

Effects of an Enterprise Zone on the Denver Housing Market

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Abstract

This paper analyses what the effect of the Denver Enterprise Zone is on median housing values within Denver, CO. I study all values at the census tract level within the county. I compare the changes in median housing values between neighborhoods that are located in the Denver Enterprise Zone with those that are not between years 1990 and 2000 and between 2000 and 2010 to account for changes in the program and designation. This way I can look at if the implementation of the Enterprise Zone in Denver in 1986, just four years prior to my starting date, had any different impact on the trajectory of the housing values in the corresponding census tracts than those where the zone was not implemented. The results from regressing this comparison of changes in housing values between tracts in the zone and those not produced no statistically significant differences. The results in values were negative between 1990 and 2000 and positive between 2000 and 2010 but were not statistically insignificant.

Introduction

Recently Denver has seen rapid growth in housing prices and development of residential buildings. Shortly after an economic slump in the 1980's, Colorado took action to improve the community. In 1986 Colorado established a set of 8 Enterprise Zones spread through different counties. These zones are a Federal Program established in the 1980's to improve distressed communities. Businesses who operate and move into these zones are awarded tax incentives. These incentives include tax credits for business investments, and employment. After 1990, Denver has experienced population growth along with residential development. According to the

S&P/Case Schiller CO-Denver Housing price index (2020), we have seen steady growth in housing prices starting around 1990. Throughout that time period people have moved into the Denver area and subsequent growth in housing values has arisen. I look into if housing values increase more or less in Enterprise Zones relative to comparable non-Enterprise Zones. Are the larger areas of growth in the city in areas where there are tax incentives for movement of businesses?

Generally, people increasingly move in and near cities. As more people move into the city, housing supply becomes scarcer and therefore, housing prices increase. The reason for this increase in population and housing values is due mostly to industries arising within the city that require employees to live nearby. If there are incentives within one part of the city that is appealing and is targeted to increase productivity, this intuitively should have an effect on the real estate market. When people move into the city, do they prefer to move into areas where there are these incentives? This preference should be shown as part of the difference in housing values that I will explore.

In theory, the housing market would be affected from more business activity occurring nearby from long term tax incentives luring firms and employment in. According to the spatial equilibrium model (Glaeser Chap. 1, 2008), utility from a residential development varies with proximity to work because a closer commute is a more desirable amenity. According to this model, housing prices decrease as distance from the commercial development where individuals work increases. This decrease in value is proportional to the costs of commuting to work. Therefore, properties with closer commutes should be priced higher than those with longer commutes. Programs aimed towards stimulating the commercial and industrial markets, may have an effect on the real estate market in the surrounding area. If a program like the Enterprise

Zone program stimulates productivity, job growth, and commercial development in a community, housing values should increase in the close proximity to a growing urban center.

In this thesis I analyze the effect of the Denver Enterprise Zone on the change in median housing values in Denver from 1990 to 2000 and from 2000 to 2010. I will be studying census tracts located in an Enterprise Zone and their corresponding median housing values relative to tracts not located in an Enterprise Zone in Denver. I pulled the information on housing values and other variables that impact these values from the Neighborhood Change Database on Geolytics. This is tract level data from 1970 to 2010 in the U.S. derived from the U.S Census Bureau. The data on Enterprise Zone location is tract data extracted from a shapefile of the Enterprise Zone in Denver provided by the U.S. Census Bureau (2011).

In order to determine the effect of the Enterprise Zone on changes in median housing values, I run a first difference regression from cross sectional data looking at the difference in growth of median housing values from 1990 to 2000 and from 2000 to 2010 between census tracts in the Enterprise Zone and those not. By running a first difference regression, I can better estimate a causal effect by reducing the amount of endogeneity involved with underlying trends in housing values. I will be comparing trends in median housing values between tracts where part of the 1986 Enterprise Zone overlaps, and those where there is no overlap. I look at how much the median housing values change relative to 1990, four years after the zone was implemented, over a 10-year period for both sets of tracts. I also do the same for changes relative to 2000 to see if there is a change in trends within a 20-year period from changes in the city or Enterprise Zone. From this information, I can determine if placing a neighborhood in the Enterprise Zone aims the housing values of that neighborhood in a different trajectory than if they were not placed in this zone.

