Neighborhood-Level Investment from the U.S. Opportunity Zone Program: Early Evidence

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Abstract

We use de-identified federal tax records from tax years 2019 and 2020 to document the first available evidence on the short-run response of financial capital to the Opportunity Zone (OZ) program, a federal place-based policy that provides tax incentives for capital investments in more than 8,000 low-income neighborhoods across the United States. We observe $41.5 billion of aggregate cumulative OZ investments by tax year 2020. Using a subsample of electronically filed returns covering 78% of total observed investment, we document three emerging patterns in the data. First, OZ capital is highly spatially concentrated. Second, among OZ-designated neighborhoods, investors report greater equity and property investments in neighborhoods with relatively higher incomes, home values, educational attainment, and pre-existing income and population growth. Third, OZ investors have extremely high incomes relative to the US population, implying that the direct distributional incidence of the tax subsidy benefits households in the 99th percentile of the national income distribution.

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1 Introduction

Socioeconomic disparities across regions and neighborhoods are pervasive in the United States (Gaubert, Kline, Vergara, and Yagan 2021a; Reardon and Bischoff 2011), and recent research documents that these disparities are likely to have causal effects on individuals' productivity (Moretti 2012), health (Chandra and Skinner 2003), intergenerational economic mobility (Chetty, Hendren, and Katz 2016; Chetty, Hendren, Kline, and Saez 2014), and propensity for innovation (Bell, Chetty, Jaravel, Petkova, and Van Reenen 2019). However, researchers and the public disagree about which policies, if any, are effective means to improving these outcomes (Glaeser and Gottlieb 2009; Busso, Gregory, and Kline 2013; Kline and Moretti 2014; Neumark and Simpson 2015; Gaubert, Kline, and Yagan 2021b).

In this paper, we use de-identified federal business tax records to study the short-run response of financial capital to the U.S. Opportunity Zone (OZ) program, a federal place-based policy enacted in 2017 as part of the Tax Cuts and Jobs Act. As a result of this recent legislation, equity and property investments in more than 8,000 designated census tracts across the United States are eligible for highly favorable tax treatment of income accrued from capital gains.

The scale of the Opportunity Zone (OZ) program is unique in the modern landscape of place-based federal policies, both in terms of its expansive geographic scope and significant federal cost. OZs are located in urban, suburban, and rural areas across all 50 states, covering approximately 12% of all U.S. census tracts. The breadth of the program offers a natural setting to consider how place-based policies impact heterogeneous neighborhoods. The Congressional Joint Committee on Taxation has estimated that the OZ program will cost the government $1.6 billion annually in foregone tax revenue, more than any other existing federal place-based policy.[1]

A nascent literature on Opportunity Zones studies short-run impacts of the program on real estate prices (Chen, Glaeser, and Wessel 2019), job postings (Atkins, Hernandez-Lagos, Jara-Figueroa, and Seamans 2020), and employment (Freedman, Khanna, and Neumark 2021), finding null or modest effects. An exception is Arefeva, Davis, Ghent, and Park (2020), who estimate substantial increases in employment from establishment-level data. However, a key missing link in the early evidence is data on the response of financial investors to the tax subsidy.

[1] See The Joint Committee on Taxation (2020) estimates of federal tax expenditures from 2020-2024.

Existing studies estimate intent-to-treat (ITT) effects based on tract-level binary indicators for OZ status, but without information on program take-up are unable to estimate average treatment effects (ATE). While both of these parameters are of clear and natural interest to policymakers and researchers, a richer and more complete understanding of the evidence requires data on how investors have responded to the capital tax subsidy.

In particular, if investor behavior is only weakly responsive to the OZ tax subsidies, then small or null ITT effects are perhaps unsurprising, and policymakers may wish to consider if or how alternative policy mechanisms might attract investment to low-income neighborhoods. On the other hand, if investors are highly responsive to the subsidy and yet over time we do not observe desirable downstream effects on labor market outcomes, then policymakers may wish to shift budget priorities away from capital tax subsidies and consider alternative policy levers that may be more effective.

This paper fills a gap in the existing research by documenting the first available evidence on tract-level financial investment associated with the OZ program. Our data is based on de-identified electronically-filed federal business tax records from tax years 2019 and 2020, the first two years in which OZ investors were required to report detailed information on the location and recipients of their investments to the IRS. We emphasize that these data are preliminary, and do not yet incorporate data from an estimated $9.0% billion (approximately 22%) of cumulative OZ investments filed via paper tax returns. Throughout the paper we explicitly discuss limitations of these early data, and we will continue to update this working paper as more up-to-date information becomes available.

We highlight three main findings from the early evidence.

First, OZ investment is highly spatially concentrated. The vast majority of designated Opportunity Zone tracts in our sample, 63%, receive zero OZ capital. However, among tracts where investing firms report positive investment, the average value is substantial, at approximately $3,313 per resident. The distribution is strongly skewed even among these tracts with positive investment, such that the median value is $386, approximately one-ninth of the average.

Second, we correlate reported OZ investment with demographic and firm characteristics, and show that OZ capital gravitates toward eligible neighborhoods with relatively higher educational

attainment, incomes, home values, population density, and concentrations of professional and amenity services. These patterns are strongest for neighborhoods with pre-existing upward trends in population, income, and home values, and declining shares of elderly and non-white residents. On the firm side, we show that reported OZ investment is overwhelmingly concentrated in equity investments in businesses that specialize in real estate, construction, and finance.

Third, OZ investors have extremely high incomes relative to the US population. We identify a large sample of OZ investors and estimate their median and average 2019 household income to be greater than $741,000 and $4.9 million, respectively.[2] These estimates imply that the direct distributional incidence of the tax subsidy is likely to benefit households in the 99th percentile of the US income distribution.

In the final section, we geocode the universe of individual and business tax records to construct novel measures of tract-level household and family income, employment, commuting, firm growth, and real investment. We demonstrate that these estimates closely match corresponding measures from publicly available data and describe advantages of our new measures relative to existing data. As more comprehensive data on OZ investment become available, we plan to use these data to evaluate the causal effect of the OZ tax subsidies on local labor market and real investment outcomes.

The rest of the paper proceeds as follows. Section 2 highlights the OZ program's goals and objectives as described by its authors in Congress, describes the process by which neighborhoods were nominated and selected, and provides details on the program's capital tax subsidies. Section 3 presents the first available descriptive evidence on the spatial distribution of OZ investment across the United States, based on electronic business tax filings in tax years 2019 and 2020. Section 4 presents new tract-level estimates of wages, family income, firm growth, and real investment based on IRS microdata, and relates these measures with the available data on OZ investment. Section 5 concludes with a discussion of this new evidence in relation to other recent studies, and provides roadmap for future research.

[2]Throughout the paper, all centile statistics are computed as centile averages to protect taxpayer privacy. For example, medians are computed as the average of all taxpayers in the 49th to 51st percentiles.

