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Do opportunity zones create opportunities? The impact of opportunity zones on real estate prices

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Abstract

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Keywords: opportunity zones, tax incentives, place-based development policies, regression discontinuity estimation
JEL codes: H24, I38, O23, R38

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The impact of opportunity zones on real estate prices

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ABSTRACT
The Tax Cuts and Jobs Act of 2017 allowed governors of the fifty states to designate low-income areas as "Qualified Opportunity Zones" (QOZs). This designation entitled investors in these QOZs to significant tax incentives, with the goal of creating economic opportunities in these areas. In this paper we estimate the impact of QOZ designation on several dimensions of economic development – residential and business real estate prices – using data from Florida for the period 2016-2020 and controlling for endogenous QOZ designation in several estimation approaches. All estimation results indicate little consistent and robust evidence that QOZ designation had a positive impact on sales prices for single family homes, commercial lots, or vacant lots.

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1. INTRODUCTION

The Tax Cuts and Jobs Act (TCJA) of 2017 allowed governors of the fifty states to designate some low-income areas as special "Qualified Opportunity Zones" (QOZs). This designation entitled the investors in these QOZs to significant tax incentives, with the goal of encouraging investments in low-income communities that would increase economic opportunities in these areas.[1] There is increasing attention on place-based policies as a tool for increasing economic development (Glaeser and Gottlieb, 2008; Neumark and Simpson, 2014; Duranton and Venables, 2018), in part because of mounting evidence that the neighborhood in which one lives has a profound and lasting impact on one's economic prospects (Chetty and Hendren, 2018a, 2018b; Chetty et al, 2022a, 2022b). As a large, costly, federal place-based program that is intended to expand economic development, understanding whether QOZs are achieving their goals is essential for current and future policy discussions. Indeed, as noted later, there have already been discussions about limiting and even eliminating the opportunity zone program, despite its recent enactment. In this paper we estimate the impact of QOZ designation on several dimensions of economic development – business and residential real estate prices – using data from Florida for the period 2016-2020 and controlling for endogenous QOZ designation in several different estimation approaches. Across all of these estimation strategies, we find little consistent and robust evidence that QOZ designation has had a positive impact on sales prices for single family homes, commercial lots, or vacant lots.

A "Qualified Opportunity Zone" (QOZ) is a designated low-income census tract within a state, selected by the governor of the state from those census tracts in the state that meet

[1] The U.S. Government Accountability Office (GAO) has recently estimated that $29 billion were held in opportunity zone asset funds as of October 2021. See GAO (2021).

specified eligibility requirements, with investments in a QOZ then eligible for a range of generous tax incentives. The TCJA specified that a census tract must meet at least one of two criteria to qualify as a low-income census (LIC) tract, thereby becoming eligible for nomination as a QOZ: the poverty rate in the census tract must be at least 20 percent, and/or the median family income in the census tract must be less than or equal to 80 percent of either the statewide median family income or the metropolitan area median family income (where applicable), whichever is higher. The governor of each state can then nominate up to 25 percent of these LIC tracts in the state as QOZs, and up to 5 percent of all QOZs nominated can be non-LICs if these census tracts are geographically contiguous with an LIC. This process was a one-time process that was completed before the end of 2018, and in December 2018 the U.S. Department of the Treasury finalized its certification of QOZs.

The stated intention of the QOZ incentives was to encourage investment in these low-income areas in order to improve incomes, jobs, and economic development in areas that were seen as lagging behind in opportunities, especially opportunities for minority groups. These tax incentives are of several types, of which the main ones relate to the treatment of realized capital gains on the investments. As discussed in more detail later, there is a temporary deferral of realized capital gains from a sale of an investment outside of a QOZ investment, if the realized gains are reinvested in a QOZ. Also, there is a step up in basis of 10 percent if the investment stays in the QOZ for 5 years and a step up in basis of 15 percent if the investment is held for 7 years. Finally, all capital gains from the sale of an investment in an QOZ are excluded from taxable income if the investment is held for at least 10 years. In their entirety, these tax incentives create significant tax breaks for investors, tax breaks that are of more value to higher income investors.

In total, the U.S. Department of the Treasury designated 8764 qualified opportunity zones (QOZs) in the fifty states and in Washington, D.C., Guam, Northern Mariana Islands, Puerto Rico, Samoa, and the Virgin Islands, from 42,160 potential census tracts out of a nationwide total of 74,163 census tracts.[2] All tracts that were nominated by the governor and subsequently certified by the Secretary of the U.S. Department of the Treasury became designated QOZs, and investors in these QOZs became eligible for the tax incentives. As a result, each governor's designation provided an opportunity for the governor to introduce investments in low-income communities that would, in principle, increase economic opportunities in these areas.

The tax incentives included in QOZs are similar to a range of "place-based development policies" that have been utilized over the years. In the United States, these place-based development policies include programs like Enterprise Zones, Renewal Communities, Enterprise Communities, the New Market Tax Credit, the Historic Tax Credit, and the Low-income Housing Tax Credit. There are also place-based policies around the world, such as Structural Funds and Enterprise Zones in the European Union and Special Economic Zones in China, among many other programs. The specific provisions of these many programs vary, but the common feature is the use of targeted incentives that are intended to encourage investment in underperforming areas. There has been much research that has examined the impact of these policies on economic development. Overall, this research has found that the success of these

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[2] The various government regulations for OZs include, among others: "Investing in Qualified Opportunity Funds", available online at https://www.federalregister.gov/documents/2018/10/29/2018-23382/investing-in-qualified-opportunity-funds; "Investing in Qualified Opportunity Funds", available online at: www.federalregister.gov/documents/2019/05/01/2019-08075/investing-in-qualified-opportunity-funds; "Treasury, IRS issue proposed regulations on new Opportunity Zone tax incentive", available online at https://www.irs.gov/newsroom/treasury-irs-issue-proposed-regulations-on-new-opportunity-zone-tax-incentive; and "Special Rules for Capital Gains Invested in Opportunity Zones", available online at https://www.irs.gov/pub/irs-drop/rr-18-29.pdf. See also Novogradic (2018), Eastman and Kaeding (2019), Nitti (2019), Tankersley (2019), and Tax Policy Center (2019) for useful information.

policies is decidedly mixed, both in the United States and abroad (Bartik, 1991, 2003, 2019; Ladd, 1994; Papke 1994; Peters and Fisher, 2002; Bondonio and Greenbaum, 2007; Billings, 2009; Hanson, 2009; Neumark and Kolko, 2010; Bowers et al., 2011; Ham et al., 2011; Hanson and Rohlin, 2011, 2013; Accetturo and de Blasio, 2012; Freedman, 2015; Gobillon, Magnac, and Selod, 2012; Givord, Rathelot, and Sillard, 2013; Reynolds and Rohlin, 2014; The World Bank, 2015; Jenson 2018).[3] Indeed, initial studies on QOZs by Chen, Glaeser, and Wessel (2019), Theodos, González, and Meixell (2020), Atkins et al. (2020), Corinth and Feldman (2020), and Freedman, Khanna, and Neumark (2021) find that OZs are not having their hoped-for impacts, while Arefeva et al. (2020), Bekkerman et al. (2021), and Sage, Langen, and van de Minne (2023) find more encouraging if still somewhat mixed impacts on such outcomes as jobs and real estate prices.

Given the relative newness of the opportunity zone program, nationally representative data are not yet publicly available on its possible impacts. Accordingly, we use comprehensive and representative Florida data for the period 2016 to 2020 to estimate the impact of QOZ designation on residential and commercial real estate prices. Our underlying assumptions are that the Florida experience (including its data) is broadly representative of other states[4] and that any economic development generated by QOZ designation will likely be capitalized into real estate prices.[5] Our simplest estimation method uses OLS methods, with the main explanatory variable

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[3] See Glaeser and Gottlieb (2008), Neumark and Simpson (2014), and Duranton and Venables (2018) for comprehensive surveys of this literature.

[4] As discussed in detail later, Florida has very detailed and comprehensive information on properties. Importantly, Florida's opportunity zones and its selection process are overall quite similar to the rest of the United States, at least prior to the enactment of the TCJA. Overall, then, our results should be representative of a significant portion of the states.

[5] It is of course possible that there may be other outcomes from opportunity zone funds that may not surface in real estate prices, and, in circumstances where this capitalization does not occur, our analysis will not capture these impacts. Note, however, that we do examine the impact of QOZ designation on other potential outcomes, such as the impact on non-vacant real estate prices and on the frequency of sales.

of interest a dummy variable for whether or not an area is designated as a QOZ. However, estimating these price effects is complicated by the endogenous nature of QOZ designation. Alm, Dronyk-Trosper, and Larkin (2021), Eldar and Garber (2021), and Frank, Hoopes, and Lester (2022) examine the factors associated with QOZ selection, and all find evidence that determine QOZ designation is more likely in areas that have higher rates of unemployment, higher levels of welfare receipt, and lower median income, all of which are consistent with the presumed goals of QOZs; these studies also demonstrate the importance of several political drivers.[6] These studies therefore indicate that QOZ selection is endogenous, dependent on specific determinants of the eligible areas, and this endogenous selection must be considered in any estimations of the effects of QOZ designation on economic opportunities. Accordingly, we also apply a fuzzy regression discontinuity (RD) methodology, using the income and poverty rate cutoffs to compare similar census tracts, in order to address potential endogeneity of QOZ designation.

Overall, we find little consistent and robust evidence that QOZ designation had a positive impact on sales prices for single family homes, commercial lots, or vacant lots. As for other potential QOZ effects, we also find no evidence that QOZ designation has affected non-vacant real estate prices or the frequency of sales.

Our paper makes several contributions. Examining the impacts of QOZ designation is a challenging enterprise, given especially the newness of the program, the difficulties in finding comprehensive and representative information on potential impacts, the challenges in addressing endogeneity issues, and the problems in identifying causal impacts of QOZ designation. Our

[6] Theodos, Meixell, and Hedman (2018) also examine QOZ selection, although their analysis of QOZ selection relies mainly on simple comparisons of the mean characteristics of OZs that are selected versus those not are designated for QOZ selection. See also Theodos and Meixell (2018), who apply similar methods to the specific case of California.

paper is among the first to address all of these challenges in a comprehensive way. As discussed in the Conclusions, there is much more work that needs to be done to assess more fully this place-based program. However, we believe that our paper is an important first step.

Note that opportunity zones have faced increased criticism along multiple dimensions, including the politicization of initial QOZ designation[7], their unintended consequences[8], and the anticipated failures of QOZ designation[9], and these criticisms have even made their way into recent high-profit entertainment programs.[10] Some politicians have already begun crafting bills to address these criticisms, including the complete termination of the QOZ program.[11] We do not discuss these dimensions of the QOZ program.

