant tax effects in the intrametropolitan areas. Of the 14 surveyed, 57% found statistically significant negative effects with a mean elasticity of -1.59. Meanwhile the mean elasticity for the intermetropolitan, which included 57 studies, had 70% resulting in significant negative results. In these areas the elasticity was lower, at -0.15. According to Bartik, these results are in line with what we would think about substitution effects; in more densely populated areas with more cities there is greater competition among local leaders to compete with their neighbors for business. A firm could reasonably expect to attract a similar quantity of customers in one suburb or another, and may be more likely swayed by different tax laws. However an entrepreneur who wants to start a business in a small rural town will have fewer options at their disposal.

In addition, Bartik notes the importance of using fixed effects – which account for time constant unobservable factors that relate to the dependent variable. Ninety-two percent of the studies that did include fixed effects in their models had statistically significant results – much higher than the sample average. Additionally, 80% of the studies that controlled for public services showed statistically significant tax effects. This is important because the negative relationship that taxes should have on development and the positive correlation between public services and development mean that an omitted variable bias of public service would tend towards zero. That is, studies that failed to include public service variables when they should have been included would see a smaller coefficient on taxes in absolute values. The fact that 80% of the studies that did include these controls say significant results further supports the idea that taxes impact business choices.

In conclusion, the body of evidence surrounding the impact of state and local taxes on economic development is far from conclusive. One trend that remains consistent throughout the literature however is that there is a tendency to overestimate the influence of tax credits on local growth. Many researchers have failed to acknowledge important factors that contribute to growth and are unrelated to tax policy – and this has biased their estimates. We should proceed in our own investigation with an awareness of the many facets that impact growth in Oregon, which are not connected with the implementation of SDC accommodations.

E. Hypothesis:

Given the large amount of research that has already been done on similar taxes, the effects of decreasing these taxes in the form of credits, and their effects on economic output, we expect that there will be no significant effect of a change in System Development Charges on economic output. This is counter to the common belief that lowering tax related cost will induce businesses to perform more in a given environment all else being equal. This is further supported by basic business principle that the only reason a business would enter a market is if they can be profitable inside that market. Based on the International Code Council's measures, which are used by cities in Oregon when assessing building permit cost, the cost of a single square foot for a business is somewhere between $121.23 and $179.29 with the average cost being $151.35. This means that for a business that needs 2000 square feet the cost to build would be on average $302,700 while the average total SDC cost in the sample is only $26114.24. This means out of start up costs for a 2000 square foot building SDC costs are only 8.6%. A builder will then need to pay property taxes which are on average as of 2012-2013 fiscal year in Oregon 1.66% or $5015.94 as well as the mortgage on the building which based on the average price of a 30 year fix mortgage from 2000 to 2010 based on census data would be 6.12% $18525.24 or as of publishing is 4.15% based on new york times data or $12562.05. This means that total regardless of SDC cost the developer will pay between $17577.99 and $23541.18 every year. Thus the Net Present Value of the building assuming it generated $20 a square foot or $40,000 dollars a year of revenue and has a 5% discount rate is between $36,000 and $42,000. Note: the number $20 dollars is just above the point of breaking even on a building assuming it pays the lowest possible interest expense as well as the property tax and SDC taxes. These calculations can be seen in *Figure 1*. There are several weaknesses of this hypothesis. First, most other studies that have been done on this type of change in tax costs to developers has been captured in employment and we will not be using employment to capture the effects of the change in the tax but instead will be using commercial building permits. This makes sense though because building permits are a more direct measure of the effect of these taxes. Second, the cost calculation done above are averages and do not capture the individual city effects that are present when looking at building in Oregon. Yet, using averages will make this a better tool to compare to all other cities across the nation.

II. Methodology

A. Question

The central purpose of this study is to examine if cities in Oregon have seen changes in economic development correspond with changing prices of System Development Charges (SDCs). While many previous studies have used employment levels to measure economic growth, the best measure of economic development for the purpose of this study will be the issuing of new commercial building permits. This is because SDCs are a one-time cost which is incurred at the time of building, therefore they are likely to more directly affect building itself and to indirectly affect employment.