2 Opportunity Zones: Brief Background

2.1 Historical Overview

In February of 2017, a bipartisan group of U.S. Senators and Representatives introduced the Investing in Opportunity Act, which was later incorporated into the Tax Cuts and Job Act enacted by Congress in December of that year. The Congressional authors of the legislation described the goals of the OZ program in a joint public statement:

> *"Too many American communities have been left behind by widening geographic disparities and increasingly uneven economic growth.* [...] *Americans should have access to economic opportunity regardless of their zip code. The Investing in Opportunity Act will unlock new private investment for communities where millions of Americans face the crisis of closing business, lack of access to capital, and declining entrepreneurship.* [...] *With this bill, we will dramatically expand the resources to restore economic opportunity, job growth, and prosperity for those who need it most."*[3]

The legislative focus on capital subsidies, rather than wage or employment subsidies, distinguishes the OZ program from the federal Empowerment Zone initiative launched in 1995, and is more ambitious in scope but similar in spirit to the federal New Markets Tax Credit Program enacted in 2000. In accordance with Congressional goals, an important aim of this research is to estimate how responsive investment has been to the OZ tax subsidy, how investment has affected local workers and businesses, and how these impacts may be heterogeneous across individuals who live, work, and invest in Opportunity Zones.

2.2 Tract Eligibility and Nomination Process

The primary geographic units of the OZ program are *census tracts*, which we interchangeably refer to as *neighborhoods* or just *tracts*. Census tracts are small spatial units of approximately 4,000 residents, with coverage spanning the entirety of the United States.

Congress determined that tracts would be eligible for OZ designation if they could be classified as a *low income community* (LIC), defined as a tract with a poverty rate above 20% or median family

[3] Statement by Senators Cory Booker and Tim Scott and Representatives Ron Kind and Pat Tiberi, February 2, 2017.

income (MFI) less than 80% of the area median.[4] In practice, policymakers used estimates of tract poverty rates and median family income from the 2015 5-Year American Community Survey (ACS) to assess eligibility.

Congress also allowed for a small number of tracts to be eligible for OZ designation even if they did not meet the poverty or income thresholds. Tracts classified as high-migration rural communities or low-population communities were deemed eligible, as were tracts with median family income of less than 125% of an adjacent eligible low income community.[5] However, the vast majority of designated OZ tracts (97%) were deemed eligible on the basis of their poverty rate or median family income in the 2015 American Community Survey rather than these alternate criteria.

After Treasury and IRS determined which tracts were policy-eligible, state governors were given three months to nominate tracts for OZ designation. States could nominate up to 25% of their eligible tracts, and less populated states were granted a minimum of 25 OZs. Treasury accepted all state nominations from April to June of 2018, and ultimately designated 8,764 tracts (≈12% of all tracts) as Opportunity Zones. We explore the characteristics of eligible and chosen OZ tracts in greater detail in Section 2.4.

2.3 OZ Tax Subsidies

The central policy instruments of the OZ program are capital subsidies — specifically, highly favorable tax treatment of income accrued from capital gains. Investors intending to claim the tax benefit must (a) register their business as a Qualifying Opportunity Fund (QOF) with the IRS, (b) liquidate an existing asset, and (c) re-invest the capital gains into qualifying OZ assets. There are three main tax advantages conferred on these investments, which we summarize below.

First, taxes owed on capital gains from liquidating the initial asset are deferred until the fund sells its subsequent OZ investments or until the end of 2026, whichever is sooner. Since investors may redeploy this taxable income into income-bearing assets until the tax is due, the deferral is

[4]For rural tracts, the area MFI is taken to be the statewide median family income. For urban tracts, the area MFI is the larger of the statewide MFI and the metropolitan area MFI.

[5]A high-migration rural community is defined as a census tract located within a high-migration rural county whose median family income was 85% of the statewide median family income. High migration rural counties are those that have had net outmigration of greater than 10% over the period 1990-2010. A low-popuation tract is a tract within an empowerment zone, contiguous to at least one LIC, with a population of less than 2,000. No more than 5% of a state's tracts could be nominated on the basis of meeting the adjacency criteria.

potentially lucrative. Second, investors who hold qualifying OZ assets are eligible for a step-up in basis on their initial capital gains after 5 years (10%) and 7 years (15%), directly reducing tax liability. Finally, investors who hold qualifying OZ assets for at least 10 years may claim a 100% reduction in capital gains tax on appreciation of those OZ assets. The capital gains tax rate typically ranges from 15-20%, and so full elimination of the tax represents a large and significant subsidy.[6]

Broadly, QOF funds may invest in two categories of assets: (1) stock and partnership interests in qualifying operating businesses (QOB), and (2) qualifiying property (QOP), which can be leased or owned. Qualifying OZ businesses (that is, firms receiving investment from QOFs) must meet regulatory criteria requiring that their core economic activities occur within the boundaries of a designated OZ tract, and property investors are generally legally required to demonstrate "substantial" capital improvements in real estate assets.[7] These regulations were introduced by the Treasury Department to curb tax evasion, and to increase the likelihood that OZ investments spur real economic activity and opportunity for OZ workers and residents.

Private-sector investors estimate that, under a range of plausible assumptions about discount rates and rates of return on OZ capital, investors who maximally leverage the OZ policy incentives may ultimately increase their after-tax return by approximately 40%.[8] The OZ program thus introduces a large spatial capital tax wedge that varies sharply even across neighborhoods within the same city.

2.4 Summary Statistics

Table 1 shows tract-level demographic summary statistics to illustrate differences between OZ-eligible tracts (Column 1), OZ-designated tracts (Column 2), and the country as a whole (Column 3). The data are from the 5-Year 2015 American Community Survey, and corresponds to the data used by the IRS and Treasury to determine which tracts were eligibile to be nominated by states as Opportunity Zones. Column 4 shows differences between OZ-designated tracts and OZ-eligible tracts, and Column 5 calculates the relevant p-values. The table shows that designated OZ tracts (Column 1) tend to have lower incomes, home values, and education attainment – and higher poverty rates and non-white population shares – relative to tracts that were eligible for

[6] IRS provides further details on capital gains tax rates here.
[7] The IRS provides further details on these regulatory requirements here .
[8] See e.g. Weinstein and Glickman (2020).

TABLE 1: TRACT SUMMARY STATISTICS

	(1) OZ Tracts	(2) Eligible, Not Chosen	(3) All Tracts	(4) Diff (1-2)	(5) p-val
Population	3,999	4,041	4,326	-42	0.07
	(1,908)	(1,860)	(2,129)		
Rural	0.21	0.18	0.16	0.03	0.00
	(0.41)	(0.39)	(0.37)		
Median Age	35.6	35.9	38.9	-0.3	0.00
	(7.3)	(7.5)	(7.7)		
% White	0.58	0.63	0.73	-0.05	0.00
	(0.29)	(0.28)	(0.25)		
% Black	0.26	0.21	0.14	0.05	0.00
	(0.30)	(0.27)	(0.22)		
% Foreign Born	0.15	0.17	0.14	-0.02	0.00
	(0.16)	(0.17)	(0.14)		
% High School	0.49	0.51	0.58	-0.02	0.00
	(0.12)	(0.12)	(0.12)		
% College	0.11	0.12	0.20	-0.01	0.00
	(0.08)	(0.09)	(0.14)		
Median Family Income	38,978	46,000	68,357	-7022	0.00
	(15,401)	(16,317)	(33,997)		
% Poverty Rate	0.29	0.25	0.16	0.04	0.00
	(0.13)	(0.11)	(0.12)		
Median Home Values (1000s)	696	748	1,021	-52	0.00
	(495)	(465)	(632)		
Household Gini	0.46	0.44	0.42	0.02	0.00
	(0.06)	(0.06)	(0.06)		
N	8,638	23,699	74,001		

Notes: Unit of analysis is 74,001 census tracts. Demographic data are from the 2015 5-Year American Community Survey (ACS). Table excludes tracts with missing ACS data. The table shows means and standard deviations in parentheses. OZ tracts (Column 1) are socioeconomically disadvantaged relative to eligible-but-not-chosen tracts (Column 2), which are in turn disadvantaged relative to the country as a whole (Column 3). Column 4 computes the difference in means between Columns 1 and 2, and Column 5 presents p-values testing the null hypothesis that these means are equal. These data are consistent with the view that policymakers intended to target populations most in need.

the OZ tax subsidy but were not nominated by the states (Column 2). Eligible tracts are, in turn, socioeconomally disadvantaged relative to the country as a whole (Column 3).