In the next section, we discuss the details of opportunity zones. We then present our data and methods, followed by our results. We conclude in the final section.

2. WHAT IS AN "OPPORTUNITY ZONE"? DEFINITIONS AND TAX INCENTIVES

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[7] See "A Trump Tax Break To Help The Poor Went To a Rich GOP Donor's Superyacht Marina", available online at https://www.propublica.org/article/superyacht-marina-west-palm-beach-opportunity-zone-trump-tax-break-to-help-the-poor-went-to-a-rich-gop-donor. See also "Symbol of '80s Greed Stands to Profit from Trump Tax Break for Poor Areas", available online at https://www.nytimes.com/2019/10/26/business/michael-milken-trump-opportunity-zones.html.

[8] See "Fixing America's Forgotten Places – Opportunity Zones, created by Trump's tax law, are meant to help the heartland thrive and make the country more equal, but can they pull it off?", available online at https://www.theatlantic.com/ideas/archive/2018/07/how-do-we-help-this-place/565862/.

[9] See: "The Problem with Opportunity Zones", available online at https://www.citylab.com/equity/2018/05/the-problem-with-opportunity-zones/560510/; "How a Trump Tax Break to Help Poor Communities Became a Windfall for the Rich", available online at https://www.nytimes.com/2019/08/31/business/tax-opportunity-zones.html; "Trump Tax Break That Benefited the Rich Is Being Investigated", available online at https://www.nytimes.com/2020/01/15/business/trump-opportunity-zone-investigation.html; and "Developers Rushing to Opportunity Zones for Tax Break, But Is It Helping Louisiana's Low-Income Areas?", available online at www.theadvocate.com/new_orleans/news/business/article_0ddb2d22-2576-11e9-bde9837b83173a57.html.

[10] See the episode of the HBO series *Billions* entitled "Opportunity Zone", in which the character Bobby Axelrod (or Axe) wants to invest in an QOZ in the Yonkers neighborhood in which he grew up.

[11] On 6 November 2019 Sen. Ron Wyden (D-OR) introduced in the U.S. Senate a bill to reform the QOZ program. See https://www.finance.senate.gov/imo/media/doc/Opportunity%20Zone%20Reporting%20and%20Reform%20Act%20of%202019%20Bill%20Text.pdf.

2.1. Definitions

To facilitate our discussion, we begin with some basic definitions that define the main features of the Opportunity Zone (OZ) program.

A low-income census tract (LIC) is a census tract in which either the poverty rate is at least 20 percent or tracts in which the median family income is less than or equal to 80 percent of the statewide median family income or metro family median income (where applicable), whichever is higher. A related definition is a Treasury-identified census tract, which is a census tract that is contiguous with one or more LICs but which does not itself meet the LIC criteria.

A state governor may declare 25 percent of the LICs in the state as a Qualified Opportunity Zone (QOZ) based on 2011-2015 ACS 5-year data from the Census Bureau.[12] Note that 5 percent of all QOZs nominated can be contiguous with an LIC, rather than an LIC itself, as specified by a Treasury-identified census tract. Because of this provision, census tracts adjacent to an LIC, but not necessarily meeting the criteria for QOZ nomination, may still be nominated for QOZ status. However, no more than 5 percent of the QOZs that are nominated within each state may be these contiguous tracts.

A Qualified Opportunity Fund (QOF) is a self-certified entity treated as a partnership or corporation for federal tax purposes and organized in any of the 50 states, District of Columbia, or the five U.S. territories for the purpose of investing in qualified opportunity zone property. At least 90 percent of held assets must be QOZ property.

A QOZ business is a business with substantially all of its tangible assets located in QOZs. Internal Revenue Service (IRS) regulations require that 70 percent of all tangible property held be in a QOZ, and that 50 percent of the gross income from a QOZ business be derived from

[12] Note that, for 51 QOZs nominated late in the process, we use the 2012-2016 ACS data.

active trade or conduct in a QOZ (Internal Revenue Service, 2018). Several enterprise types cannot qualify as a QOZ business, including: a golf course, a country club, a massage parlor, a hot tub facility, a suntan facility, a gambling facility, and stores specializing in alcoholic beverages to be consumed off the premises. A QOZ business may include houses and apartments for rent.

A QOZ property must be a property purchased after 31 December 2017, be qualified as a QOZ at the time of purchase and remain qualified for substantially all of the time held. These properties include:

- QOZ Stock: Equity in a QOZ business held by a QOF.
- QOZ Partnership Interest: Partnership interest in a QOZ business held by a QOF.
- QOZ Business Property: Tangible property used in a trade or business in a QOZ if the original use of such tangible property commences with the QOF or the QOF substantially improves the tangible property, where "substantial improvement" means that during any 30-month period *additions* to the tax basis of the building (excluding land values) are made such that the value added to the tax basis is higher than the adjusted taxpayer basis at the beginning of any 30-month period.

Note that a 90 percent investment in a business with a 70 percent QOZ business property means that there must be a minimum 63 percent investment in QOZs for a QOF.

2.2. Tax incentives

There are three tax incentives from investing in a QOF. First, there is a temporary deferral of realized capital gains from a sale outside of an QOZ if reinvested in a QOF, which must be realized (and taxed) when the property is sold or at the end of 2026, whichever occurs first. An investor must invest in a QOF within 180 days of realizing the capital gains to qualify for deferment.

Second, capital gains newly invested into a QOF will receive a step-up in basis of 10 percent if the investment is held for 5 years, and another 5 percent (for a total of 15 percent) if

held for 7 years. This provision enables investors to reduce 15 percent of their capital gains invested into a QOF from taxable income if held for the full 7 years.

Third, there is permanent exclusion from taxable income of capital gains from the sale or exchange of an investment in a QOF if the investment is held for 10 years. This incentive only applies to gains accrued after an investment in a QOF. As a result, capital gains earned before investment in the QOF receive benefits from the first and second tax incentives, while capital gains earned after investing in the QOF benefit from this third incentive.

In their entirety, these tax incentives mean that for an investment that is held for ten years all realized capital gains used for investment in a QOF will not be taxed until 2026, only 85 percent of the original capital gains invested will be taxed (100 percent would have been if realized originally), and no taxes will be paid on the appreciation of the investment. These represent quite significant tax breaks for investments in a QOF. Given that the marginal tax rate on capital gains varies from 0 percent for low income earners to 20 percent for higher income earners, these tax benefits will be of more value to higher income investors.

As an example that illustrates the magnitude of these benefits, consider the case of an individual facing a 20 percent capital gains tax rate who sells stocks, earns $1 million in capital gains on these sales, and then reinvests these capital gains in a QOF that earns $50,000 every year. After 6 years, the investor will have made $1,300,000 (or the initial $1,000,000 in capital gains plus $300,000 from the [6 X $50,000] in returns each year). Selling this QOF in its entirety would result in capital gains taxes on $300,000 of earnings, plus $900,000 from the original investment due to the step up in basis (e.g., "…if the investment is held in the QOF for 5 years"), thereby reducing the capital gains tax base by $100,000. Selling the QOF after 8 years would result in earnings of $1,400,000 but capital gains taxes on only $850,000 of the original

investment plus the $400,000 in newly earned capital gains (e.g., "…if the investment is held in the QOF for 5 years, up to a total of 15 percent if the investment is held in the QOF for 7 years"), reducing the capital gains tax base by $150,000. However, selling the investment in year 11 would result in capital gains taxes on only the initial amount less the 15 percent reductions because of the permanent exclusion of capital gains from holding the investment for 10 years (e.g., "…there is permanent exclusion from taxable income of capital gains from the sale or exchange of an investment in a QOF if the investment is held for 10 years"). All of the accumulated capital gains from the QOF investment would avoid the 20 percent capital gains tax rate, and only $850,000 of the initial $1 million in capital gains would be subject to the capital gains tax rate, and any additional capital gains earned would be received tax free.

3. DATA AND METHODS

3.1. Data

Our main variables that capture economic development effects are residential and commercial parcel sales prices in the state of Florida. As noted earlier, Florida is an especially useful state to examine. Florida maintains very detailed and comprehensive information on properties and real estate transactions.[13] Also, the Florida census tracts nominated as opportunity zones are overall quite similar to the census tracts nominated as OZs in the rest of the United States, at least prior to the enactment of the TCJA, and Florida's QOZ selection process is also very similar to the process used by many other states, including the way in which information

[13] Note that there are a few dimensions along which Florida appears to be different from nationwide averages. For example, median home prices are lower in Florida than in the U.S., although this could be driven by minimum reporting costs and responses to Florida's Documentary Stamp and Transfer Taxes. Also, in terms of demographic features, there are proportionately fewer Native Americans in Florida than in other states. Overall, however, these differences are small.

from relevant parties was incorporated in the selection process. It is the case that Florida's selection process resulted in fewer Florida OZs being designated as undergoing socioeconomic change than for the U.S. average (1.4 percent for Florida versus 3.2 percent for the U.S.), which implies that Florida's selection process targeted fewer OZs that may have been likely to see expected future growth. As such, our results should hold true for a significant portion of the states, although they may not be as representative for states with very high socioeconomic change percentages such as Washington, D.C. (32 percent) or New York (13 percent). Note, however, there were 17 states with even lower percentages of OZs in this category than Florida (Theodos et al., 2018).

Home price information comes from Florida state tax rolls that incorporate real estate transaction data at the individual transaction level, including census tract identifiers, month, year, and type of transaction for every real estate transaction in Florida from 2016-2020. We use only those transactions that are considered to be "arms-length" transactions, i.e. between strangers. These data include residential and commercial real estate prices, as well as designations for whether the lot is vacant (and improved) or built. Given that QOZ designation occurs at the census tract level, we aggregate these sales to the tract level.

Note that we focus on the impact of opportunity zones on various measures of real estate prices. Ideally, we would examine the impacts of opportunity zones on such variables as unemployment rates, startups, and economic growth, given especially that OZs are intended to encourage investments in low-income communities that increase economic opportunities in these areas. However, data for these outcomes are not yet available. Even so, the effects of place-based incentives like OZs are often examined using real estate prices as a proxy for these other outcomes (Engberg and Greenbaum, 1999; Merriman, Skidmore, and Kashian, 2011), given the

strong correlation between these various outcomes. In this regard, note that we also example the impact on QOZ designation on frequency of sales.

Our explanatory factors include demographic variables, economic variables, and political variables. Demographic and economic variables are drawn from the American Communities Survey (ACS), for 2011-2015, 2012-2016, and 2014-2018 5-year estimates. ACS data include median household income, median family income, educational attainment, race and ethnicity information, total population, unemployment rate, metropolitan area population, the percent of the population on welfare, and the percent of the population in various age groups.