Previous Literature

Current literature regarding Enterprise Zones or similar programs look at several aspects of their effect on economic activity but are somewhat contrasting. My paper looks to add to current knowledge by proving evidence from Denver where there is limited existing research done in the area. I am also looking specifically into direct effects on housing values where there is also mixed evidence. In the following sections I compare my contribution to literature that deals with Enterprise Zones or similar programs on real estate, business entry, and employment.

Enterprise Zones and real estate

There is little existing evidence on the direct effects of Enterprise Zones on the housing market. One study by John Engberg and Robert Greenbaum uses housing values in small cities across 22 states to determine if Enterprise Zones lead to economic growth (1999). Their results showed no increase in housing values from Enterprise Zones, yet there was evidence that they may lead to lower vacancy rates and a tighter housing market (Engberg, J., & Greenbaum, R., 1999). Instead of picking out small cities in across the U.S. I will look into the effects within census tracts of one city and determine the concentrated effect of these programs. Similarly, a study by Marlon G. Boarnet and William T. Bogart on Enterprise Zones in in 28 municipalities in New Jersey between 1982 and 1990 showed no effect of these zones on property values (1996). This study analyzed effects at the census tract level as I do, yet I will be refining my study to Denver. Also, their study looks at municipal property values while I focus on housing values to analyze the effect on the residential real estate market specifically. A study from Matias Busso, Jesse Gregory, and Patrick Kline showed a large positive correlation between Enterprise Zones and owner-occupied housing prices (2013). One point that Jeffrey S. Zax and Devon

Lynch make on this discrepancy is that there may be different regulations on zoning and building type transformations that lead to different effects on the housing market (2010). They also note that depending on the industries arising, there may be different types of externalities on nearby residential areas (Lynch, D., & Zax, J. S., 2010). Housing prices may vary depending on the types of industries growing near residential areas. If these are industries like manufacturing that may make a lot of noise, we may see a decrease in nearby housing values. But if there are finance and tech centers arising, we may see a rise in nearby housing values. The credits provided are a little ambiguous with regard to what kinds of industries it promotes. So, we may see values go either way. As seen from conflicting results from these studies, there is more information needed to answer this question.

I expand on this knowledge by studying how correlated the Enterprise Zones are with housing values in Denver. The advantages of restricting this study to just Denver is because of the steady housing price growth it has seen over the years. This means that Denver has seen movement of people into the city and that businesses have been relatively productive. If the entire city was distressed over the years, it would be harder to track growth in housing values. I provide some more insight into the effects of these zones within the county level, instead of the state, or country level. This will isolate the urban environment where we see more unified trends in housing markets, spatial equilibrium, and industries. Housing trends may vary between rural and urban areas because there are different types of industries, commuting methods, zoning, and demand for housing. Within cities we tend to see centers where people work, with their housing nearby as commute times are a valuable amenity. This along with scarcer housing supply from a concentrated population trying to live in the same area drive up housing prices. This kind of environment is perfect for analyzing the effect of incentives for increases in businesses and

employment in an area because we see a higher concentration of people moving into the area and working there than in a rural area. By doing this, I will provide a specific approach to analyzing housing market effects.

Enterprise Zones and Business Entry

There is contrasting literature on Enterprise Zones and their effect on job growth and entry of new businesses. In theory, tax credits for businesses operating in an Enterprise Zone should increase profit margins for firms, motivating entry into that area. This should influence an increase of residents in the zones with individuals who work at these businesses. Often when businesses move, so do their employees and managers. Also, there may be a decrease in the amount of residential buildings from development of commercial property which would lead to heightened home values.