This evidence, corroborated by other researchers, is consistent with the view that both federal and state lawmakers generally intended to target OZ investment toward populations most in need. In the following section, we present new evidence on take-up and the spatial distribution of OZ investment across tracts.

3 Descriptive Evidence on OZ Investment

3.1 OZ Data in Federal Tax Records

We measure OZ program investment for all businesses that filed an electronic copy of IRS Form 8996 in tax years 2019 and 2020. This form requires QOF funds to identify the firms and census tracts in which they are investing, as well the corresponding dollar values. These data do not yet cover OZ investments from businesses that submitted paper copies of their tax returns, nor do they cover data from subsequent tax years. We provide details about how line items in Form 8996 correspond to definitions in this paper in Appendix A.

The first two columns of Table 2 show that QOF businesses reported approximately $26.7 billion in OZ-subsidized capital investment flows in 2019 and an additional $14.8 billion in flows in 2020, for a cumulative total of $41.5 billion by the end of 2020.

TABLE 2: INVESTMENT IN OPPORTUNITY ZONES OVER TIME

Tax Year	Total Annual Flows (mil)	Cumulative Flows (mil)	Cumulative E-Filed (mil)	E-Filed Share	Tracts (#)	QOF (#)	QOB (#)
2019	26,670	26,670	18,779	0.70	1,347	2,526	2,224
2020	14,789	41,459	32,504	0.78	3,242	3,514	3,281

Notes: Data in the first two columns are from the universe of 8996 QOF returns. Data in all remaining columns cover only electronically-filed 8996 tax returns. The final four columns show cumulative values. We provide additional details about these data in Appendix A.

We calculate that the electronic Form 8996 returns in our analysis sample cover approximately 78% of the cumulative value of QOF investments in tax year 2020. Among the sub-sample of e-filers for which we have detailed data, the number of OZ tracts receiving any investment more than doubled from 2019 and 2020 and the cumulative number of QOFs (investors) and QOBs

(investees) increased substantially as well.

That our sample is limited to eletronic filers naturally invites the question: how representative are electronic filers of all 8996 filers? Since the OZ program and its associated tax forms are new, historical patterns provide limited guidance in assessing possible differences between electronic and paper filers. Even if electronic filers on average make similar investment decisions to paper filers, the descriptive estimates presented below should nevertheless be interpreted as providing a lower bound on aggregate OZ investment by tax year 2020.

Caveats aside, the existing data from electronic filers provide an emerging picture of OZ investment to date. In what follows, we describe the data sources, present aggregate summary statistics, break out investment by industry and geography, and correlate investment flows with demographic, industry, and firm characteristics. Overall, the data show that OZ investment is highly spatially concentrated, is directed toward the real estate and construction sectors, and gravitates toward tracts with relatively higher educational attainment, income, density, and pre-existing upward income and population growth trends.

3.2 OZ Investment is Spatially Concentrated

We begin with a broad overview of the Form 8996 data. Table 3 shows that businesses filing electronic 8996 returns reported approximately $32.5 billion in cumulative OZ-subsidized capital investments by 2020. In total, we observe 3,953 QOF funds investing in 3,677 QOB businesses across 3,242 OZ census tracts. Panel A reveals that this investment is highly concentrated in a small share of tracts: in fact, 5,522 of 8,764 OZ tracts in our sample (63%) appear to receive zero investment. We also find that approximately $3.2 billion of this investment (10%) is not associated with a designated Opportunity Zone tract; this may reflect regulatory guidance allowing QOF funds to invest a fraction (10%) of their assets in non-OZ tracts, as well as taxpayer or administrative error.

TABLE 3: INVESTMENT IN OPPORTUNITY ZONES BY TYPE

	(mil)	Share	# OZ Tracts	# QOF	# QOB
Panel A: By Tract Type					
OZ tract, >0 investment	29,267	0.90	3,242	3,514	3,281
OZ tract, no investment	0	0	5,522	0	0
Unmatched tract	3,236	0.10	n.a.	511	501
Panel B: By Investment Type					
Stock or Partnership Interest	32,478	1.00	3,573	3,953	3,677
Owned or Leased Property	25	0.00	6	0	0
Panel C: By QOB Entity Type					
Partnership	23,217	0.71	3,102	2,623	2,149
Other	9,286	0.29	1,121	1,558	1,528
Total	**32,504**	**1.00**	**3,242**	**3,953**	**3,677**

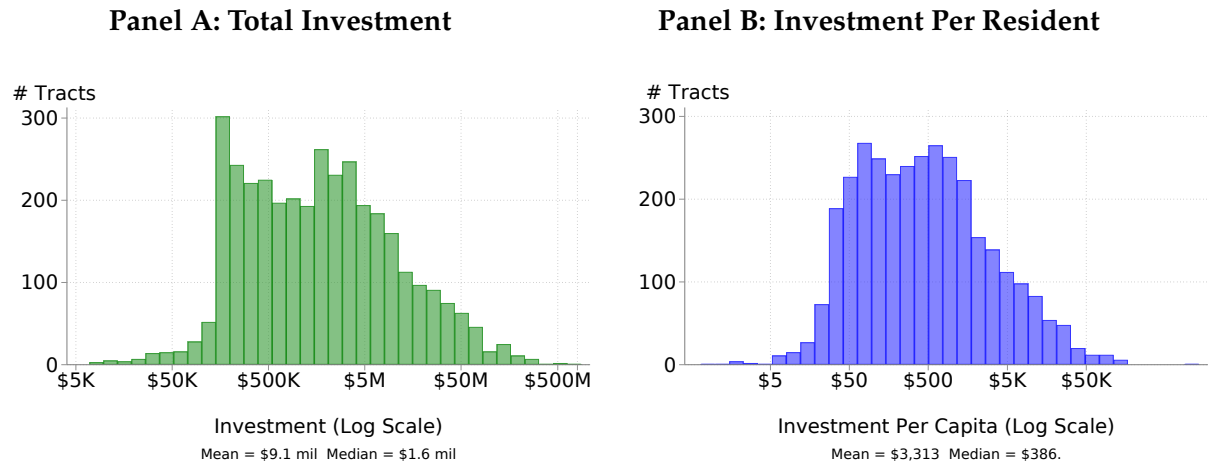
Notes: Data based on IRS records of Form 8996 from electronic filers in tax year 2019. Columns need not always sum to totals. The table shows that OZ investment is highly concentrated in a small number of Opportunity Zones and in partnership interests.