This project was proposed by the League of Oregon Cities, who had observed that a number of Oregon city councils were discussing the role that SDCs may have in deterring development. This discussion was attributed to the recent economic downturn of 2007. As a consequence, the possibility of SDC accommodations – in essence, various forms of cost reduction – were discussed and some were implemented in towns across Oregon. SDC costs, population trends and other data across a few dozen Oregon cities were provided by the League of Oregon Cities, other data such as annual building permits were tracked down on an individual basis.

The availability of both time series and cross sectional data made panel data the ideal model to employ. The limited availability of data, both in the time series and cross sectional sets made it necessary to run a variety of models that assured significance of the observed effects. Due to limited observations and degrees of freedom, there were limited statistical techniques available to use, so it was decided that panel data with fixed effects and carefully chosen dependent variables and use of logarithmic transformations would be the best method to employ.

B. Data Specification

The bulk of the explanatory variable information used in the research was found in data sets provided by the League. In the previous six years, two surveys had been issued by the League – one from 2010, the other from 2013. The first survey asked respondents to refer to SDCs that had been charged during the previous three years (2008-2010) in their answers. The second survey referred to the years 2011-2013. The surveys were sent to the majority of Oregon cities, 67 replied to both.

There are five different types of SDCs that a city may charge: water, transportation, parks, sewer and storm water. The charges of each one are based on which of the follow four categories that a project falls in: commercial improvement, commercial reimbursement, residential improvement and residential reimbursement. 'Improvements' refer to a brand new development while 'reimbursements' refer to additions to existing structures. Some of the 67 cities included in the data had no SDCs while others had charges for all five types. Because the effect of individual SDCs on their own was not pertinent to our central question we summed each of the SDC types together into one total cost.

Although the cities provided one SDC charge per type of project, in reality this represents an average. Some commercial improvement projects may require higher or lower charges based on size or other characteristics. In order to maintain consistency, the League asked the cities to determine the cost of an SDC based on a given building (Figure 1.1). The examples serve the purpose of determining the relative cost of an SDC within a city so that the charges can be appropriately compared with one another. All of this information, as well as population statistics of Oregon cities, per year, dating back to the early 1990s, were all provided by the league.

It had been established that the annual issuing of commercial building permits would be the ideal way to measure the economic growth most impacted by SDC changes, but this information had not yet previously been collected by a third party. Therefore commercial building permit data was collected by cold calling each of the 67 cities that had responded to both of the League's two surveys. The information requests included: the number of new commercial permits issued per year between 2008 and 2013, the number of improvements to commercial buildings per year during the same time period and the valuation of each of the projects aforementioned. It was emphasized that the raw number of new commercial building permits was the highest priority. In total, 28 cities responded to this survey with the number of new commercial permits per year. While some cities provided the other information that was requested, enough failed to provide it that this route was neglected in the regression analysis.

Finally, as an alternative to new commercial development, new residential development was considered. The United States Census Bureau website provided data on new residences built since 1996. The number of residential buildings was included in the regression. After compiling the available residential data there was a total of 46 cities accounted for who had answered both of the SDC surveys.

Since building permit data had been collected by year over a six year period, but SDC data was only represented by two sets of averages, it was necessary to convert permits to averages as well. This meant that the quantity of permits in each city was averaged for the grouping of years from 2008 to 2010 and from 2011 to 2013. This was done for both the residential and permit data sets. Although the data was not truly collected over two years, it represents only two different time periods, which have been named Survey1 (2008-2010) and

Survey2 (2011-2013).

C. Variable Specification

When specifying the variables, many different variable specifications with various regressions were used, however, throughout all of the regressions panel data modeling techniques, and robust standard errors were used. The variable specifications included separating each type of SDC, total SDC charges, inverse hyperbolic sine of building permits and logarithm of total SDC charges, and joint significance variable of population multiplied by building permits in both levels and in logarithmic form.

Initially the model was specified to have building permits be a response to all the SDC improvement types, sewer (SewerImprovement) , storm (StormImprovement), transportation (TransImprovement), parks (ParkImprovement), water (WaterImprovement), population (POP), and the time period using a STATA technique of i.Year * (year effects). The i.Year simply turns the year variable into a dummy variable. When the regression was ran there were no significant variables among the SDC improvements. In order to solve this problem, all of the SDC improvements were aggregated into a single variable TOTAL, which is equal to all the SDCs added together in each time period in each city. After running the regression of building permits on TOTAL, POP, and i.Year, TOTAL was determined to be a significant variable.