Interestingly though, a couple studies show there is little effect of tax incentives from Enterprise Zones on new entry. Gilles Duranton, Laurent Gobillon, and Henry G. Overman studied the effects of taxation on employment and business entry and that taxation has little effect on business entry (2011). This would imply that Enterprise Zones will have little effect on movement of business and possibly not much change in the real estate sector. Billings (2008) analyzed differences of new entry and employment between Enterprise Zone areas and non-Enterprise Zone areas. This study showed that Enterprise Zones had no effect on the movement of new establishments. While this study looks at Enterprise Zones in Colorado, it only observes areas in close proximity to the border of the Enterprise Zones. Although this may be good to restrict the sample to areas with similar characteristics, however my study will instead look more generally at differences in entire tracts inside and outside of the Enterprise Zone. This will help control for effects of the Enterprise Zone spilling over into the surrounding area. If there is

movement of people into the surrounding area of an Enterprise Zone, some of these residents may be moving just outside of the Enterprise Zone boundaries. Therefore, we could see a higher increase in housing values outside of the Enterprise Zone if we were just comparing areas at the boundaries.

The findings from these studies challenge the idea that new commercial buildings in these zones will push out residential developments, raising the housing prices. These findings would lead us to think there would be a minimal effect on housing prices from the implementation of Enterprise Zones. My research should add additional specific information to this theory and provide evidence for the city level in Denver. This way I can analyze the effects of these zones at the urban level, therefore reducing the inconsistencies with the different industries associated with different geographies of the state. I can also see relatively how much these zones had an impact on the growth of housing prices we have seen in Denver overall. If there is a much larger margin of growth in values within the Enterprise Zone, we could imply the Enterprise Zone could have had an impact on the overall average increase in housing prices in Denver.

Enterprise Zones and Employment

There is also mixed existing results on whether these zones lead to growth in jobs. Proximity to work and avoidance of traffic and commuting is valuable to many individuals. Therefore, we may see an increase in the value of residential buildings in the area if there are more employees living in these zones. One of the first papers written on the effect of Enterprise Zones on employment was one done by Leslie E. Papke in 1991 which looked at changes in assets and unemployment in jurisdictions in Indiana containing Enterprise Zones and those not. This study found a decrease in unemployment claims in communities surrounding zones relative

to what it would be without a zone (Papke, 1991). The work from Gilles Duranton, Laurent Gobillon, and Henry G. Overman show that taxation has a negative effect on employment (2011), this would suggest that tax incentives would lead to an increase in employment rates. Another relevant study looked at the effects of federal urban Empowerment Zones which also provide similar credits as Enterprise Zones on employment and wages in the U.S. between 1980 and 2000 (Busso, M., Gregory, J., & Kline, P., 2013). This study found a positive correlation between Empowerment Zones and employment (Busso, M., Gregory, J., & Kline, P., 2013). The results of Stephen Billings' study show the same trend (2008).

In contrast, the study from Marlon G. Boarnet and William T. Bogart showed no effect of these zones on municipal employment (1996). Similarly, the article by Jeffrey S. Zax and Devon Lynch on the employment effects of these zones in Colorado show that there was no overall effect of these zones on employment (2010). From the findings of these studies we cannot say for sure what employment outcomes are from Enterprise Zones. Therefore, it is not clear what this implies for the housing market. If there is a change in employment as a result of Enterprise Zones, there is reason to believe there are also effects on the housing market. But, if there is no effect on employment, then there still may be changes in housing prices from other factors like changes in zoning or building types, externalities from a certain industry, or a different wealth group moving into the area.

My study will look at if there is any stimulation in the housing market which could be because of any one of those potential outcomes. I will be focusing on Denver housing values as the dependent variable, as Denver has seen much growth in the real estate industry and has held an Enterprise Zone for a long period of time. And by using housing values as the dependent variable, this will show directly what the impacts of these zones are on the housing market. I will

also be using tract data as done by Boarnet and Bogart (1996), but just refining it to Denver as Enterprise Zones may have different effects on the types, amount, and value of real estate development across urban and rural areas. We tend to see trends in housing preferences play into effect in cities where the industries are similar and there is usually a core where most businesses are (Glaeser Chap. 1, 2008). Therefore, by isolating my study to within Denver, I can get a better grasp of the effects of implementation of Enterprise Zones on the real estate market within an urban environment. Comparing census tracts within the city that are either located in the Enterprise Zone or not will be a worthy sample because census tracts have roughly the same population, and I will be able to compare areas with a similar urban environment and demographics. This way I can compare trends of similar neighborhoods all within a county where there is a denser concentration of businesses and residents with regards to the implementation of the Enterprise Zone in some and not others.