We also use information on the specific geographic location of campus of higher education, obtained from the U.S. Department of Homeland Security Homeland Infrastructure Foundation-Level Data. This source includes location information from a census of institutions of higher learning, including doctoral/research universities, masters colleges and universities, baccalaureate colleges, associates colleges, theological seminaries, medical and other health care-related schools, schools of engineering and technology, business and management schools, art, music, and design schools, law schools, teachers colleges, tribal colleges, and other specialized institutions.

Our political variables measure political control of state government institutions at the time of QOZ nomination. We generated some of these variables from ballotpedia.com, which we coded by hand. We also coded the legislative district and census tract crosswalk, using GIS data from the U.S. Census Bureau. These data measure the upper and lower state legislative partisanship by district and state executive partisanship for January-March 2018, the period immediately following enactment of the QOZ program in the TCJA of 2017 during which states could nominate eligible census tracts to be qualified opportunity zones.

We use the complete list of QOZs and LIC census tracts in Florida from the IRS. Also, we use consumer price index information to adjust nominal dollars to real dollars from the Federal Reserve Bank of St. Louis. All dollar amounts are in 2018 USD, and all observations are at the census tract level. We distinguish between the *Pre-period*, or January 2016 to March 2018, and the *Post-period*, or March 2018 to November 2020.

The national data include all census tracts in the lower 48 states except Nebraska (omitted due to the unicameral nature of its legislature). For the Florida data, there are 4245 Census tracts in ACS data, including 1706 LICs, and 427 QOZs in Florida; however, we do not include tracts that are unpopulated in any of the ACS periods, that do not have arms-length real estate transactions in both the pre- and the post-period, or that are missing any ACS variables. Our final Florida data include 4037 Census tracts, 1621 LICs, and 411 QOZs. Summary statistics are reported in Table 1. A list of all variable names and definitions is provided in the Appendix.

3.2. Methods

Our regressions only look at those census tracts in Florida classified by the IRS as LICs. We estimate the impact of QOZ designation on the percent change in real mean real estate transaction prices in Florida between the pre- and post-periods, controlling for demographic, political, and economic variables.

Our basic model is as follows:

$$\%\Delta Price_{i,t} = \beta_0 + \beta_1 QOZ_{i,t} + \beta_2 X_i + \varepsilon_{i,t}$$

where $\%\Delta Price$ denotes the percentage change in price between the pre- and post-period for census tract *i* at time *t*, as determined by the dummy variable *QOZ* (equal to 1 for a census tract designated as a qualified opportunity zone and 0 otherwise), *X* is a set of control variables, ε is the error term, and β are estimated coefficients.

We estimate several models. In the first and simplest model, we estimate OLS regressions that include many of these demographic and economic variables, with our main explanatory variable of interest a dummy variable for QOZ designation equal to one if the census tract is a qualified opportunity zone and zero otherwise. We also estimate a simple difference-in-differences (DID) model. However, as noted earlier, Frank, Hoopes, and Lester (2020), Alm, Dronyk-Trosper, and Larkin (2021), and Eldar and Garber (2021) provide evidence that QOZ designation is likely to be endogenous, determined in part by many of these same demographic and economic variables, along with various political variables; that is, selection into the treatment group (e.g., QOZ designation) may be influenced by these variables, along with prior trends toward relatively accelerating real estate prices (pro-investors) or relatively decelerating real estate prices (pro-distressed community residents). This endogenous QOZ selection makes both OLS and standard DID estimates problematic, and requires that QOZ selection be considered in estimating the impact of QOZ designation on economic opportunities.

We address this potential endogeneity by using a fuzzy regression discontinuity (RD) approach. Although the eligibility criteria based on median family income and poverty rates were laid out by the TCJA of 2017, meeting these criteria did not guarantee selection into treatment but simply meant that the census tract was eligible for selection into treatment. As a result, it is possible to compare the performance of census tracts that were eligible for QOZ designation with those census tracts that were close to the LIC cutoffs but did not meet these criteria, in order to determine the effects of QOZ designation.[14] The first stage of this fuzzy regression discontinuity approach estimates the probability of selection into the treatment based on which side of the

[14] Note that, while there are other programs that use similar cut-offs, an RD should still be a valid causal mechanism so long as those programs were either implemented at a different time, or as long as they were ongoing programs for which their expenditures did not differ over this period.

cutoff each census tract falls, and the second stage estimates the effect of the probability of QOZ designation on the percent change in real estate transaction prices between the pre- and the post-period.

We apply both parametric and non-parametric RD models with several bandwidths to ensure robustness. Our parametric model is specified as:

$$\%\Delta Price_i = \beta_0 + \beta_1 c_i + \beta_2 c_i^2 + \beta_3 c_i^3 + \beta_4 c_i^4 + \beta_5 D_i + \varepsilon_i \ ,$$

where *c* is one of three potential running variables used for QOZ designation, median household income, poverty rate, or both and *D* is a dummy variable where 1 means the census tract meets the cut-off for the particular running variable. For the non-parametric models, a triangular weight is used, and the appropriate bandwidth is calculated following the algorithm laid out by Calonico, Cattaneo, and Titiunik (2014). Our non-parametric model is specified as:

$$\%\Delta Price_i = \beta_0 + \beta_1 D_i + \beta_2 c_i + \varepsilon_{i,t} \ ,$$

where observation *i* is included only if *c* is within a given distance from the cut-off of the running variable. This approximates a local linear regression around the cut-off point.

Because any results may be driven by a few very large or very small transactions, we estimate the RD model on the entire sample of low-income census tracts, a trimmed subsample in which the ten tracts with the highest percent change in real estate prices and the ten tracts with the lowest percent change in real estate prices are dropped from the sample prior to analysis, and a winsorized sample in which all observations below (say) the 10th percentile in real estate prices are considered to be equal to the 10th percentile and all observations above (say) the 90th

percentile are considered equal to the 90th percentile. We also use different percentile cutoffs (e.g., 95th and 5th, 99th and 1st) in alternative winsorized estimations.[15]

All of our estimation strategies give results that are largely the same; that is, we find no evidence that QOZ designation has had a statistically significant and positive impact on sales prices. The next section discusses in detail our estimation results.

4. RESULTS

4.1. OLS estimation results

We present the OLS estimation results in Table 2, where we estimate the impact of QOZ designation on the percent change in real mean real estate transaction prices between the pre- and post-periods after controlling for demographic and economic characteristics.[16] The results for Models 1-5 provide weak evidence that overall real estate prices have in fact grown at a slightly slower rate (10 percent slower) in QOZs compared to the rest of the state. These results seem to be driven by the slower growth in vacant real estate prices relative to other LICs. There is also suggestive evidence that non-vacant residential properties have increased in value faster in QOZs than in non-QOZ low-income census tracts. However, because QOZ designation is likely endogenous, these findings cannot be interpreted as causal. Recall that we also estimated a simple DID model, and, while we find statistically significant and (small) positive impacts from the QOZ on some real estate prices, the DID estimates likely suffer from endogeneity issues

[15] To winsorize a variable, we take all observations below the 10th percentile and set them equal to that percentile, and we also take all observations above the 90th percentile and set them equal to the 90th percentile. We repeat this process for the 5th and 95th percentiles and the 1st and 99th percentiles, respectively

[16] Note that we are unable to use political variables in these OLS estimations because the only political variables that are available are time-invariant political variables, which of course do not provide an accurate picture of partisanship over time.

similar to the OLS estimates, so we omit these results here. The following section presents RD models that deal with the selection issue.

4.2. Fuzzy regression discontinuity estimation results

Results for the first stage of the regression discontinuity models can be seen in Figures 1 and 2, using the poverty rate cutoff in Figure 1 and the income level cutoff in Figure 2. Recall that the first stage of the fuzzy RD approach estimates the probability of selection into the treatment based on which side of the cutoff the census tract falls, and the second stage estimates the effect of the probability of QOZ nomination on percent change in real estate transaction prices between the pre- and the post-periods.

In both Figures 1 and 2, there is no compelling evidence of a discrete jump in probability of selection at the cutoff of either criteria. This explains the apparent lack of a result in the second stage results for the impact on real estate prices between the pre- and the post-periods (Figure 3 for the poverty rate cutoff and Figure 4 for the income level cutoff).

Further examination of QOZ selection compared to the eligibility criteria (Figures 5 and 6) suggest that, although there is no discrete jump at the cut-offs because of the dual nature of the criteria, there is certainly a marked increase in the likelihood of nomination when at least one of the criteria is met. Indeed, Figures 5 and 6 suggest that there is a dosage effect, as the higher the poverty rate and the lower the income the more likely a census tract is to be nominated in the first place. Figures 7 and 8 also examine the overall percent change in real estate prices compared to the two criteria. These figures do not provide causal evidence of the impact of QOZ designation. Even so, the results in Figures 7 and 8 fail to find convincing evidence of an increase in value of properties in qualified opportunity zones.

There may be concerns in these methods regarding whether QOZs and non-QOZs are comparable in real estate sales price changes before the TCJA was enacted. We therefore check the pre-treatment trends in home prices between these two groups. Figure 9 shows the comparison between QOZs and non-QOZs overall. Notably, both QOZs and non-QOZs move in similar fashion though non-QOZs have a higher mean real estate sales price, although there may be some differences in the trend starting in 2017. When restricting the data to just residential structures (Figure 10), we see very similar trends over the entire period. While the usage of an RD should resolve any concerns over underlying differences between the QOZs and non-QOZs, Figure 11 presents the pre-trends for residential structures using only the census tracts used in the RD. Once again, we see similar trends in home price changes up to the treatment date.

In a more formal test for pre-trends, we ran a pre-trend analysis by year between 2009 and 2019, in which we added yearly dummy variables interacted with the treatment variable. The results for these coefficients are shown in Table 3. We find some weak evidence in two of the pre-treatment years (2012 and 2014), but most years show no difference in the pre-treatment period. Notably, in our RD estimates, we only use sales prices closer to the treatment period starting 2016, and none of the periods in our pre-trend analysis show statistically significant differences in the pre-trend check.