After finding significance in the SDC variable, the building permits were modeled as a percentage change from year to year by taking the inverse hyperbolic sine of building permits and then taking the logarithm of TOTAL and POP then regressing building permits on logTOTAL, logPOP, and i.Year. This removed significance from out SDC variable, and thus was not used. This regression was also tried without taking the inverse hyperbolic sine of building permits and had the same insignificant results.

The next specification was brought about by the idea that the number of building permits and the size of the city by population may be correlated. Thus, a variable was created to test for joint significance. This was done as with the technique described above and labeled PT. When the regressions we had before using PT and the logarithm of PT were ran, it was found that PT and TOTAL were significant when the regression was run in levels. However logTOTAL and logPT was used, with or without, taking the inverse hyperbolic sine of building permits only PT was significant. Thus it was decided that the leveled version of all of our variables would be used.

The last important specification note on our variables is that the initial SDC and population data from The League of Oregon Cities was indexed in single dollar or person values. To make the regression output for feasible for large scale policy decisions it was determined it would be best to reindex both data sets into thousands by dividing each observation by one thousand.

D. Model Specification

Because our research question examined the effect of a policy change in many cities over a limited stretch of time, panel data was the most effective approach we could employ. Because the only available time periods were 2010 and 2013 the model is somewhat limited in explaining overarching trends that cities may have been experiencing. This could have presented a potential problem because the 2007 recession - which affected Oregon - would have coincided with the beginning of data collection in the League's surveys. However this issue is addressed with the inclusion of fixed effects and a year dummy variable (for 2010).

The model also included fixed effects which allowed city effects to be taken without sacrificing a large number of degrees of freedom. Including this effect has the impact of not attributing the results we see to the size and growth of the cities themselves. It is reasonable to suspect that larger cities in terms of population would have more building permits, but including both the variable for population and fixed effects controls for this.

There is also clear evidence of heteroscedasticity, namely in the data set that included commercial building permits. Approximately 30% of the cities had no building permits in either year. This represents a lower-bound limit on the data (due to the fact that building permits obviously cannot be negative). This may lead to an upwardly biased estimate, however much of this is addressed with the inclusion of robust standard errors. An attempt was made to run a tobit model - which specifically deals with lower and upper bound limits of data, but the limited size of the observations resulted in insignificant coefficients across the board.

The presence of many 0-values for building permits also gave reason to attempt to use inverse hyperbolic sine transformations, as opposed to logs. This also resulted in insignificant variables. However due to the ease of interpreting logged variables, several regressions were run until it was decided to use logs on population and on the interaction term of log*POP and TOTAL (representing SDC total charge). This choice was made both for ease of interpretation and for significance.

Lastly, there was a large variation in population in the sample size. Therefore it was established that a useful interaction term would combine the effects of both population and SDC total. This term explains how much a constant SDC total affects building permits if city size growth. A significant coefficient would suggest that a larger city is more elastic than a small city. The direction of the sign indicates whether the charge may be aiding or hindering development.

III. Results

The results of the base model for commercial building data, which tested the year dummy variable (Survey2) , the total SDC commercial improvement charge (TOTAL) , and population (POP) on the number of commercial building permits, are presented in *Table 2*. All regressors were insignificant except for the TOTAL variable which was significant at the $p<.10$ level. The TOTAL variable had a negative coefficient, which suggests that the higher costs associated with creating new commercial infrastructure (higher SDC charges) will deter commercial building within a city. The other variables, which include the 2013.Year dummy and POP, were less significant. The 2013.Year dummy had a negative coefficient, which would suggest that there was less commercial building in the time period from 2011-2013 then there was from 2008-2010. Although, this variable is insignificant so this interpretation is inconclusive. In addition, the POP variable had a positive coefficient, which would suggest that cities with a larger population would experience more commercial growth than smaller cities. Like the 2013.Year dummy, this variable is also insignificant so this interpretation is inconclusive. Even though the 2013.Year dummy and POP were insignificant, they were retained in the model because of their effect on our R^2, which was .7981.