Panel B of Table 3 shows that OZ investment is virtually entirely concentrated in equity and partnership interests (100%) rather than property (0%). In Panel C we identify the legal entity type of the QOB businesses receiving investment from OZ funds, and confirm that this investment is overwhelminly concentrated in partnerships (71%). Structuring a business as a partnership offers owners several legal and economic advantages over alternative entity types, but in our setting perhaps the most important is that partnerships allow taxable depreciation deductions (such as those resulting from real estate depreciation) to flow through to the investors.

Although Table 3 shows that the vast majority of OZ tracts do not attract any investment, the tracts that do receive investment report large and economically significant amounts. Panel A of Figure 1 shows the distribution of investment for tracts that received at least $5,000 by 2020, and Panel B shows these values normalized on a per-resident basis. Among these tracts, median OZ investment is $1.6 million, or $386 per resident. Overall, the distribution of investment across all OZ tracts is highly skewed, such that the top 5% of tracts receive 78% of total investment, and the top 1% of tracts receive 42% of total investment.

In summary, many neighborhoods have received no OZ investment, but for those that do, the amount of investment can be quite large. Low tract-level take-up rates may help to explain estimates of modest or null intent-to-treat effects in existing research (e.g., Chen, Glaeser, and Wessel 2019; Atkins, Hernandez-Lagos, Jara-Figueroa, and Seamans 2020; Freedman, Khanna,

FIGURE 1: TRACT-LEVEL DISTRIBUTION OF OZ INVESTMENT



Notes: N=3,230 census tracts with at least $5,000 of OZ investment. Data based on electronic filers of IRS form 8996 in tax year 2020. Panel A shows the distribution of total investment, and Panel B shows the distribution of investment per capita. We use log scales on the x-axes and exclude tracts with less than $5,000 of investment to improve the data visualization. The figures underscore that OZ investment is highly spatially concentrated: the top 5% of OZ tracts receive 78% of total investment, and the top 1% of tracts receive 42% of total investment. As shown in Table 3, the bottom 63% of tracts receive zero investment. Among tracts that receive >0 investment, the median investment of $386 per resident is economically large relative to existing federal place-based programs.

and Neumark 2021). Among tracts where QOFs do report investment, the extent to which these financial investments translate into physical capital expenditures that would not have occured in the absence of the OZ tax subsidy is a question we are investigating in ongoing research.

3.3 Industry Composition of OZ Investment

We next examine how OZ investment varies across industires. Panels A and B of Table 4 show the NAICS-2 composition of QOF funds and QOB businesses, respectively. Both QOF investor funds and recipient QOB firms are mainly in the business of real estate, with smaller but significant shares in related industries such as construction, finance, and management. Panel B shows that approximately 52% of OZ dollars are invested in real estate firms, while 11% is invested in construction firms, and 9% in finance. In Appendix Table A.2, we further decompose industry composition of funds and recipient firms using finer 6-digit industry codes, and show that both residential and non-residential real estate businesses attract considerable OZ investment.

TABLE 4: INDUSTRY COMPOSITION OF FUNDS AND RECIPIENT FIRMS

Panel A: QOF Investor Funds

NAICS	Industry	# Funds	(mil)	Share
53	Real Estate, Renting, and Leasing	1,943	13,738	0.42
52	Finance and Insurance	1,238	9,376	0.29
23	Construction	384	1,805	0.06
55	Management of Companies	200	1,724	0.05
–	Other	188	5,860	0.18
	Total	**3,953**	**32,504**	**1.00**

Panel B: QOB Firms Receiving Investment

NAICS	Industry	# Targets	(mil)	Share
53	Real Estate, Renting, and Leasing	2,066	16,778	0.52
23	Construction	448	3,733	0.11
52	Finance and Insurance	326	2,985	0.09
55	Management of Companies	81	888	0.03
72	Lodging and Restaurants	111	842	0.03
54	Professional Services	73	823	0.03
31	Manufacturing	54	325	0.01
–	Other	214	4,220	0.13
–	Unknown	304	1,909	0.06
	Total	**3,677**	**32,504**	**1.00**

Notes: Data based on electronic filers of IRS form 8996 in tax years 2019 and 2020. Panel A shows the number of QOF investor funds, dollar values, and dollar share of OZ investment, and Panel B shows analogous measures for the QOB firms receiving investment. QOF investment is highly concentrated in real estate, with smaller but significant shares in related industries such as construction, finance, and management..

Several factors help to explain why OZ funds exhibit a preference for real estate investments. First, real estate is a highly capital-intensive sector. The Bureau of Economic Analysis estimates that residential and non-residential structures account for approximately 39% of annual private fixed asset investment.[9] Second, investment in real estate is geographically versatile and thus well suited to benefit from a tax subsidy that applies broadly to hetergeneous neighborhoods. Virtually any area of the country with population growth is likely to need new housing and commercial structures.[10] By contrast, other capital-intensive sectors such as oil refineries or manufacturing plants are unlikely to sprout up, for example, in dense urban areas. Third, specialists in the real estate sector may be uniquely situated to facilitiate financing and reduce transaction costs associated with investment. This specialization is reflected in part by the large number of real estate funds in Panel A of Table 4. Similarly, local real estate developers may have portfolios of

[9] See BEA Table 5.10: Changes in Net Stock of Produced Assets (Fixed Assets and Inventories).

[10] In Section 3.4 we show that population growth is indeed a strong predictor of OZ investment.

potential projects that can be prioritized or de-prioritized depending on the price and availability of capital financing. Fourth, the widespread availability of data on real estate price trends may help investors to identify investments likely to have higher returns and lower risk. Finally, legal and regulatory considerations also favor investments in real estate over other sectors; see Hadjilogiou, Lutz, and Bruno (2021) for a review.

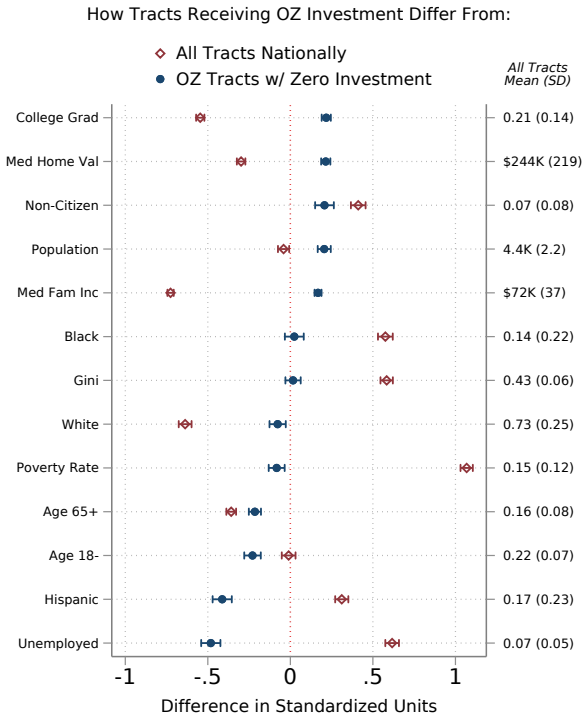
3.4 Demographic Correlates of OZ Investment

In this section we explore how OZ investment is correlated with tract demographics. Figure 2 compares demographic characteristics for three groups of census tracts: (1) OZ tracts receiving positive investment from QOFs; (2) OZ tracts receiving zero investment from QOFs; and (3) all tracts nationally. In Panels A and B, these demographic characteristics are computed from the 2017 American Community Survey, while in Panel C we use data from the 2016 Census Longitudinal Employer-Household Dynamics LODES data. We standardize the variables to have mean zero and standard deviation one, and report how OZ tracts that receive QOF investment differ in standardized units from all tracts and from OZ tracts that do not receive investment. The confidence bars report 95% confidence intervals computed using robust standard errors.