Table 4 shows the results of non-parametric fuzzy RD estimation with percent change in real estate prices as the dependent variable in the second stage. The first two columns (Models 7 and 8) display results only using median family income as the running variable, while the other two columns (Models 9 and 10) display estimation results in which only the poverty rate was used as the running variable; controls for economic and demographic variables are included in Models 8 and 10. The sign of the first stage estimates are expected; that is, being the above the

income threshold is negatively associated with the likelihood of being nominated as a QOZ, while being above the poverty threshold is positively associated with the likelihood of being nominated as an QOZ. These signs align with previous estimates and expectations, although the first stage estimates are not statistically significant for any of the models. The second stage estimates are also not statistically significant, though of opposite sign. Because the variables in the first stage lack significance, it is possible that these cut-offs function as weak instruments because only one of the relevant running variables is examined at a time so the cut-offs are not strict. Also, when examining the figures it is apparent that the likelihood of QOZ nomination increases as distance from the cut-offs increases, so there may not be an immediate "jump" along either dimension when examined in isolation.

Table 5 contains the results for the parametric fuzzy RD regressions for Models 11-19. This approach allowed multiple bandwidths to be examined. Like the non-parametric estimation methods, the results are generally mixed and statistically insignificant, though this could be due to the relatively small number of observations available in each bandwidth causing reduced precision of the estimates. The results when using income as a running variable are all negative; the results when using the poverty rate as a running variable are all positive; and the results when using both running variables are all negative. While these are in-line with the results from the non-parametric methods, once more none of these results are statistically significant.

By combining the results from Tables 4 and 5, we find with the RD methodology little to no evidence of a statistically significant impact of QOZ selection on parcel sales prices.

4.3. Additional results

We also explore several other dimensions of possible QOZ impacts. Because about 85 percent of all transactions in our data involve non-vacant residential properties and because these

are the properties that tend to be more standardized, we apply simple OLS methods to examine the percent change in mean non-vacant real estate prices by census tract, using both the full sample and the trimmed dataset. We find somewhat varied results. In some models with the full dataset, we find that QOZ designation had a positive and significant impact on mean non-vacant real estate prices. However, when we include winsorizing, the effects turn negative but statistically insignificant.

In addition, transaction frequency may be affected by QOZ designation, so we estimate the impact of QOZ designation on the percent change in number of real estate transactions between the pre- and post-period using the OLS methods. We find that the effect of QOZ nomination on all real estate transactions is negative but statistically insignificant when no control variables are included, while the effect on non-vacant residential transactions is positive and statistically significant when controls are not included. However, upon inclusion of control variables, we find no statistically significant correlations between QOZ designation and transaction counts for any category of real estate transactions. These last results should be viewed mainly as suggestive, given endogeneity concerns. Even so, we believe that these results are useful, providing additional evidence that QOZ designation has had little consistent or statistically significant impact on real estate prices or transactions.

Finally, we attempted to deal with endogeneity issues with other estimation strategies. In one approach, we first estimated the likelihood of QOZ nomination using the *national* sample of qualified opportunity zones along with partisanship variables and demographic information used by policy makers at the time (2011-2015 and 2012-2016 ACS 5-year estimates). We then included this calculated probability of nomination as the right-hand side variable of interest as a replacement for the QOZ binary variable in the original specification, in an OLS equation of the

percent change in *Florida-specific* real estate transaction prices. Admittedly, this approach is somewhat ad hoc. Even so, because it is unlikely that *national* qualified opportunity zone nomination is correlated with *Florida-specific* trends, this method should control for any endogeneity in QOZ designation. In another approach, we used a standard instrumental variables approach, with residential zoning as the instrument. We found no evidence from these additional methods that QOZ designation had a statistically significant impact on prices for any category of real estate.[17]

5. CONCLUSIONS

Overall, our results suggest that QOZ designation has not had a substantial impact on residential and commercial parcel sales prices or on the volume of real estate transactions. In some of our simpler specifications (mainly those without many control variables), our estimation results suggest that qualified opportunity zones may have had a small positive effect on non-vacant residential property values. However, in nearly all models that include economic and demographic controls and that also control for potential endogeneity of QOZ designation, we find statistically insignificant results for the impacts of qualified opportunity zones.

What might explain these results? There are several likely explanations. An obvious one is that the program is simply ineffective in achieving its stated aims, a conclusion that characterizes many if not all place-based initiatives. Relatedly, if opportunity zones are used primarily as tax shelters or in otherwise unproductive uses, then we would not expect to see any impact on real estate prices, or even on other dimensions of economic development. Another, more positive explanation is that the QOZ program is still in its infancy, and so it may not have

[17] All estimation results are available upon request.

had sufficient time to achieve its intended effects. Now capitalization of tax changes from the opportunity zone program suggests that residential prices should respond very quickly. Even so, our results are based upon data from a period of time immediately after the policy was implemented. If the capitalization effects take longer to manifest themselves, then we may not find an impact, even though a longer term perspective might still reveal some effects of QOZ designation. Still other possibilities relate to the data that we used. For example, the use of real estate price changes as the indicator of economic opportunity may not capture the relevant impacts on such other indicators as poverty rates, unemployment rates, and income levels.[18] Also, there may be potential spillovers (either positive or negative) of QOZ designation on neighboring non-QOZ census tracts. In both cases, these spillover effects would be of interest to policy makers, but identifying these effects may also require more time and better data. Further, although Florida appears to be a typical state in its administration of opportunity zones, there may be specific features of Florida that affected the estimation results. T

These other explanations suggest that more time may be needed before examining the effects of QOZs, that other measures of economic opportunity should be used in future empirical work, and that effects in other states should be considered. We anticipate over the next several years that more comprehensive publicly available data covering a longer time period and additional states will bring clarity to the impacts of the opportunity zone program.

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[18] Relatedly, the use of real estate price changes is likely influenced by outliers in price changes. Using a winsorized data set and/or using the percent change in median prices (rather than the percent change in mean prices) as the dependent variable are approaches that may deal with the issue of outliers.

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DISCLAIMER

This work was done prior to Sean Larkin's employment at the Census Bureau. Any opinions and conclusions expressed herein are those of the authors and do not reflect the views of the Census Bureau.

CONFLICT OF INTEREST DISCLOSURE

The authors have no financial arrangements that might give rise to conflicts of interest with respect to the research reported in this paper.

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TABLE 1: Summary statistics (means) for Florida low-income census tracts, 2016-2020

	All census tracts	Low-income census tracts	Opportunity Zones
%Δ in Mean Price, Total	0.157	0.223	0.186
%Δ in Mean Price, Commercial Non-vacant	2.111	1.188	0.708
%Δ in Mean Price, Commercial Vacant	7.125	11.566	3.156
%Δ in Mean Price, Residential Vacant	3.198	6.157	1.374
%Δ in Mean Price, Residential Non-vacant	0.082	0.123	0.152
Low-income Census Tract	0.402	1.000	1.000
Percent Tract Zoned as Residential, 2017	0.887	0.849	0.815
Qualified Opportunity Zone	0.102	0.253	1.000
$\hat{QOZ}$	0.159	0.247	0.337
Percent Under 18	0.190	0.209	0.222
Percent Over 65	0.216	0.178	0.167
Total Population	4.999	4.765	4.675
Percent Black	0.150	0.251	0.390
Percent Hispanic	0.222	0.274	0.219
Percent Native American	0.002	0.002	0.002
Percent Family Households	0.641	0.611	0.607
Percent Less Than High School	0.122	0.188	0.222
Percent College	0.290	0.180	0.143
Median Household Income	57.207	39.345	34.866
Percent on Welfare	0.154	0.254	0.315
Unemployment Rate	0.065	0.084	0.118
Percent Non-citizen	0.084	0.115	0.098
Campus of Higher Education	0.073	0.096	0.085
In Metropolitan Area	0.960	0.935	0.922
N	4037	1621	411

TABLE 2: OLS regressions for percent change in price

	Model				
	(1)	(2)	(3)	(4)	(5)
Type of Property	All Real Estate	Vacant Commercial	Non-vacant Commercial	Vacant Residential	Non-vacant Residential
Variable					
Qualified Opportunity Zone	-0.101*	-9.407	-0.388	-6.335	0.019*
	(0.057)	(22.230)	(0.394)	(11.817)	(0.011)
Percent Under 18	-0.514	108.853	2.689	43.731	-0.042
	(0.504)	(226.948)	(3.649)	(110.637)	(0.095)
Percent Over 65	0.246	-0.470	2.284	-71.777	-0.181***
	(0.288)	(141.301)	(2.183)	(68.476)	(0.057)
Total Population	-0.006	3.079	-0.134*	-2.281	-0.005***
	(0.011)	(4.438)	(0.079)	(2.261)	(0.002)
Percent Black	0.012	10.229	0.463	-39.262	0.050*
	(0.141)	(66.961)	(1.052)	(31.738)	(0.026)
Percent Hispanic	-0.052	-26.094	1.161	-109.471**	0.043
	(0.194)	(90.643)	(1.427)	(46.598)	(0.037)
Percent Native American	1.258	-221.633	64.464**	564.530	-0.475
	(3.047)	(1816.369)	(31.621)	(654.064)	(0.624)
Percent Family Households	-0.419	-11.620	0.254	168.539***	-0.002
	(0.287)	(131.319)	(2.090)	(64.541)	(0.055)
Percent Less Than High School	0.039	-165.535	6.744**	-56.355	0.054
	(0.395)	(181.628)	(2.807)	(88.915)	(0.075)
Percent College	-0.233	-150.332	-0.493	195.261**	-0.233***
	(0.364)	(169.884)	(2.636)	(88.138)	(0.071)
Median Household Income	-0.001	-0.931	0.010	-1.889**	-0.001**
	(0.003)	(1.681)	(0.025)	(0.794)	(0.001)
Percent on Welfare	0.568*	-106.648	-5.624**	-79.553	-0.028
	(0.335)	(144.211)	(2.390)	(76.849)	(0.064)
Unemployment Rate	0.082	-2.587	-2.891	188.890	-0.214*
	(0.611)	(253.370)	(4.350)	(127.189)	(0.114)
Percent Non-citizen	0.561	138.105	-2.134	295.210***	-0.047
	(0.381)	(179.989)	(2.766)	(97.196)	(0.073)
Campus of Higher Education	-0.071	79.753***	-0.418	-12.237	0.002
	(0.076)	(30.061)	(0.512)	(17.537)	(0.014)
In Metropolitan Area	0.107	15.929	1.306**	6.070	0.008
	(0.094)	(43.mc098)	(0.612)	(17.604)	(0.017)
Constant	0.359	70.219	-0.574	-23.423	0.271***
	(0.245)	(116.601)	(1.770)	(56.140)	(0.048)
R^2	0.021	0.025	0.027	0.022	0.064
N	1621	455	1178	1161	1576

Notes: Standard errors are in parentheses. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

TABLE 3: Pre-trend analysis – OLS estimation with sale price (thousands USD) as dependent variable