The results of the complex model for commercial building data, which tested the year dummy variable (Survey2), the total SDC commercial improvement charge (TOTAL) , the population (POP) on the number of commercial building permits, and an interaction term (LPT) are presented in *Table 3*. All of these factors are significant at the $p<.10$ level. However, these results have been discarded in interpretation because of the lack of intuitive sense. This is further explained in the discussion section.

The results of our base model for residential building data, which tested the year dummy variable (Survey2), the total SDC residential improvement fee (TOTAL), and the log of population (lpop) on the average number of residential building permits in each time period, can be seen in *Table 6*. All regressors were insignificant except for TOTAL which was significant at the p<.10 level. The TOTAL variables had a positive coefficient, which suggests that the higher the cost associated with building new residential units entices developers. The other variables, which include the 2013.Year dummy and lpop, were much less significant. The 2013.Year dummy had a positive coefficient, which would suggest that there was more residential building in the time period from 2011-2013 then there was from 2008-2010. Although, this variable is insignificant so this interpretation is inconclusive. In addition, the lpop variable had a positive coefficient, which would suggest that cities with a larger population would experience more residential growth than smaller cities. Like the 2013.Year dummy, this variable is also insignificant so this interpretation is inconclusive. Even though the 2013.Year dummy and POP were insignificant, they were retained in the model because of their effect on our R^2, which was .8893.

We then ran the same model with the year dummy variable (Survey2), the total SDC improvement charge, and population but added an interaction term (PT) between the total SDC improvement charge and the log of population. These results are presented in column 2 of *Table 6*. The interaction term proved to be significant at the p<.10 level but all other variables proved to be insignificant. The year dummy, Survey2, carried a positive coefficient suggesting that there was more building in this time period. This variable also increased slightly in significance but was still overall insignificant. In addition, the TOTAL variable carried a positive coefficient. Both its significance and magnitude dropped slightly in this model. The log(POP) variable was positive, but still insignificant. The interaction term, LPT, carried a positive coefficient. This positive coefficient suggests that at any given TOTAL, there will be a greater effect on building permits if the cities are larger. In other words, larger cities will see a more drastic increase in building permits issued than smaller cities, given a specific TOTAL.

IV. Conclusion

Given the effects that we have seen in the regressions we explain above it is clear that there are differing effects for changing SDC charges for residential and commercial building permits. Also, that there are differing degrees of what makes sense out of what is found in the results of processing the data. This makes the interpretation and intuition behind these results challenging.

What can be said given what is shown is in a simplistic model of how the commercial building permits are affected by SDCs there is a significant effect when lowering SDC charges an increase commercial building permits will result. This is seen on *Table 2*. While an interpretation of the complex model of shows an entirely different story. This is seen on *Table 3*. What is seen in the complex model is that when you hold SDCs constant as the size of the city increases by number of people there will be a decrease in the number of commercial building permits. The intuition behind this is clearly flawed if it were to be applied to the real world, and thus is why the results have been discarded. In summary of what can be said about how commercial building permits are affected by SDC charge changes there is no clear result. The conflicting nature of the regressions means that there needs to be further study done here to support any policy advice that may be given based on that data that is currently available.

Similarly what is found in the residential building permits is not very supportable for making policy advice on when view in context. The simple regression seen on the left side of *Table 6*, shows that raising taxes should increase the number of house built, which makes no sense intuitively until examining the complex model seen on the right side of *Table 6*. The complex model shows that as tax increases building permits decrease unless you are in large cities. Intuitively this makes sense because larger cities have suburbs while a small town does not. Suburbs are very infrastructure intensive thus require a lot of tax while individual houses built in the country do not need very much tax payer supported infrastructure. However, this does not mean that raising taxes in a large city will increase the number of residential building permits. It only shows that large cities require a large amount of infrastructure and that more house are built in a large cities.

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VII. Appendix and Tables

Appendix A

"System development charges may be applied to new development based on a fee to reimburse for unused infrastructure capacity and/or to make planned improvements that increase infrastructure capacity. SDC revenues may only be used for capital costs; they cannot be used for ongoing facility or system maintenance or projects that either fix existing system deficiencies or replace existing capacity.