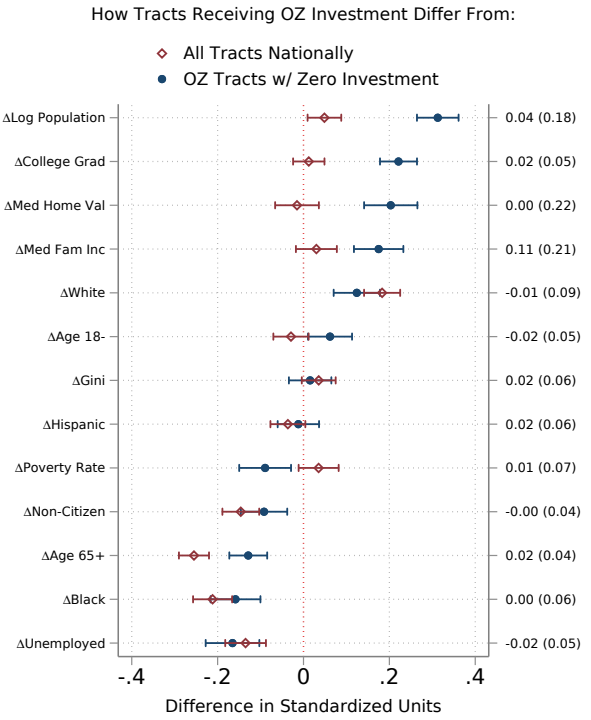
Panel A of Figure 2 shows that, relative to the general population, OZ tracts that receive investment have on average fewer residents with a college degree, lower incomes, and higher poverty rates. Conversely, when compared to other OZ tracts with zero investment, tracts that receive investment have relatively high educational attainment, home values, and incomes, as well as lower unemployment and higher shares of prime-age workers. The interpretation of the coefficients is, for example, that the share of college graduates in tracts that received OZ investment is on average 0.55 standard units lower than the national average, and 0.22 standard units higher than in OZ tracts that did not receive any investment. For reference, we report the raw mean and standard deviation of these variables for all tracts on the right-hand side of the figure, and also report the raw means for each of these outcomes and groups of tracts in tables in Appendix A.1.

FIGURE 2: DEMOGRAPHIC CORRELATES OF OZ INVESTMENT

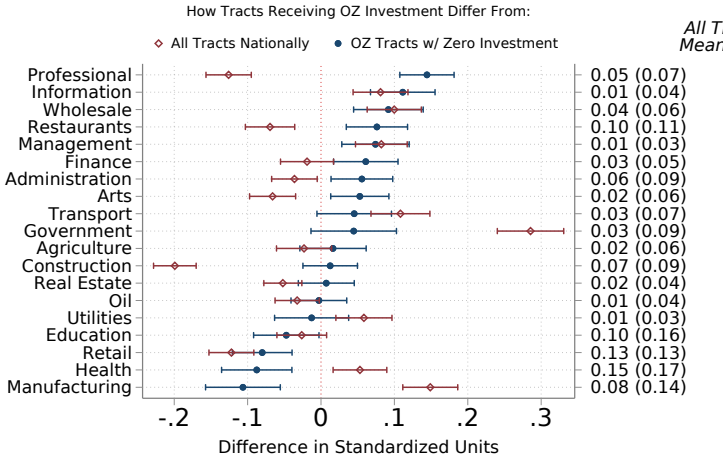
Panel A: 2017 Demographics



Panel B: 2010-2017 Demographic Trends



Panel C: 2016 Tract Workforce Industry Composition



Notes: N=74,288 census tracts. The figure shows average differences in demographic characteristcs for three groups of census tracts: (1) OZ tracts receiving positive investment; (2) OZ tracts receiving zero investment; and (3) all tracts nationally. The data in Panels A and B are from the 2017 and 2010 5-Year ACS, and the data in Panel C are from 2016 Census Longitudinal Employer-Household Dynamics LODES data. All variables are standardized to have mean zero and standard deviation one. Error bands show 95% confidence intervals with robust standard errors. The coefficients imply, for example from Panel A, that the share of college graduates in tracts that received OZ investment is on average 0.55 standard units lower than the national average, and 0.22 standard units higher than in OZ tracts that did not receive any investment. Among OZ tracts eligible for the tax subsidy, QOFs typically invested in neighborhoods with higher educational attainment, income, demographic change, and concentrations of professional and amenity services. We also present the raw means of these variables for each group of census tracts in Appendix Table A.1.

Panel B of Figure 2 correlates OZ investment with 2010-2017 demographic trends. Among OZ tracts, QOF funds invested in neighborhoods where incomes, population, and the share of college educated residents have increased sharply over the past decade, and where the non-white and elderly share of the population have declined. However, the figure also shows that trends in these neighborhoods are similar to trends in the rest of the US. As in Panel A,these results overall point towards investment in tracts with relatively greater pre-existing economic opportunity.

Lastly, Panel C of Table 2 compares the 2016 industry composition of the workforce across these three groups of tracts. On average, tracts with higher 2016 shares of workers in professional and amenity services – such as finance, management, restaurants, and the arts – attracted more OZ capital by 2020 relative to other OZ tracts. By contrast, QOF funds were less likely to invest in OZ tracts with higher workforce shares in healthcare, manufacturing, education, or retail. Relative to all tracts, tracts receiving OZ investment have a significantly larger share of government workers and a smaller share of construction workers.

Taken together, the three panels in Figure 2 paint a consistent picture. Although all OZ tracts are relatively disadvantaged in comparison to the rest of country, the tracts that received investment were the least disadvantaged of those granted OZ status. Moreover, the preliminary descriptive evidence suggests that OZ capital may disproportionately benefit a narrow subset of tracts in which economic conditions were already improving prior to implementation of the tax subsidy.

In Appendix Figure A.2, we show variations on Panels A and B to illustrate how the characteristics of tracts receiving OZ investment have changed from 2019 to 2020, relative to OZ tracts that did not receive investment in either year. While QOF investment in 2020 continued to favor relatively well-off OZ neighborhoods, the figure shows that this pattern was attenuated relative to 2019.