	Model
Variable	(6)
2009*Treatment	14.086
	(24.118)
2010*Treatment	28.280
	(21.406)
2011*Treatment	34.971
	(21.274)
2012*Treatment	55.620 ***
	(20.672)
2013*Treatment	28.189
	(19.714)
2014*Treatment	41.983 **
	(19.385)
2015*Treatment	23.471
	(18.898)
2016*Treatment	27.239
	(18.612)
Treatment Variable	QOZ
Year fixed effects?	Yes
Sample	Within broadest RD bandwidth
Observations	705,532

Notes: Standard errors are in parentheses. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

TABLE 4: Fuzzy regression discontinuity results with non-parametric methods

	Model			
	(7)	(8)	(9)	(10)
Running Variable	Income	Income	Poverty Rate	Poverty Rate
First Stage Estimates				
Meets LIC Criteria	-0.028 (0.038)	-0.016 (0.037)	0.047 (0.032)	1.034 (0.301)
Second Stage Estimates				
$\widehat{QOZ}$	-2.189 (3.437)	-2.858 (7.474)	0.744 (1.159)	0.337 (1.405)
Bandwidth	+/- 8.435	+/- 7.933	+/- 5.5%	+/- 6.7%
Controls?	No	Yes	No	Yes
N	1313	1256	1210	1473

Notes: Standard errors are in parentheses. Outcomes are measured in percent change in sales price. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

TABLE 5: Parametric regression discontinuity results

Running Variable	Distance from Income Threshold			Poverty Rate			Distance from Income Threshold and Poverty Rate		
	(11)	(12)	(13)	(14)	(15)	(16)	(17)	(18)	(19)
$\hat{QDZ}$ (% Change Sales Price)	-1.356 (1.625)	-0.368 (2.349)	-2.006 (1.799)	1.214 (0.984)	1.156 (6.861)	0.813 (0.529)	-0.885 ** (0.432)	-0.449* (0.239)	-0.066 (0.247)
Bandwidth	+/- 0.5	+/- 1	+/- 2	+/- 0.5%	+/- 1%	+/- 2%	+/- 0.5(%)	+/- 1(%)	+/- 2(%)
Controls?	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
N	89	184	321	99	103	400	184	269	652

Notes: Standard errors are in parentheses. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

FIGURE 1: Percent of census tracts nominated as QOZs by poverty rate – Subsample included in the broad bandwidth shown

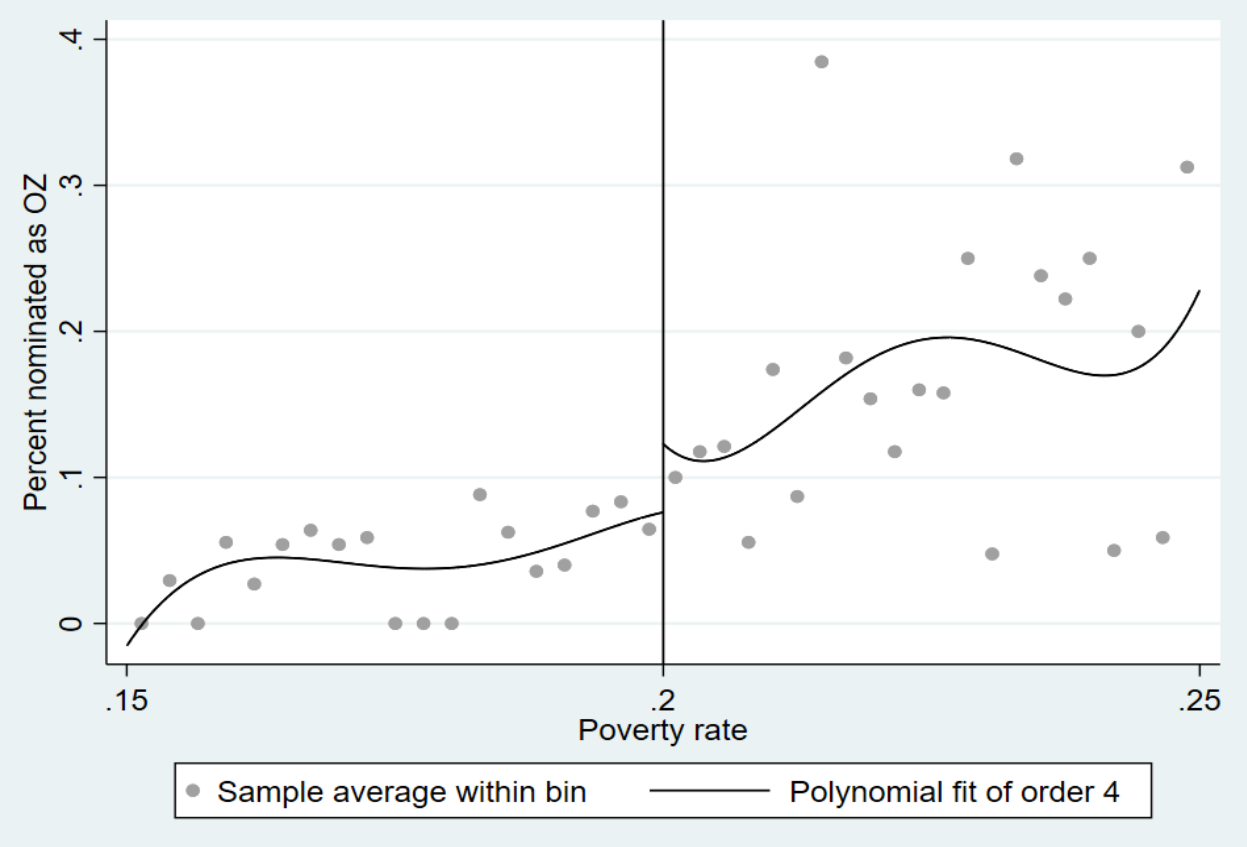


FIGURE 2: Percent of census tracts nominated as QOSZs by distance from income eligibility cutoff – Subsample included in the broad bandwidth shown

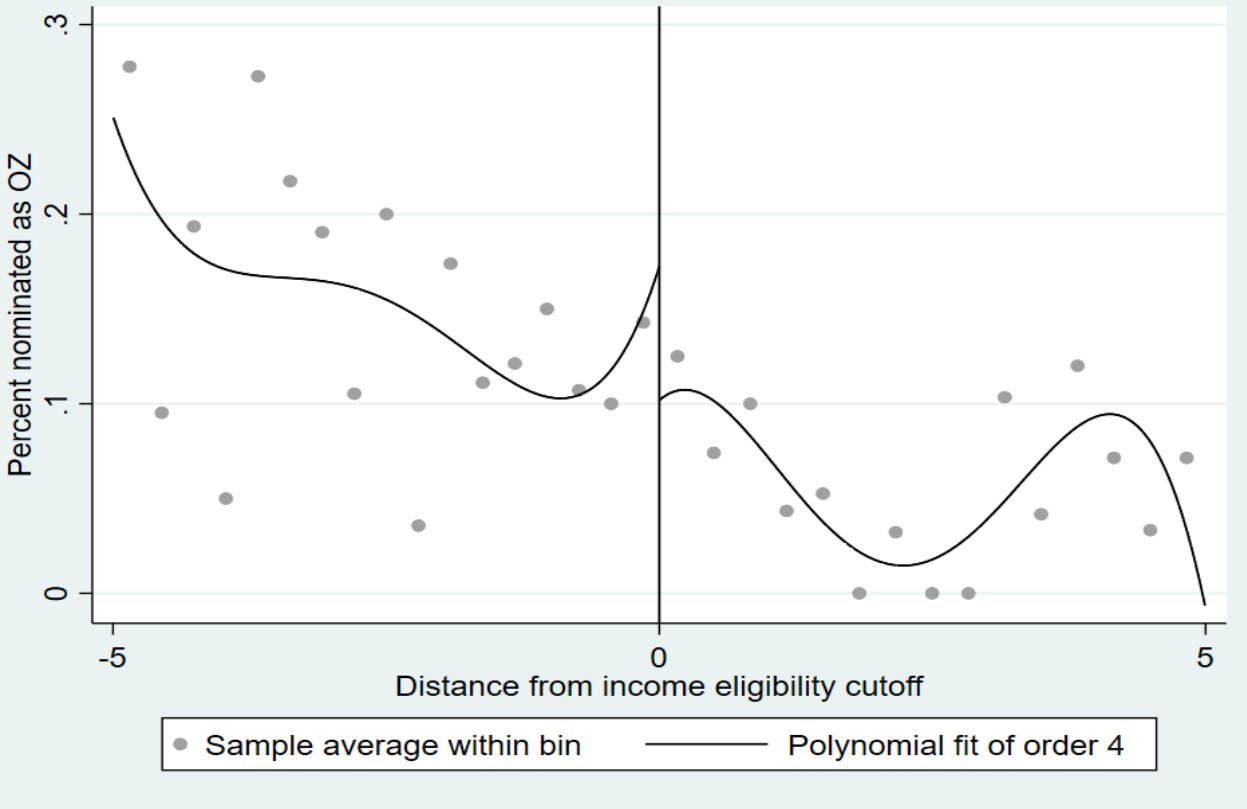


FIGURE 3: Percent change in mean total real estate prices by distance from the poverty cutoff – Subsample included in the broad bandwidth shown