Enterprise Zone History

The Enterprise Zone is a Federal Program that was introduced in Colorado in 1986. This program is aimed to improve distressed communities by offering tax incentives to entice businesses to move into these areas with the hopes of improving employment and investment in the community. Neighborhoods qualify to be designated as an Enterprise Zone if they have high unemployment, low per-capita income, and slow population growth compared to the state average. The following states useful information over the years that I am studying on the Enterprise Zone and the changes made to the program and control of it from the Colorado Office of Economic Development & International Trade.

The Colorado Enterprise Zone was designed as a pilot program in 1986 with only eight zones and was scheduled to end in 1990, but they later expanded the number of zones and kept

pushing the sunset date later and later until they eventually removed the sunset date in 1991. When it was established, it initially provided credits for investment, employment, and manufacturing equipment sales. Over the years it added credits for research and development in 1988, investing in vacant buildings in 1989, employee health insurance in 1987, agricultural processing in 1987, renewable energy in 2015, among a variety of specific actions a firm can take that improves the community. When the program started out, the maximum population in each zone was 50,000, this changed to 80,000 people in 1996, to 100,000 people in 2002, and then to 115,000 people in urban areas and 150,000 people in rural areas in 2010.

Throughout the zones' existence, control and timing of Enterprise Zone designation, requirements, termination periods, boundaries, and amounts of credits has changed. In 1992 they made the maximum timeframe businesses could still receive credits after termination of the zone five years, and in 2002, it changed to 10 years. This originally pertained to the employment credit, there were extensions made for unused investment and employee health insurance in 1996. The responsibility of determining boundary review and termination of non-qualifying zones was given to the Economic Development Commission in 1996. In 1999 they created a five-year cycle for review of the boundaries but was repealed in 2002.

There are currently 16 Enterprise Zones in Colorado and designations are reviewed every 10 years. In order for an area to receive credit they must meet at least one of three criteria: per-capita income less than 75% of the state average, unemployment rates greater than 25% of the state average, or population growth rates under 25% of the state average. Population must also be under 115,000 people for urban areas to qualify. There are currently credits for investment in personal property, job training, new employees, research and development, vacant building rehabilitation, and commercial vehicle investment.

Data

In order to study the relationship between Enterprise Zones and median housing values in Denver, I needed a relevant sample that compared similar neighborhoods where some of them are in the Enterprise Zone and some of them are not. To do this I compared census tracts and pulled information on corresponding median housing values and other relevant variables at the tract level. I needed this data to be from shortly after the designation of the Denver Enterprise Zone, so I chose years 1990, 2000, and 2010 to pull values for. I also needed information on the boundaries of the Enterprise Zone and which tracts were inside of it, so I used GIS to find the intersection of census tracts with the Enterprise Zone.

I analyze observations at the census tract level. Information on census tracts are found from Geographic Products Branch at the U.S. Census Bureau. A census tract is a fraction of a county, more like a neighborhood where individual data is aggregated to that specific tract. Census tracts are designated to be coarsely permanent and all have roughly the same population. This way I can analyze data between neighborhoods within a county. I can also be able to compare areas with similar populations that don't change much over time. The tracts also match up well with the boundaries of the Enterprise Zones. That said, there is not a perfect match, but tracts within the zone are almost completely filled by the zone, while there is very little overlap of the zones into the tracts that are not directly in the zone.