Local governments must establish their SDCs by ordinance or resolution and through a public process. They must have a methodology to calculate a reimbursement fee and/or an improvement fee and provide credit if a developer finances a qualified capital improvement. They also must provide a review procedure through which anyone may challenge an expenditure of SDC revenue if it is out of compliance with state restrictions.

There must be a reasonable connection between the need for additional facilities and the growth generated by new development. There must also be a reasonable connection between the expenditure of the fee collected and the benefits received by the developer paying the fee.

SDCs are typically assessed at the time of building permit issuance, but can be collected upon connection to a water or sewer system or at the time of occupancy. Developers may pass some or all of the cost to buyers. Some jurisdictions have recurring street maintenance fees that are not covered by SDC law."

Figure 1

Net Present Value Calculations for Commerical Building

year	Loan cost	SDC cost	return	discount rate	interest and tax cost (low)	interest and tax cost (high)	npv (low)	npv (high)	npv (low) w/o SDC cost	npv (high) w/o SDC cost
1	$302,700	$26,114.24	40000	0.05	$17,577.99	$23,541.18	-307459.9448	-313139.1733	-281345.7048	-287024.9333
2	$0.00	$0.00	40000	0.05	$17,577.99	$23,541.18	20337.42404	14928.63492	20337.42404	20337.42404
3	$0.00	$0.00	40000	0.05	$17,577.99	$23,541.18	19368.97527	14217.74754	19368.97527	19368.97527
4	$0.00	$0.00	40000	0.05	$17,577.99	$23,541.18	18446.64312	13540.71195	18446.64312	18446.64312
5	$0.00	$0.00	40000	0.05	$17,577.99	$23,541.18	17568.23154	12895.91614	17568.23154	17568.23154
6	$0.00	$0.00	40000	0.05	$17,577.99	$23,541.18	16731.64909	12281.82489	16731.64909	16731.64909
7	$0.00	$0.00	40000	0.05	$17,577.99	$23,541.18	15934.90389	11696.97609	15934.90389	15934.90389
8	$0.00	$0.00	40000	0.05	$17,577.99	$23,541.18	15176.09894	11139.97723	15176.09894	15176.09894
9	$0.00	$0.00	40000	0.05	$17,577.99	$23,541.18	14453.42757	10609.50212	14453.42757	14453.42757
10	$0.00	$0.00	40000	0.05	$17,577.99	$23,541.18	13765.16911	10104.28774	13765.16911	13765.16911
11	$0.00	$0.00	40000	0.05	$17,577.99	$23,541.18	13109.68487	9623.131177	13109.68487	13109.68487
12	$0.00	$0.00	40000	0.05	$17,577.99	$23,541.18	12485.41416	9164.886835	12485.41416	12485.41416
13	$0.00	$0.00	40000	0.05	$17,577.99	$23,541.18	11890.87063	8728.463652	11890.87063	11890.87063
14	$0.00	$0.00	40000	0.05	$17,577.99	$23,541.18	11324.63869	8312.822526	11324.63869	11324.63869
15	$0.00	$0.00	40000	0.05	$17,577.99	$23,541.18	10785.37018	7916.973834	10785.37018	10785.37018
16	$0.00	$0.00	40000	0.05	$17,577.99	$23,541.18	10271.78113	7539.97508	10271.78113	10271.78113
17	$0.00	$0.00	40000	0.05	$17,577.99	$23,541.18	9782.648693	7180.928648	9782.648693	9782.648693
18	$0.00	$0.00	40000	0.05	$17,577.99	$23,541.18	9316.808279	6838.979665	9316.808279	9316.808279
19	$0.00	$0.00	40000	0.05	$17,577.99	$23,541.18	8873.150742	6513.313966	8873.150742	8873.150742
20	$0.00	$0.00	40000	0.05	$17,577.99	$23,541.18	8450.619754	6203.156158	8450.619754	8450.619754
21	$0.00	$0.00	40000	0.05	$17,577.99	$23,541.18	8048.209289	5907.76777	8048.209289	8048.209289
22	$0.00	$0.00	40000	0.05	$17,577.99	$23,541.18	7664.961228	5626.445495	7664.961228	7664.961228
23	$0.00	$0.00	40000	0.05	$17,577.99	$23,541.18	7299.963074	5358.519519	7299.963074	7299.963074
24	$0.00	$0.00	40000	0.05	$17,577.99	$23,541.18	6952.345785	5103.351923	6952.345785	6952.345785
25	$0.00	$0.00	40000	0.05	$17,577.99	$23,541.18	6621.2817	4860.335165	6621.2817	6621.2817
26	$0.00	$0.00	40000	0.05	$17,577.99	$23,541.18	6305.982571	4628.890633	6305.982571	6305.982571
27	$0.00	$0.00	40000	0.05	$17,577.99	$23,541.18	6005.697687	4408.46727	6005.697687	6005.697687
28	$0.00	$0.00	40000	0.05	$17,577.99	$23,541.18	5719.712083	4198.540257	5719.712083	5719.712083
29	$0.00	$0.00	40000	0.05	$17,577.99	$23,541.18	5447.344841	3998.609768	5447.344841	5447.344841
30	$0.00	$0.00	40000	0.05	$17,577.99	$23,541.18	5187.947468	3808.199779	5187.947468	5187.947468
Totals	$302,700	$26,114	$1,200,000		$527,340	$706,235	$15,867	($75,802)	$41,981	$36,302