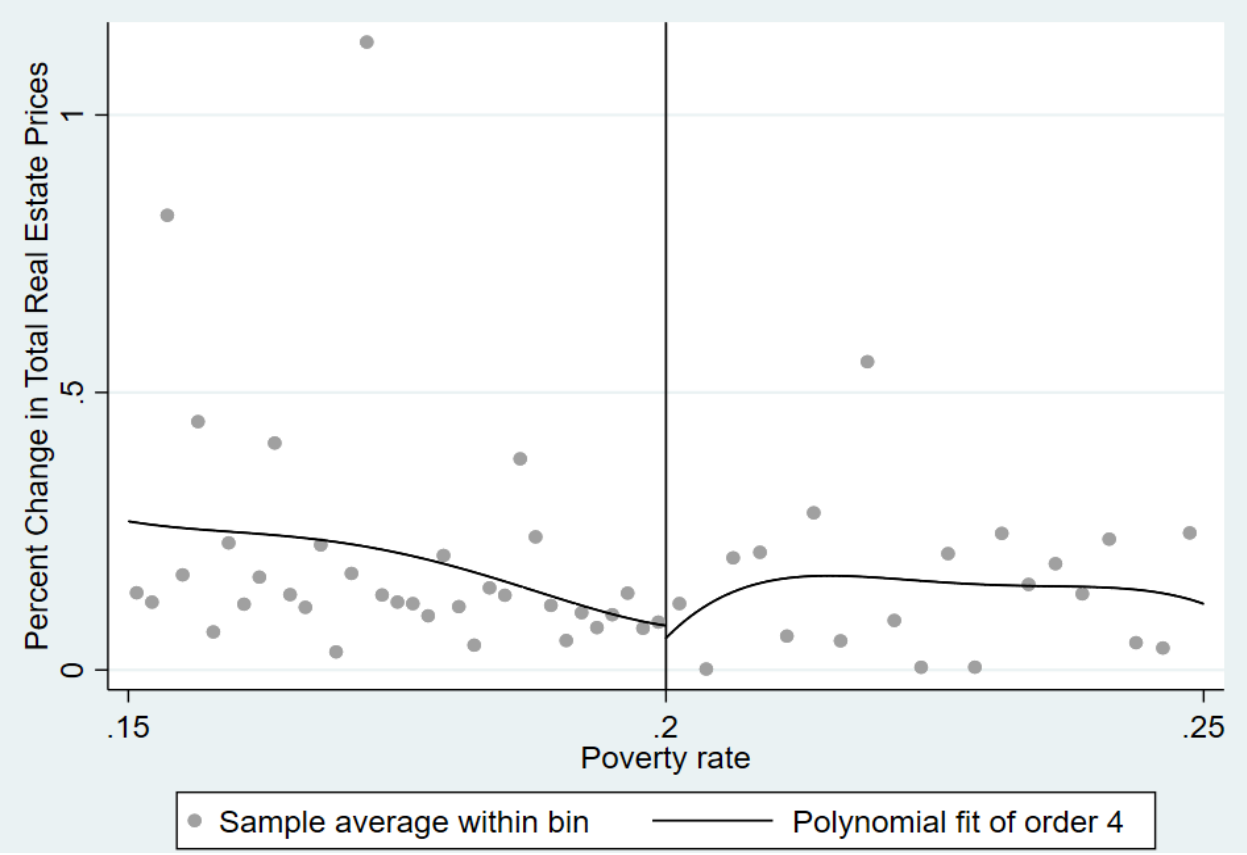


FIGURE 4: Percent of census tracts nominated as QOZs by distance from income eligibility cutoff – Subsample included in the broad bandwidth shown

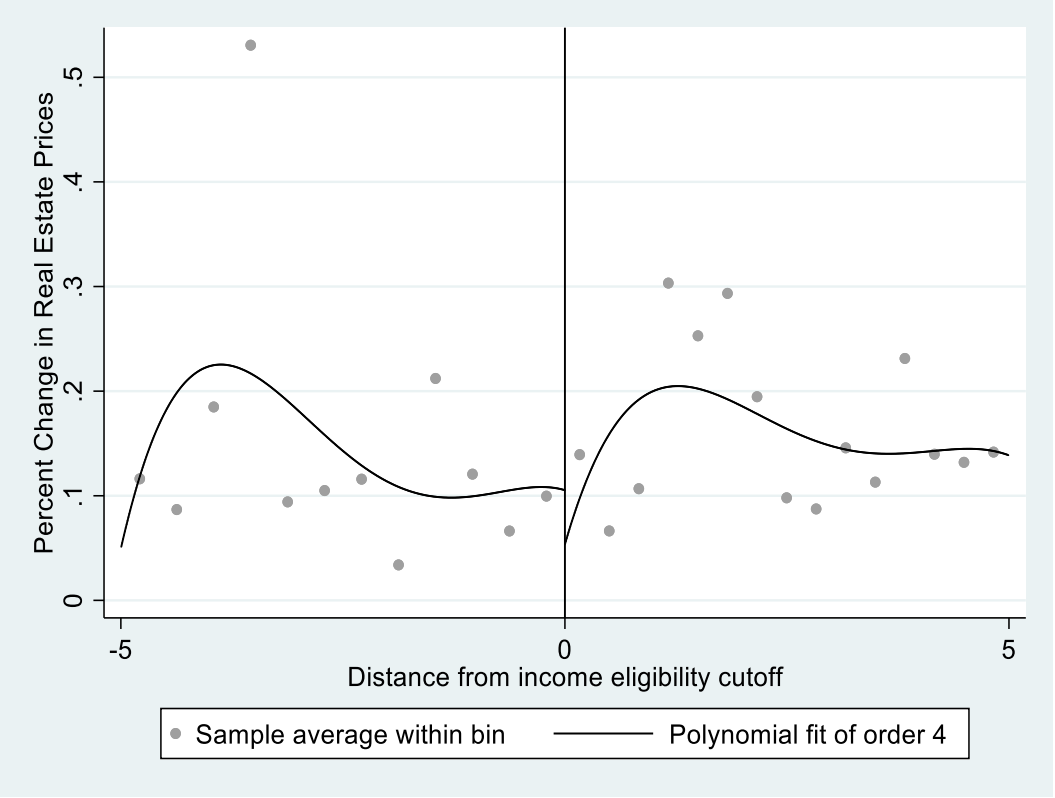


FIGURE 5: Percent of census tracts nominated as QOZs by poverty rate – Entire sample

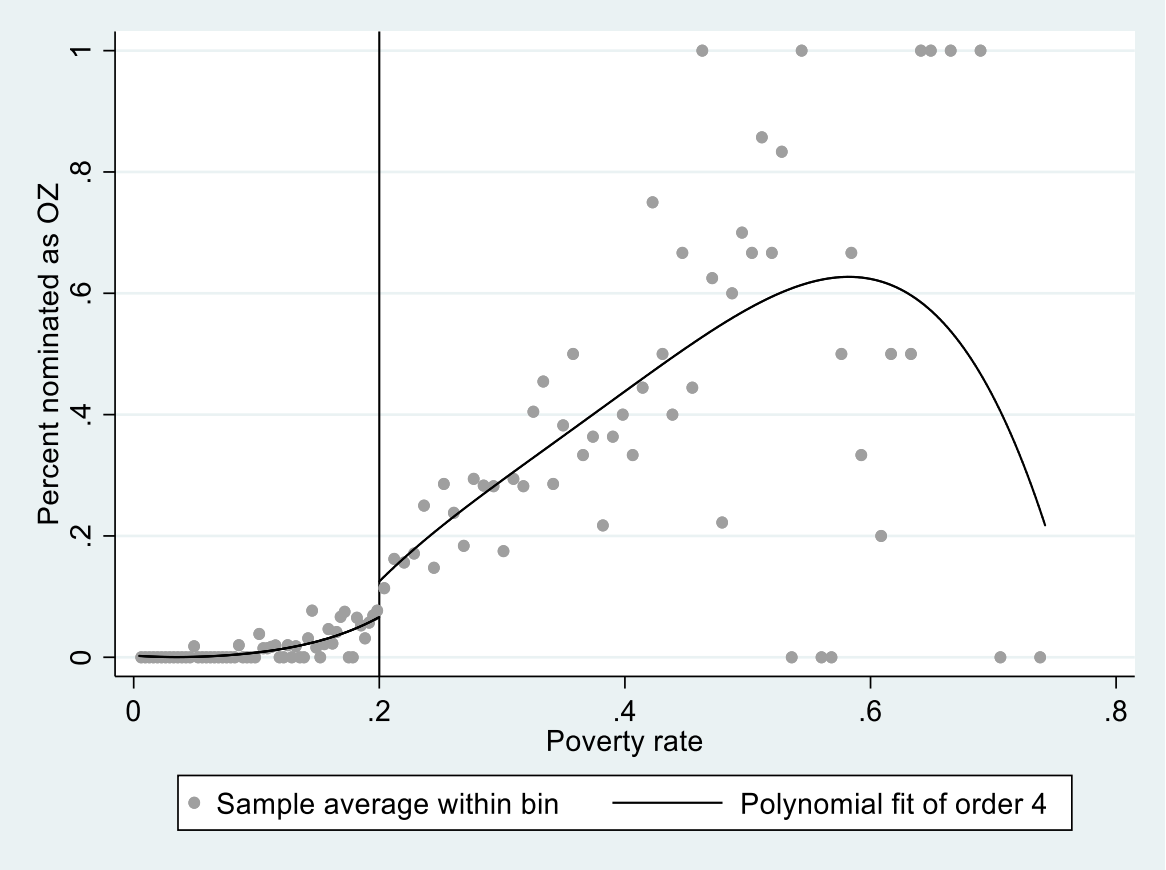


FIGURE 6: Percent of census tracts nominated as QOZs by distance from income eligibility cutoff – Entire sample

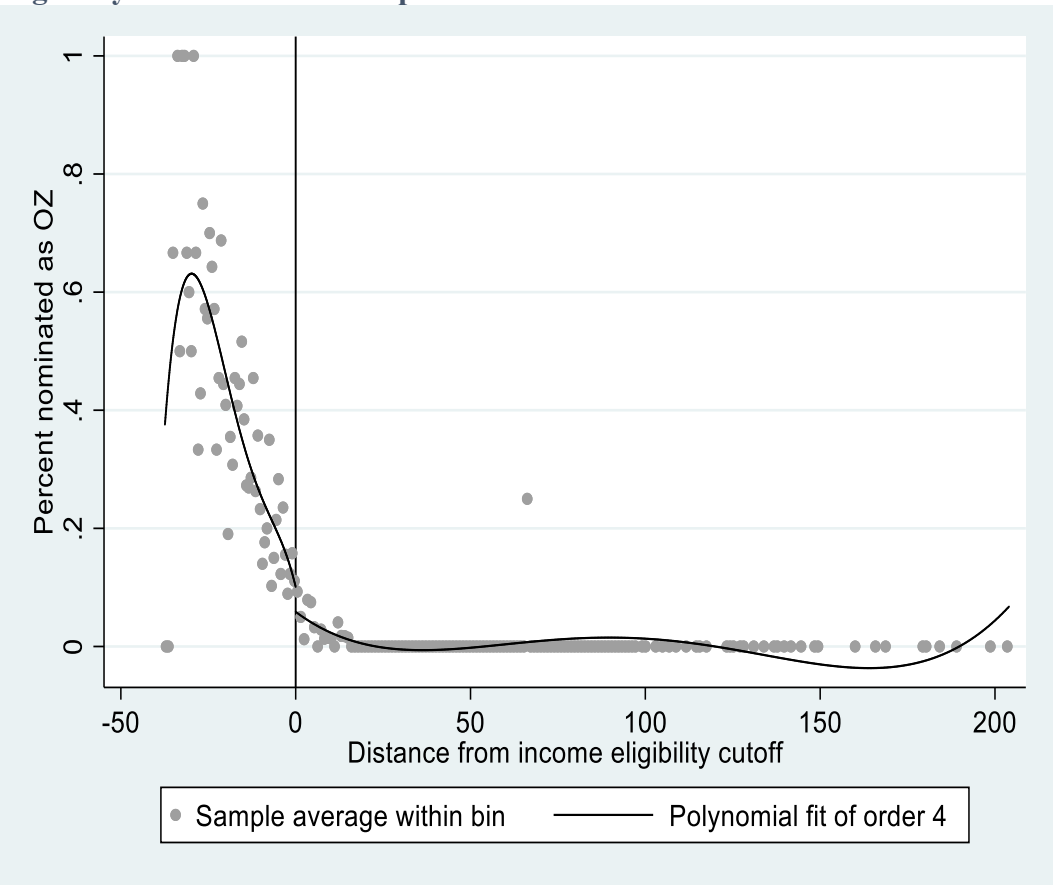


FIGURE 7: Percent change in mean real estate value by poverty rate – Entire sample