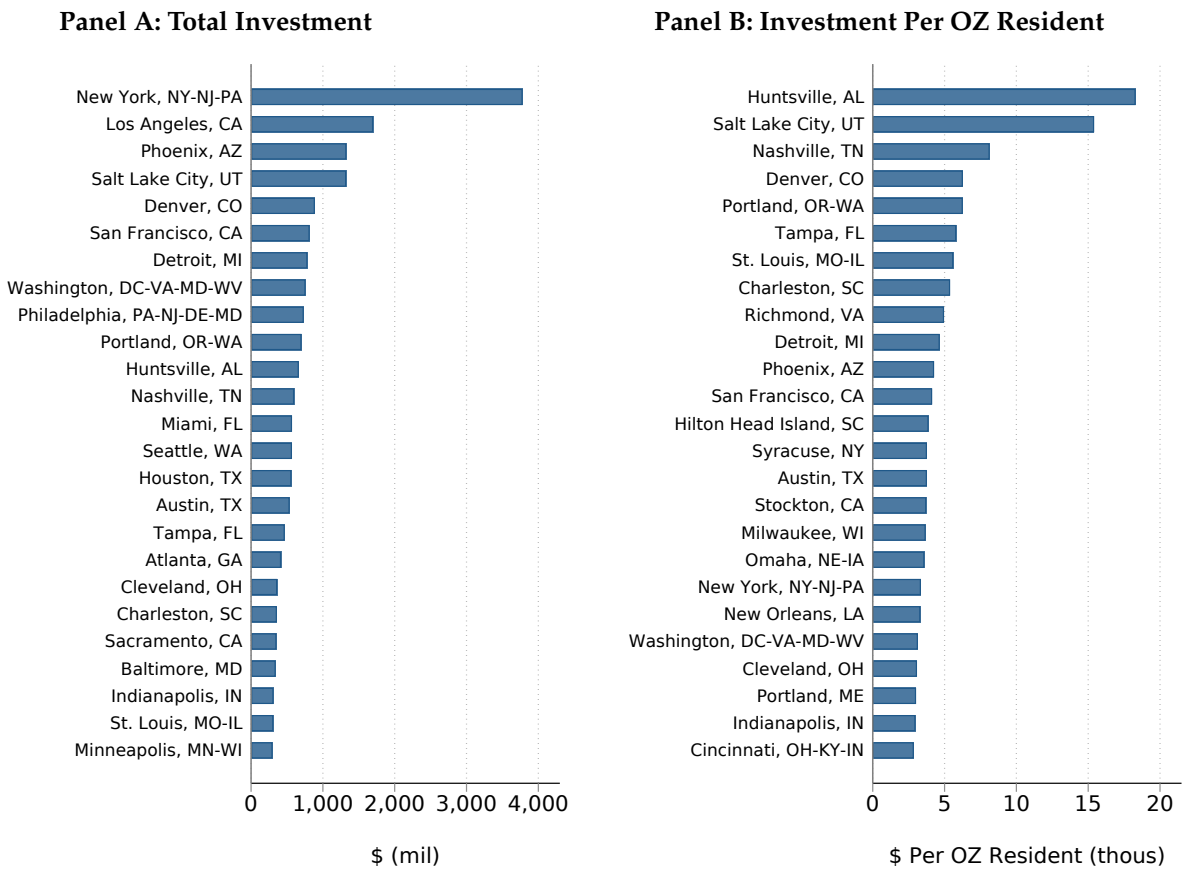
3.5 Geographic Patterns in OZ Investment

We now explore geographic patterns in OZ Investment. Panels A and B of Figure 3 show total investment and investment per OZ resident, respectively, for the top 25 commuting zones.[11] The diverse list of commuting zones in Panel A reflects that QOF funds reported investment in virtually

[11] Appendix Table A.3 shows these statistics for the top 50 commuting zones.

every region of the country and, not surprisingly, that the most populous commuting zones such as New York and Los Angeles generally received the most investment. Panel B shows that, on a per capita basis, mid-size commuting zones like Salt Lake City, Nashville, and Tampa received the most investment, although QOF investors did not neglect larger commuting zones like Denver, San Francisco, and Phoenix. OZ investment in Hunstville, Alabama is especially large and appears to be an outlier relative to other eligible OZ labor markets.

FIGURE 3: OZ INVESTMENT IN 25 TOP COMMUTING ZONES



Notes: Panel A shows total OZ investment by commuting zone, and Panel B shows investment per OZ-resident, normalizing by the population of tracts with >0 investment. We compute investment from electronically-filed business tax records of Form 8996 in tax years 2019 and 2020. The panels present data for the top 25 commuting zones, exluding those with few QOF funds and/or QOB businesses to protect taxpayer privacy. The figure shows that QOF's invested in diverse labor markets in nearly every region of the country. Appendix Table A.3 shows these statistics for the top 50 commuting zones.

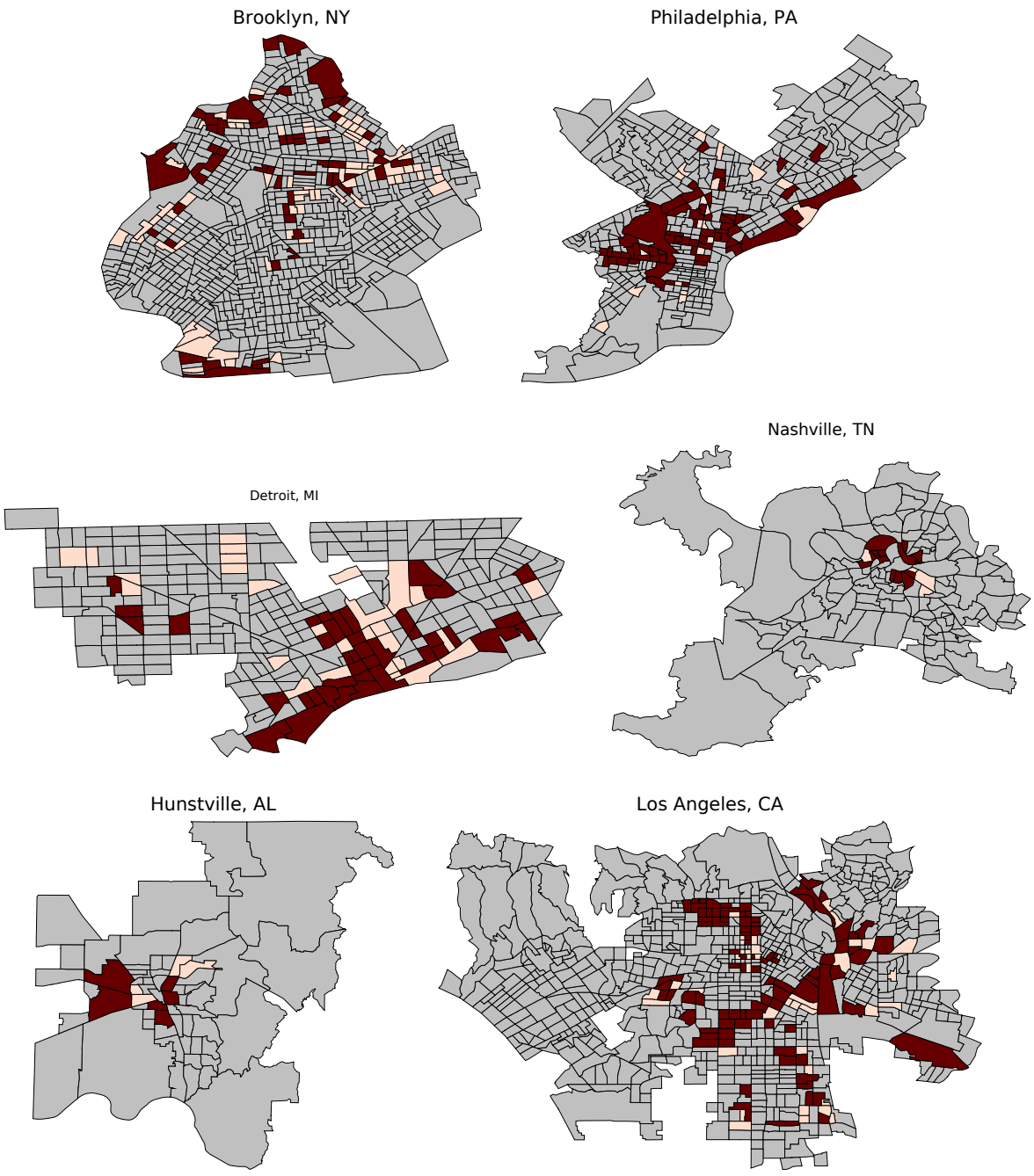
In Figure 4 we zoom in at a finer level of detail and map the spatial distribution of OZ investment in six illustrative cities: Brooklyn, Philadelphia, Detroit, Nashville, Hunstville, and Los Angeles. Dark red areas on the maps indicate OZ tracts with >0 investment, and pink areas