Table 1

Summary Statistics- Commercial

Variable	Obs	Mean	Std. Dev.	Min	Max
SewerImprovement	56	5795.55	7925.647	0	33800
StormImprovement	56	1656.612	2991.388	0	13760
TransImprovement	56	12484.98	25932.84	0	131295
ParkImprovement	56	1397.548	4864.15	0	29097
WaterImprovement	56	5735.63	7532.563	0	40880
SDCTotal	56	27070.32	36824.63	0	162049
Permits	56	6.553571	14.54263	0	81
Pop	56	14508.69	33556.66	150	158308.3

Table 2

	Commercial Permits
Survey1	0
	(0)
Survey2	-2.942
	(1.962)
TOTAL	-0.0762*
	(0.0433)
POP	2.983
	(3.681)
Constant	-33.19
	(53.72)
Observations	56
Number of ID	28
R-squared	0.129

Robust standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.1

Table 3

	Commercial Permits	Commercial Permits
Survey.1	0	0
	(0)	(0)
Survey.2	-1.958	-3.143
	(2.302)	(2.175)
TOTAL	-0.102	0.692***
	(0.067	(0.160)
lpop	-16.79	-25.28*
	(13.71)	(14.49)
LPT		-0.0944***
		(0.0192)
Constant	145.6	215.4*
	(110.8)	(117.6)
Observations	56	56
R-squared	0.098	0.293
Number of ID	28	28

Robust standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.1

Table 4

VARIABLES	Permits
2.ID	93.60
	(257.1)
3.ID	66.39
	(214.1)
4.ID	98.05
	(246.2)
5.ID	-122.4
	(209.6)
6.ID	76.88
	(231.6)
7.ID	91.63
	(263.4)
8.ID	87.14
	(255.3)
9.ID	90.59
	(252.3)
10.ID	91.98
	(264.9)
11.ID	96.95
	(258.1)
12.ID	93.88
	(250.5)
13.ID	-370.0
	(568.7)
14.ID	90.07
	(260.7)
15.ID	10.83
	(84.86)
16.ID	90.76
	(261.0)
17.ID	57.77
	(193.3)
18.ID	88.43
	(258.6)
19.ID	85.50

	(249.9)
20.ID	83.50
	(245.5)
21.ID	87.65
	(247.4)
22.ID	90.38
	(252.3)
23.ID	98.01
	(264.3)
24.ID	94.27
	(263.5)
25.ID	77.88
	(224.7)
26.ID	90.35
	(252.1)
27.ID	86.07
	(247.0)
28.ID	90.97
	(261.8)
Survey.1	0
	(0)
Survey.2	-2.942
	(2.829)
TOTAL	-0.0762
	(0.0624)
POP	2.983
	(5.309)
Constant	-90.94
	(266.1)
Observations	56
R-squared	0.7981
Number of ID	28