Since the Enterprise Zones were established in 1986 in Colorado, the 1990, 2000, and 2010 years serve as a relevant time period for this study. The sample is the census tracts in Denver. The dependent variable I analyze is the log of median housing value changes between 1990 and 2000 and between 2000 and 2010 for each tract. This is the difference in the log of

median housing values between 1990 and 2000 and between 2000 and 2010. Although I assume that the census tracts and Enterprise Zone boundaries stayed relatively permanent from the beginning of my study to 2011 (the year of the Enterprise Zone boundary data), there may have been minor changes to the census tract boundaries between 1990 and 2010, or changes to the zone designation, boundaries, and credits offered, from 1990 to 2011. Therefore, I run a regression between 1990 and 2000 and between 2000 and 2010 to help account for any changes that may have occurred to either the Enterprise Zone, or the census tract boundaries, in the 20-year time period I study. Analyzing these two 10-year time frames back to back can also help show if there were any changes the city experienced that changed the effect of the Enterprise Zone on housing values. The dependent variable along with controls are extracted from Geolytics. This database provides information at the tract level for every ten years, but the tracts do not change from year to year (Geolytics). This way I am able to easily compare trends between tracts over time, without worrying about changes to the tracts.

The key variable I will be working with is an indicator variable for if a tract intersects the Denver Enterprise Zone. This variable is created from the boundaries of all census tracts in Denver overlaid with the boundaries of the Denver Enterprise Zone on GIS. The files of information on the census tracts and Enterprise Zone boundaries are from the U.S. Census Bureau (2011). The intersection of the Enterprise Zone boundaries over the census tracts were then calculated and those Geo ID's corresponding to the intersected tracts were merged with those from the other variables from Geolytics and turned into a dummy variable. This variable is created from using the 1990 Geo ID's from the tracts that intersect the Enterprise Zone. I set the variable corresponding to any tract equal to 0 if it is not one of the Geo ID's corresponding to the intersection, and 1 if it is a Geo ID corresponding to the intersection.

In order to reduce endogeneity from differences in neighborhoods inside and outside of the Enterprise Zone that puts the neighborhoods' housing values in different trajectories. We want to assume that from before 1990 and onward, the census tracts studied would have the same trend in housing values if there was no Enterprise Zone designated, so we want all of the tracts being analyzed to be similar. Taking into account the requirements the Fed places for a neighborhood to be entered into the Enterprise Zone, I look at income and unemployment rates as restrictions to the data. Unlike the requirement that takes into account average per capita income, I look at average household income.

Due to a small number of tracts being studied, I am unable to restrict the data to meet the requirements of Enterprise Zone designation, or even the state averages for income and unemployment levels. In the 1990 data, there is a total of 124 tracts being studied where 52 of them are in the Enterprise Zone. In the 2000 data, there is a total of 123 tracts being studied where 57 of them are in the zone. So, I run separate regressions where one eliminates the top 10 tracts with the highest average household income, another dropping 10 tracts with the lowest unemployment rates, and another excluding the 10 tracts with the lowest poverty rates. This excludes the census tracts that could differ the most from the ones that receive the Enterprise Zone. This way, the tracts may not be perfectly alike, but they have closer similarities and a better chance of having similar housing trends. Taking only 10 observations out at a time, also allows me to have a large enough sample to be relevant.

Methodology

I run a first difference regression comparing median housing value changes in each tract between 1990 and 2000, and between 2000 and 2010, to determine whether Enterprise Zone implementation has an effect on the trajectory of housing prices.

Equation 1:

$$\Delta Y_i = \beta_0 + \beta_1(E.Z.)_i + X_i\beta_1 + \varepsilon_i$$

Subscript i represents the census tract for where trends are being analyzed. The variable ΔY_i is the difference in the log of median housing values between 1990 and 2000, and between 2000 and 2010, relative to the what tract it is in. The coefficient β_0 is how many percentage points the median housing values change for neighborhoods not designated as zones. The coefficient β_1 looks at how many percentage points more or less the change in median housing values are between tracts intersecting the Enterprise Zone and those not. The variable E.Z. is the dummy variable for if the census tract intersects the zone or not (1 if it does, 0 if it does not) with regards to what tract it is in as of 1990 or as of 2000. The vector of controls is noted as $X_i\beta_1$. This includes total number of housing units, the time period the houses were built, vacant housing units, population, unemployment rate, proportion of population with poverty status, and average household income. These controls are all 1990 or 2000 variables as they may have had an impact on housing growth trends regardless of Enterprise Zone designation. The variable ε_i represents residual characteristics not observable to me that change over time at the tract level. In order for this to hold, I make the assumption that there is conditional mean independence where Enterprise Zones are not correlated with any of these unobservables.