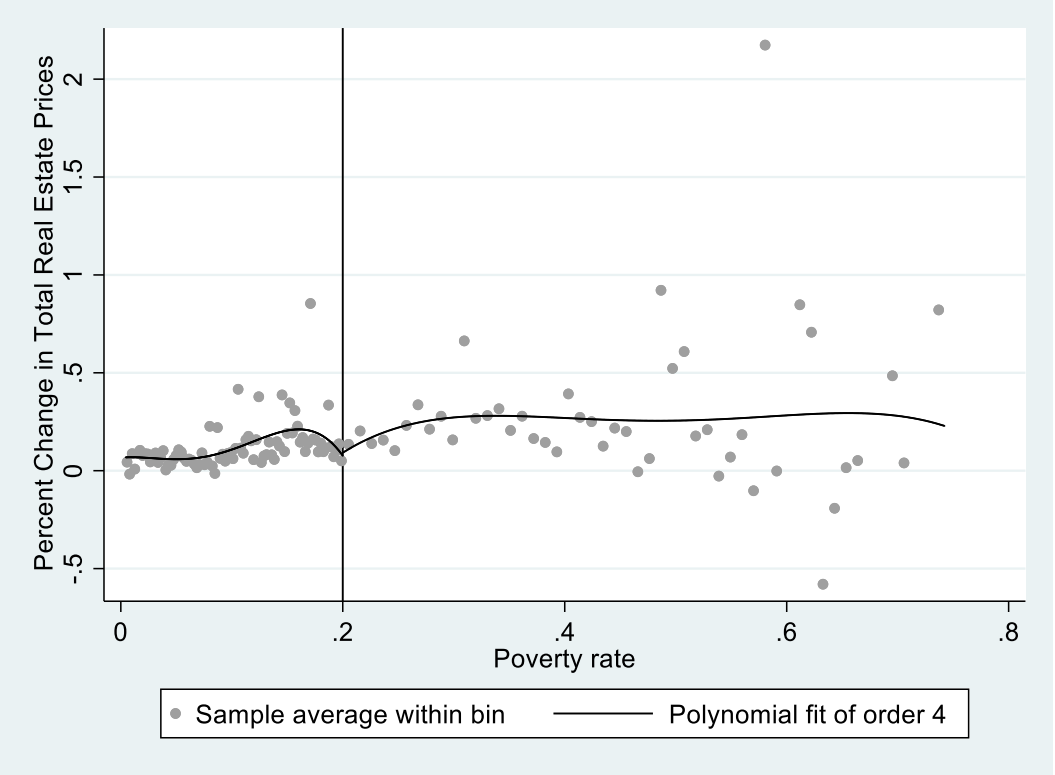


FIGURE 8: Percent change in mean real estate by distance from income eligibility cutoff – Entire sample