indicate OZ tracts that receive zero investment. Grey areas indicate tracts that are not Opportunity Zones. These illustrative examples suggest that OZ investment gravitated toward dense city centers and central business districts (or, in Brooklyn, the neighborhoods most proximate to Manhattan).

We confirm generalizable relationships between investment, population density, and distance from the city or commuting zone center in Panel A of Figure 5, which shows how tracts receiving positive OZ investment differ in economic geography from all tracts and from OZ tracts that did not receive investment. Tracts receiving OZ investment are on average more densely populated and urban relative to other OZ tracts and relative to non-OZ tracts. These tracts are also closer to the centers of commuting zones relative to other tracts.[12] OZ investment is also decreasing in the distance between investor funds and OZ tracts. Panel B of Figure 5 shows the distance distribution between OZ funds and the census tracts in which they invest, and Panel C plots fund-by-tract-level investment against the log distance between funds and OZ tract. Consistent with empirically and theoretically documented linkages between spatial proximity and economic activity, investment between QOFs and QOBs is declining in distance. In the next section we further explore how the locations of not only QOB businesses, but also QOF investors, may have implications for understanding the geographic incidence of the OZ program.

[12]We define the commuting zone center as the census tract with the largest number of jobs in the municipality (commuting zone) in which the tract located.

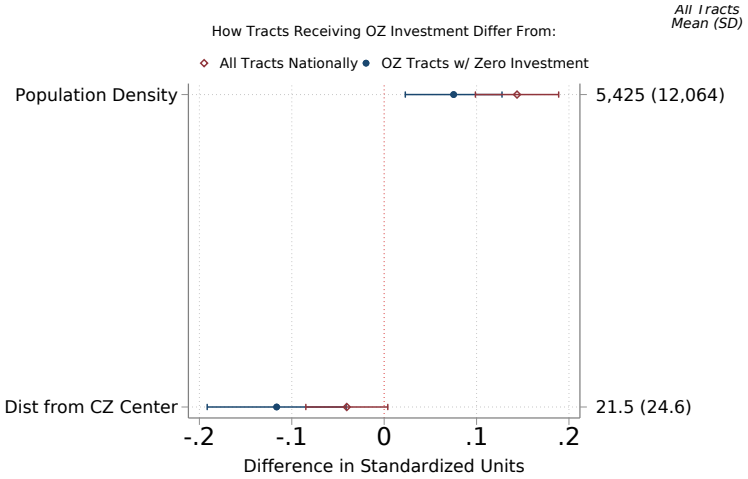
FIGURE 4: MAPPING OZ INVESTMENT IN SIX ILLUSTRATIVE CITIES



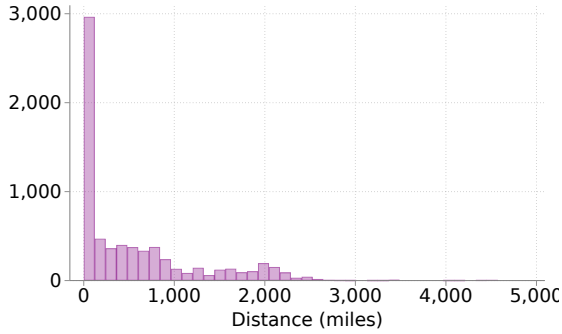
Notes: Red areas on the maps indicate OZ tracts with >0 QOF investment, and pink areas indicate OZ tracts that receive zero QOF investment. Grey areas indicate tracts that are not Opportunity Zones. We compute investment from electronically-filed business tax records of Form 8996 in tax years 2019 and 2020. These illustrative examples suggest that OZ investment gravitated toward dense city centers and central business districts (in the case of Brooklyn, investment appears concentrated in the neighborhoods most proximate to Manhattan). We confirm this generalizable relationship in Figure 5.

FIGURE 5: OZ INVESTMENT, POPULATION DENSITY, AND DISTANCE

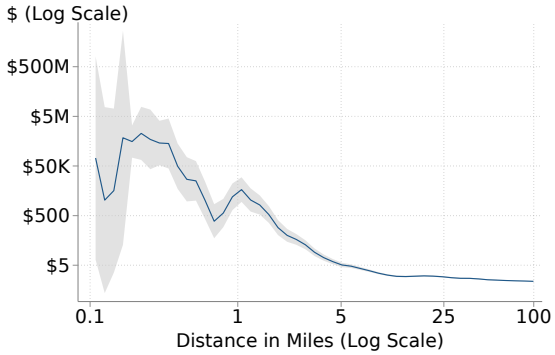
Panel A: Population Density, Distance from City and CZ Center



Panel B: Distance Between Fund-Tract Pairs



Panel C: Investment vs. Fund-Tract Distance



Notes: The sample is N=74,288 census tracts. Panel A shows differences in economic geography for three groups of tracts: (1) OZ tracts receiving positive investment; (2) OZ tracts receiving zero investment; and (3) all tracts nationally. On average, QOF funds invest more heavily in densely populated, urban neighborhoods closer to city and commuting zone centers. Panel B reports the distribution of distances between fund-tract pairs, and Panel C plots fund-level investment against distance from OZ tracts using a smooth polynomial fit. The plots highlight that OZ investor funds tend to be located (or, set up ex-post) in locations very close to OZ tracts.