Analysis

Table 1.

1990	Zone	Non-Zone	Total
Median Housing Value			
mean	\$ 72,236.54	\$ 84,187.50	\$ 79,175.81
sd	\$ 25,505.53	\$ 41,521.37	\$ 36,054.98
Population			
mean	3773.962	3153.528	3413.71
sd	1314.472	1336.749	1357.341
Poverty Proportion			
mean	0.2295	0.132	0.1729
sd	0.1496	0.1223	0.1423
Unemployment			
mean	0.0894	0.0573	0.0708
sd	0.0476	0.0439	0.048
Average Household Income			
mean	\$ 28,031.29	\$ 37,072.65	\$ 33,281.11
sd	\$ 10,497.95	\$ 17,394.90	\$ 15,505.61
Total Housing Units			
mean	1836.635	1681.653	1746.645
sd	801.3524	797.7104	799.6745
Vacant Housing Units			
mean	229.5577	192.5278	208.0565
sd	171.3799	160.4931	165.479

When looking at the differences in median housing values as of 1990, we can see that initial values on average are lower in zones than non-zones by about \$11,000. We can see the unemployment rates were on average about 3% higher in the neighborhoods that were designated as zones than those that were non-zones. The average household income was about \$9,000 less for the neighborhoods that were designated as zones than those that were non-zones. Poverty rates were on average 10% greater in zones than non-zones. These are all differences that could set median housing values in different trajectories for the separate set of tracts that receive a tract than those that do not. Therefore, we can imply that many neighborhoods that were designated as Enterprise Zones had different demographics and housing trends to start with. From this information I use these differences to set restrictions on all tracts so that I am comparing

neighborhoods that have similar demographics and housing trends to eliminate any endogeneity from differences between zones and non-zones.

Table 2.

2000	Zone	Non-Zone	Total
Median Housing Value			
mean	\$ 153,440.40	\$ 225,693.90	\$ 192,210.60
sd	\$ 58,252.55	\$ 90,975.54	\$ 85,299.72
Population			
mean	4395.877	3685.242	4014.561
sd	1535.018	1290.871	1447.751
Poverty Proportion			
mean	0.1856	0.1048	0.1423
sd	0.1129	0.07785	0.1035
Unemployment			
mean	0.073	0.0472	0.0592
sd	0.1129	0.0779	0.1035
Average Household Income			
mean	\$ 46,091.90	\$ 65,053.99	\$ 56,233.31
sd	\$ 13,439.08	\$ 28,335.57	\$ 24,525.64
Total Housing Units			
mean	1830.579	1900.848	1868.285
sd	786.8992	765.9159	773.3129
Vacant Housing Units			
mean	75.6667	102.2576	89.935
sd	50.8153	87.9751	74.0682

We can see from the year 2000 statistics in Table 2 that those differences in values between zones and non-zones still exist. There has been large growth in housing values from 1990 to 2000 for all tracts regardless of if they were in a zone or not. Yet, the housing values are still quite a bit lower for the tracts that were designated as an Enterprise Zone by about \$70,000 on average. We can see there was about a 112 percentage point increase for average median housing values in neighborhoods corresponding to with the zone, and about a 169 percentage point increase for non-zones. Population slightly increased for both sets of tracts and was still higher in the tracts corresponding to zones. Unemployment rates, however, have decreased for

both zones and non-zones, but there is still about a 3% difference between the two. Poverty rates decreased in both zones and non-zones, but there was still around an 8% difference between the two tracts. Average household income increased for most tracts but was still higher for non-zones and the disparity increased to about \$19,000.