Robust standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.1

Table 5

Variable	Obs	Mean	Std. Dev.	Min	Max
Pop	90	20849.61	36079.95	416.67	158308.3
ResPermits	90	42.95511	78.93398	0	535
SDCTotal	90	8020.299	5007.182	0	21098

Table 6

	Residential Permits	ResidentialPermits
Survey1	0	0
	(0)	(0)
Survey2	9.259	12.42
	(10.48)	(10.36)
TOTAL	3.511*	-46.02
	(2.074)	(27.85)
lpop	109.0	104.1
	(188.7)	(172.8)
LPT		5.473*
		(3.248)
Constant	-955.2	-909.9
	(1,661)	(1,524)
Observations	90	90
R-squared	0.125	0.317
Number of ID	45	45

Robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Table 7

	Residential Permits	Residential Permits
2.ID	95.91	161.4
	(432.2)	(378.2)
3.ID	166.6	285.5
	(713.9)	(611.9)
4.ID	-13.28	-10.35
	(159.6)	(146.6)
5.ID	200.0*	146.5
	(118.6)	(100.8)
6.ID	115.9	190.8
	(554.4)	(482.3)
7.ID	270.1	363.6
	(908.9)	(800.7)
8.ID	235.1	359.8
	(875.9)	(759.6)
9.ID	-73.05***	-110.6***
	(22.28)	(36.35)
10.ID	87.67	149.4
	(441.2)	(384.3)
11.ID	144.7	233.9
	(627.9)	(544.1)

12.ID	227.8	307.1
	(800.3)	(706.7)
13.ID	266.6	423.5
	(968.3)	(833.5)
14.ID	214.8	325.4
	(776.3)	(673.0)
15.ID	-58.62	-57.74
	(312.8)	(285.6)
16.ID	-19.13	-0.317
	(103.2)	(88.80)
17.ID	352.3	411.0
	(1,079)	(968.0)
18.ID	200.8	267.4
	(342.4)	(297.3)
19.ID	142.6	210.3
	(518.9)	(454.0)
20.ID	57.72	123.9
	(492.8)	(424.2)
21.ID	186.5	309.4
	(767.2)	(660.0)
22.ID	166.8	269.8
	(698.4)	(603.9)
23.ID	-61.21	-133.1
	(101.4)	(137.5)
24.ID	190.5	269.1
	(716.6)	(630.5)
25.ID	42.01	79.11
	(213.7)	(184.6)
26.ID	152.4	233.7
	(638.8)	(557.9)
27.ID	-13.35	-113.5
	(302.3)	(254.0)
28.ID	103.7	185.2
	(557.3)	(480.5)
29.ID	103.5	189.2
	(574.3)	(494.7)
30.ID	247.7	368.8
	(868.0)	(753.6)

31.ID	-39.76	-34.88
	(46.82)	(44.70)
32.ID	57.78	111.8
	(367.8)	(319.5)
33.ID	380.6	670.4
	(1,301)	(1,099)
34.ID	87.10	156.8
	(507.7)	(440.1)
35.ID	203.3	332.5
	(807.9)	(695.4)
36.ID	107.9	172.9
	(453.1)	(396.9)
37.ID	298.0	445.0
	(1,028)	(891.7)
38.ID	182.6	274.1
	(714.7)	(623.6)
39.ID	-55.42	-73.47
	(185.4)	(176.1)
40.ID	145.4	243.9
	(643.3)	(554.3)
41.ID	257.6	324.7
	(850.7)	(757.1)
42.ID	30.50	16.88
	(270.4)	(250.6)
43.ID	165.2	267.9
	(710.9)	(615.7)
44.ID	364.6	459.7
	(1,133)	(1,005)
45.ID	315.0	466.5
	(1,067)	(925.2)
Survey.1	0	0
	(0)	(0)
Survey.2	9.259	12.42
	(14.99)	(14.92)
TOTAL	3.511	-46.02
	(2.967)	(40.10)
lpop	109.0	104.1
	(270.0)	(248.8)

LPT		5.473
		(4.677)
Constant	-1,094	-1,116
	(2,907)	(2,653)
Observations	90	90
R-squared	0.8893	0.9136
Number of ID	45	45

Robust standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.1