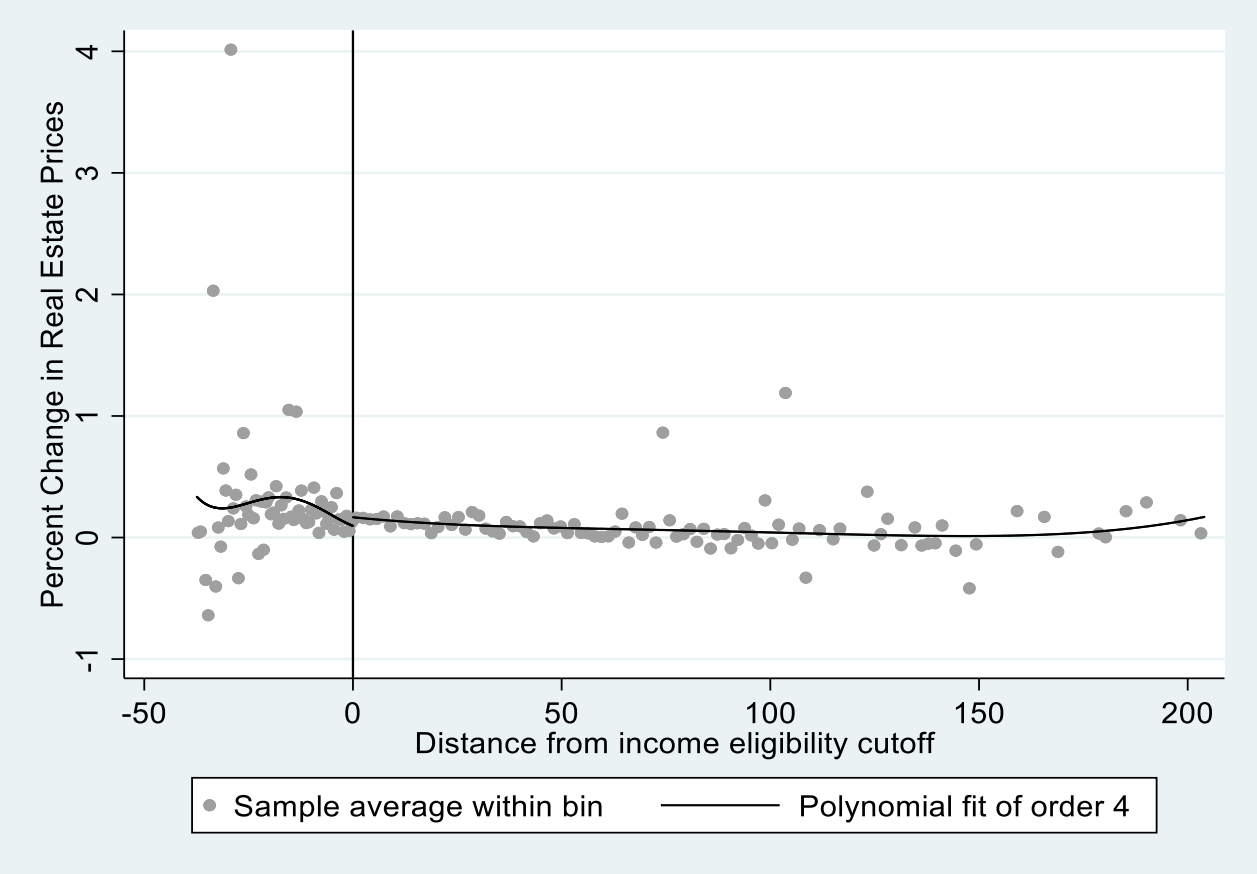


FIGURE 9: Average yearly real estate price of QOZs versus non-QOZs

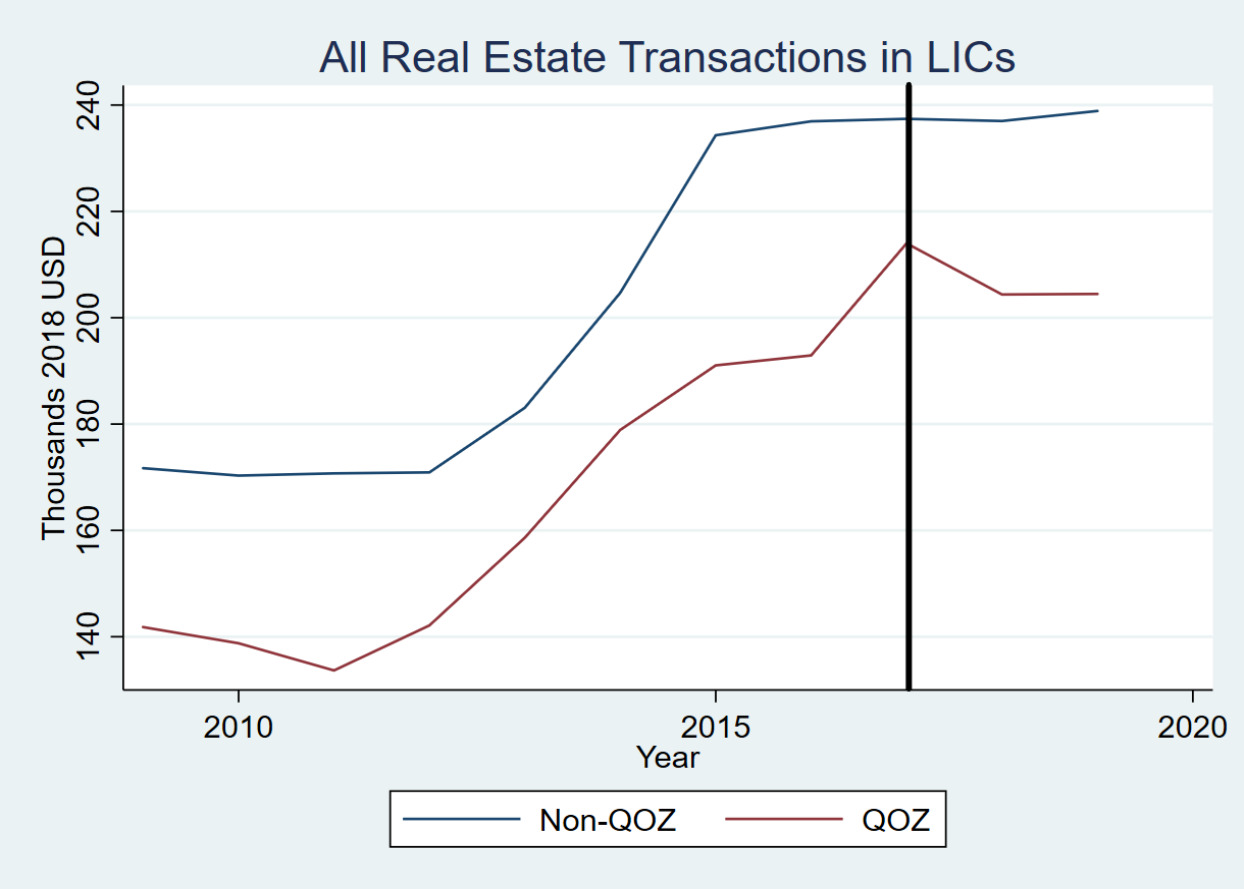


FIGURE 10: Average yearly home price of QOZs versus Non-QOZs

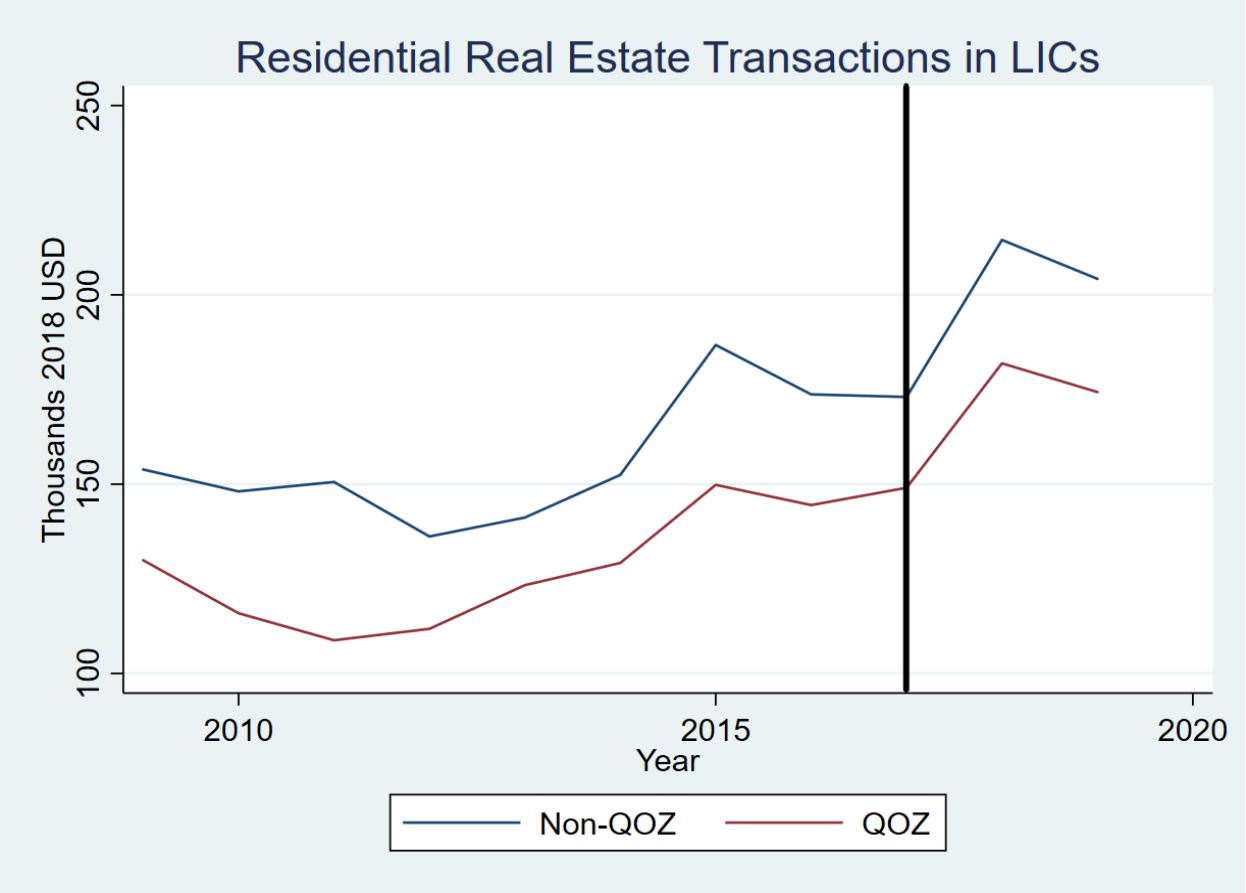
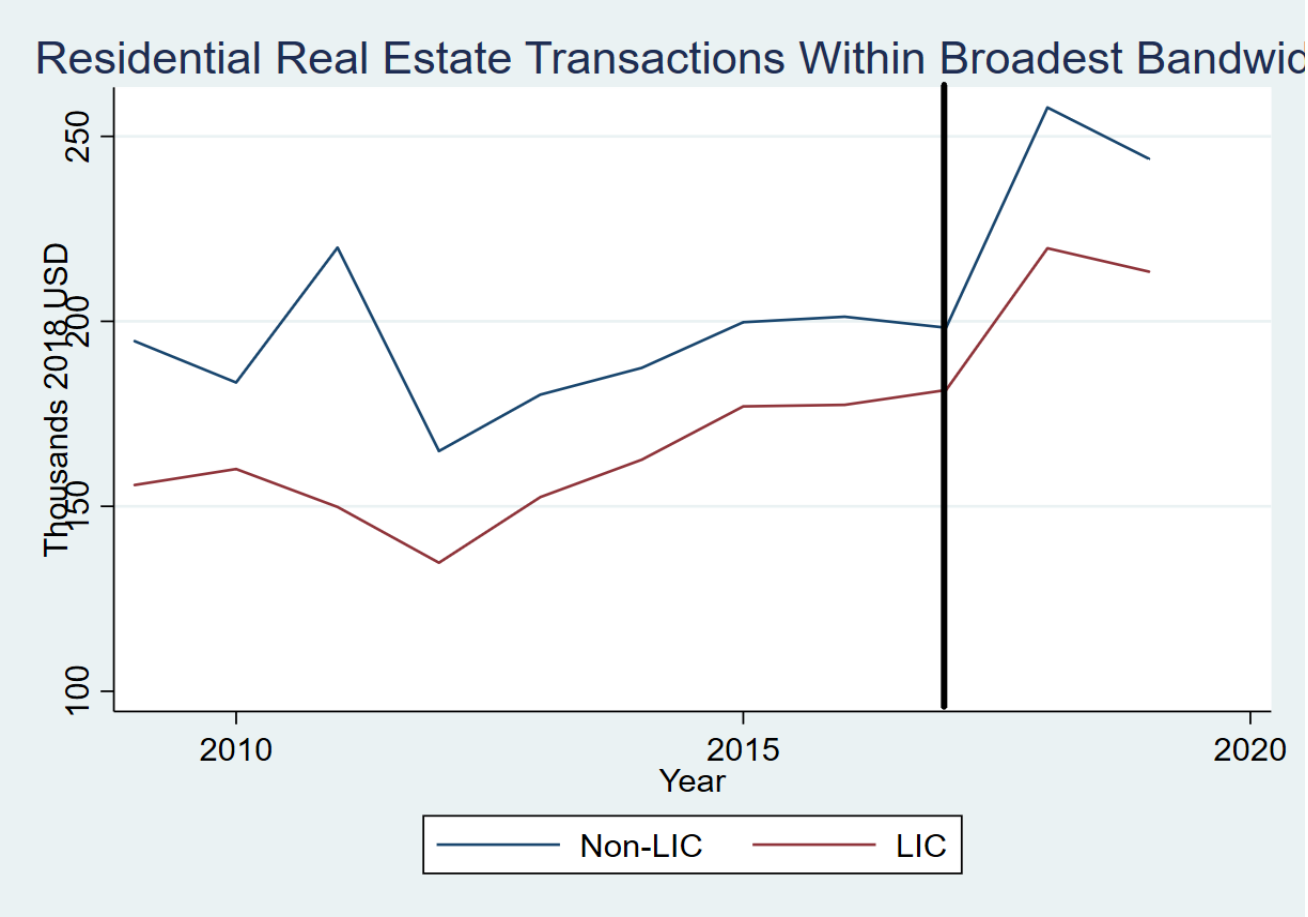


FIGURE 11: Average yearly home price of QOZs versus Non-QOZs used in regression discontinuity estimates



APPENDIX: Variable names and definitions

- %Δ in Mean Price, Total: Percent change in mean real estate transaction price from pre- to post-period.
- %Δ in Mean Price, Commercial Non-vacant: Percent change in mean commercial, non-vacant real estate transaction price from pre- to post-period.
- %Δ in Mean Price, Commercial Vacant: Percent change in mean commercial, vacant real estate transaction price from pre- to post-period.
- %Δ in Mean Price, Residential Vacant: Percent change in mean residential, vacant real estate transaction price from pre- to post-period.
- %Δ in Mean Price, Residential Non-vacant: Percent change in mean residential, non-vacant real estate transaction prices from pre- to post-period.
- Low-income Census (LIC) Tract: Binary variable equal to one if the census tract was considered a low-income census tract by the IRS at the time of OZ nomination, and zero otherwise.
- Percent Tract Zoned as Residential, 2017: Percent of census tract zoned as residential in 2017.
- Qualified Opportunity Zone (QOZ): Binary variable equal to one if the census tract is registered as a qualified opportunity zone, and zero otherwise.
- $\hat{QOZ}$: Predicted probability [0,1] that a census tract is nominated as a qualified opportunity zone.
- Percent Under18: Percent of the census tract under the age of 18, from ACS 2014-2018 5-year estimates.
- Percent Over 65: Percent of the census tract over the age of 65, from ACS 2014-2018 5-year estimates.
- Total Population: Total population of the census tract in thousands, from ACS 2014-2018 5-year estimates.
- Percent Black: Percent of the census tract population that identifies as non-Hispanic Black or African-American, from ACS 2014-2018 5-year estimates.
- Percent Hispanic: Percent of the census tract population that identifies as Hispanic, from ACS 2014-2018 5-year estimates.
- Percent Native American: Percent of the census tract population that identifies as Native American, from ACS 2014-2018 5-year estimates.
- Percent Family Households: Percent of family households in the census tract relative to all households in the census tract, from ACS 2014-2018 5-year estimates.
- Percent Less Than High School: Percent of the census tract population over 25 with a highest educational attainment of less than HS (or equivalent), from ACS 2014-2018 5-year estimates.
- Percent College: Percent of the census tract population over 25 with a highest educational attainment of a 4-year degree or higher, from ACS 2014-2018 5-year estimates.
- Median Household Income: Median household income of the census tract in 2018 USD, from ACS 2014-2018 5-year estimates.
- Percent on Welfare: Percent of the census tract population that receives some form of welfare (SNAP, state welfare programs, and so on), from ACS 2014-2018 5-year estimates.

- Unemployment Rate: Unemployment rate of the census tract, from ACS 2014-2018 5-year estimates.
- Percent Non-citizen: Percent of the census tract population that does not have an American citizenship, from ACS 2014-2018 5-year estimates.
- Campus of Higher Education: Binary variable equal to one if there is a campus of higher learning present, and zero otherwise, from U.S. Department of Homeland Security Homeland Infrastructure Foundation-level Data.
- In Metropolitan Area: Binary variable equal to one if the census tract is located in a metropolitan area, and zero otherwise.