Considering the housing values increased for both zones and non-zones, but there was still a difference between the two, I run the first difference regression to see if there was any convergence or divergence between these tracts.

Results

Table 3.
No Restrictions

	1990 to 2000	2000 to 2010
Enterprise Zone	-0.556 (0.439)	.5231 (0.344)
Population	-0.001 (0.0)	0.0002 (0.0002)
Unemployment	-12.292 (8.077)	-4.3459 (5.2209)
Poverty Proportion	1.343 (2.951)	-5.9167 (2.2584)
Average Household Income	0 (0)	0 (0)
Total Housing Units	0 (0.001)	-0.0008 (0.001)
Vacant Housing Units	-0.001 (0.0025)	-0.0043 (0.0035)

Notes: Standard error in parentheses

Interpretation of β : $e^\beta - 1$

Interpretation of "-.55": Increase in median housing value between 1990 and 2000 is on average 73 percentage points less for zones than non-zones

Running a regression on this relationship without any restrictions in place, we cannot say there is a statistically significant effect of Enterprise Zones on housing values. We can see in

Table 3. that there was a negative coefficient for β_1 associated with about 73 percentage points less of an increase for zones than non-zones on average. This is not statistically significant at a 95% confidence interval given the p-value was .204 and a relatively large standard error of .439. When looking at the results for effects between 2000 and 2010 we see there is a positive coefficient for β_1 associated with about 69 percentage points greater of an increase for zones than non-zones on average. Yet the β_1 estimate for 2000 to 2010 is also statistically insignificant.

Considering this, I run another restricted regression where tracts with the top 10 average household incomes are dropped.

Table 4.
Income Restriction

	1990 to 2000	2000 to 2010
Enterprise Zone	-0.678 (0.454)	0.576 (0.366)
Population	-0.001 (0)	0 (0)
Unemployment	-10.546 (8.295)	-4.45 (5.632)
Poverty Proportion	-1.186 (3.23)	-5.832 (2.657)
Average Household Income	0 (0)	0 (0)
Total Housing Units	0 (0.001)	-0.001 (0)
Vacant Housing Units	-0.002 (0.003)	0.004 (0.004)

Standard error in parentheses

Interpretation of β : $e^\beta - 1$

Interpretation of "-0.678": Increase in median housing value between 1990 and 2000 is on average 96 percentage points less for zones than non-zones

Table 4 shows the results after eliminating the top 10 tracts with the highest average household income. We can see the coefficients did not change much and the corresponding

standard errors were still relatively large for the β_1 coefficients for both 1990 to 2000 and 2000 to 2010 time periods. Even though income per capita is a requirement for the designation of Enterprise Zones, we can see from Table 3 that there was basically no presence of an effect of household income on median housing values. Unemployment rates were also criteria for the designation of Enterprise Zones, and were higher for zones than non-zones, so I took another regression where the 10 tracts with the lowest unemployment rates were dropped.

Table 5.
Unemployment Restriction

	1990 to 2000	2000 to 2010
Enterprise Zone	-0.392 (0.32)	0.594 (.378)
Population	0 (0)	0 (0)
Unemployment	0.023 (6.266)	-5.486 (5.544)
Poverty Proportion	2.093 (2.357)	-6.236 (2.407)
Average Household Income	0 (0)	0 (0)
Total Housing Units	0.001 (0.001)	-0.001 (0.001)
Vacant Housing Units	-0.002 (0.002)	0.004 (.004)

Standard error in parentheses

Interpretation of β : $e^\beta - 1$

Interpretation of "-0.392": Increase in median housing value between 1990 and 2000 is on average 47 percentage points less for zones than non-zones

Similarly, we can see from Table 5 of the regression results where the ten tracts with the lowest unemployment rates dropped, there are still statistically insignificant results for the β_1 coefficient. Between 1990 and 2000, the coefficient of β_1 became less negative at -0.392, this

time corresponding to 47 percentage points less of an increase for zones than non-zones. The standard error did decrease slightly from the previous regressions, but it is still large relative to the coefficient at .32. We also see a high p value of .139, making this result statistically insignificant.

The descriptive statistics show a 10% difference in poverty rates between zones and non-zones in 1990, and an 8% difference in 2000. This difference could lead to endogeneity in the trajectory of housing values, so I ran another regression where the 10 tracts with the lowest poverty proportions were dropped.

Table 6.
Poverty Restriction

	1990 to 2000	2000 to 2010
Enterprise Zone	-0.472 (0.39)	0.523 (0.361)
Population	-0.001 (0)	0 (0)
Unemployment	-7.392 (7.271)	-4.256 (5.669)
Poverty Proportion	4.922 (2.791)	-6.043 (2.503)
Average Household Income	0 (0)	0 (0)
Total Housing Units	0.001 (0.001)	-0.001 (0.001)
Vacant Housing Units	-0.001 (0.002)	0.004 (0.004)

Standard error in parentheses

Interpretation of β : $e^\beta - 1$

Interpretation of "-0.472": Increase in median housing value between 1990 and 2000 is on average 60 percentage points less for zones than non-zones

From Table 6 that shows regression results from the 10 tracts with the lowest poverty proportions, we can see very similar trends to the previous regressions in the results for β_1 . The standard errors and p-values have not changed much relative to the magnitude of the β_1 coefficient, therefore making these results statistically insignificant as well.

Conclusion

From the findings of this study, I cannot say for certain the effects of an Enterprise Zone on housing values in Denver. When running a first difference regression on the differences between changes in median housing values between 1990 and 2000 and between 2000 and 2010, we see that between 1990 and 2000 there was a large percentage difference between tracts in the zone and tracts outside of the zone. Tracts inside of the zone saw less of an increase in housing values. Between years 2000 and 2010, we see the tracts inside of the zone saw a larger percentage point increase in housing values than those outside of the zone. Yet these results were not statistically significant. When running the same regression, but with restrictions on average household income, unemployment rates, and poverty proportions, we saw the same results.

From the change in the coefficient representing the relative difference in the change of housing values for the 10-year time periods, we could imply that changes to the city, or the Enterprise Zone program could have led to different trends in housing values between zones and non-zones. Yet there is not enough evidence for this in my study. These results are similar to those of John Engberg and Robert Greenbaum in that there is little direct effect of the Enterprise Zones on housing values (1999). These findings also contribute to those of Marlon G. Boarnet and William T. Bogart that found no increase in municipal property values (1996), by providing evidence of no statistically significant effects of Enterprise Zones on residential housing values. However, this is in contrast to the results from Matias Busso, Jesse Gregory, and Patrick Kline

who found large positive correlation between Enterprise Zones and owner-occupied housing prices (2013).

One thing I did not account for were the industries being targeted and arising in Denver in this time period. This was one dilemma briefly discussed by Jeffrey S. Zax and Devon Lynch (2010). Certain industries that the Enterprise Zone encourages, could either promote or hinder the residential development around the area. For instance, if the Enterprise Zone is more beneficial for manufacturing industries, it may be undesirable for residents to live near, therefore lowering values of houses in the area. But if the industries moving in the area are more associated with tech or finance, housing prices around the area may be higher. We may see a change in industries in Denver throughout the timeframe studied. Also, there may have been a variety of different types of industries across tracts both within the zone and outside. Not controlling for the concentration of industries in and arising in these areas is one limitation of this study.

Some of this uncertainty also could be from the restriction to Denver county. Studying tracts restricted to just Denver county isolate the urban environment where we should see similar trends in housing values. Also, by studying a growing city, we can compare trends well. Yet, by isolating to my study to just Denver county, I have a limited amount of observations. With a smaller sample comes higher standard error and a less precise estimate. I also have limitations with regards to setting restrictions based on neighborhood demographics. My study is subject to endogeneity from differences in demographics between the tracts in the Enterprise Zone and those outside. Ideally, I could restrict the data to the levels of income and unemployment that are required for zone designation. That way I would be able to compare similar neighborhoods that

are more likely to have the same trends in housing values if there was no zone designation. In order to do that more cities, larger cities, or more counties would have to be included.

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