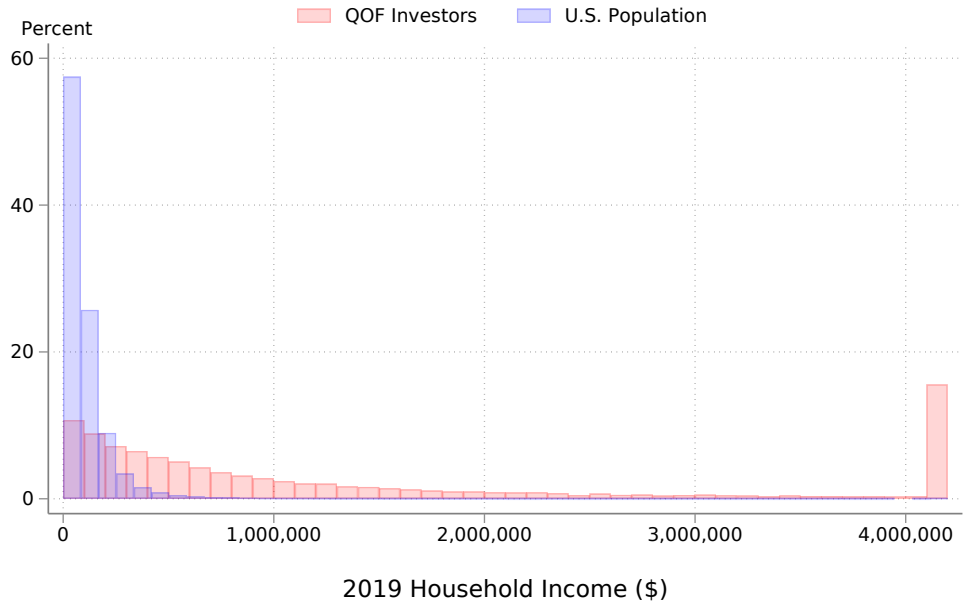
3.6 Income and Geography of QOF Investors

We have focused so far on describing the economic and sectoral characteristics of QOF investments, as well as the demographic and geographic characteristics of neighborhoods that receive those investments. Apart from residents of OZ neighborhoods, the incidence of the OZ program will naturally also fall in part on QOF investors, who are likely to most directly benefit from the tax incentives described in Section 2.3. In this section we briefly describe the income and geographic profiles of QOF investors in the available data.

To estimate the household income of QOF investors, we link QOF partnerships to their partners using the universe of 1065-K1 information return filings, which must be reported to IRS annually for all partners. Partnership ownership structures can be complex — for example, higher-tier partnerships may include both individuals and/or lower-tier partnerships as partners — rendering a complete match of these data to be difficult. Nevertheless, we are able to match approximately 89% of the partners of higher-tier QOF partnerships to individuals, who we then link to our household income database. In Figure 6, we show the distribution of household income for these QOF investors relative to the general US population.

The plot shows that, on average, QOF investors have substantially higher household income relative to the general US population. We estimate 2019 median and average household income for QOF investors to be $741,000 and $4,852,000 , respectively — an order of magnitude higher than the national median and average household incomes of$69,000and $117,000, respectively. While tax benefits to QOF investors will ultimately depend on the extent to which their investments appreciate in value over time, these results suggest that the direct tax incidence of the OZ program is likely to benefit households in the 99th percentile of the national household income distribution.

FIGURE 6: INCOME DISTRIBUTION OF QOF INVESTORS AND THE US POPULATION



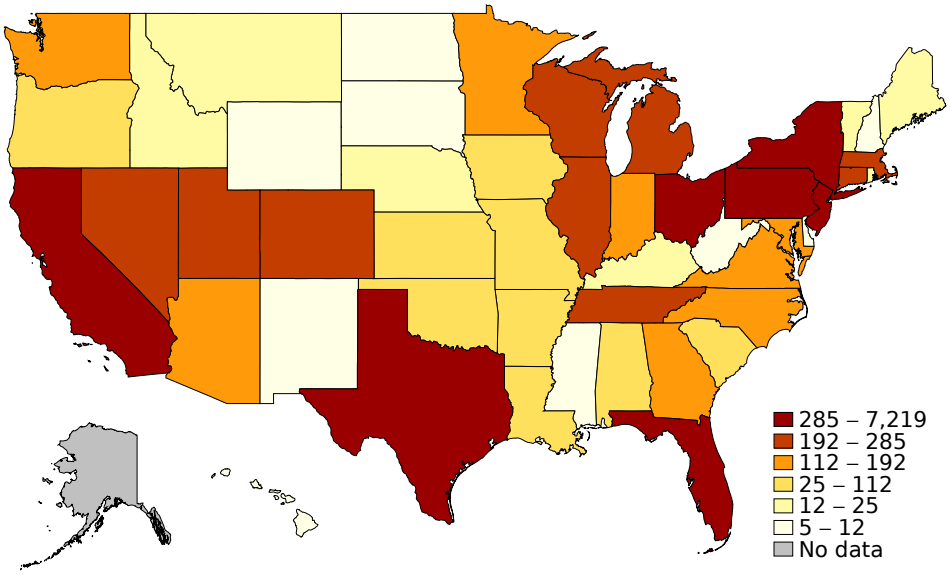
Notes: The plot shows the distribution of 2019 household income for QOF investors relative to the general US population. We identify QOF investors by linking QOZ partnerships to their partners using IRS Form 1065-K1, an information return that must be filed annually for all partners. Household income computations are described in Appendix A. We winsorize the top 1% of the QOF income distribution to improve the data visualization, and exclude households with negative income. Median and average household income for QOF investors is approximately $741,000 and $4,852,000 , respectively, relative to the national median and average of $69,000 and $117,000 , respectively.

Finally, in Figure 7, we link QOF investors to their state of residence, and estimate total the value of QOF investments coming from each state. To perform this computation, we again focus on QOF partnerships, and further make the simplifying assumption that all partners of a fund are equally invested in it. Panel A shows the resulting aggregate QOF investment that we assign to each state, scaled in million of dollars, and shows that the bulk of QOF dollars flow from populous and relatively wealthy states such as California, Texas, Florida, New York, and New Jersey.

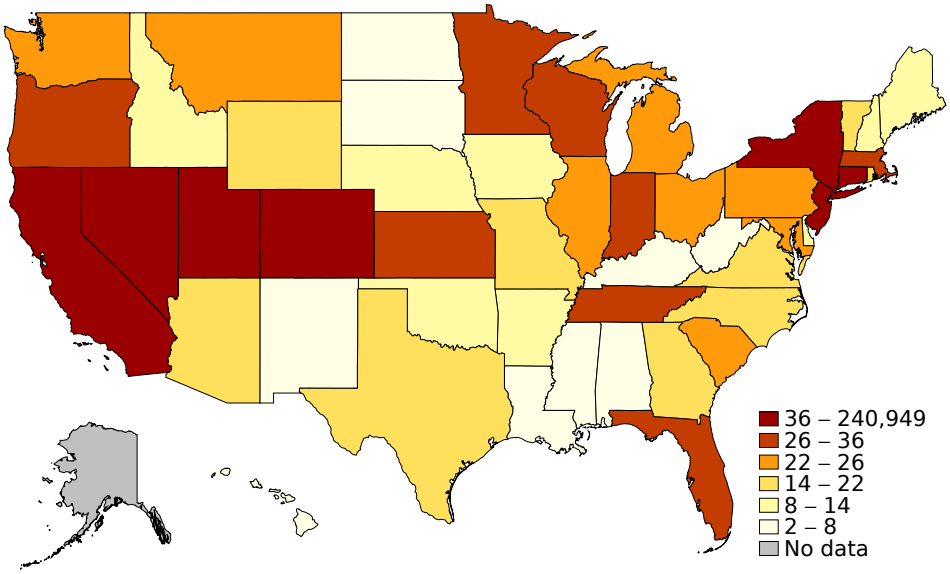
Panel B shows these aggregate totals scaled by state population, and shows that investors disproportionately reside in the Northeast and Pacific Coast, as well as a few states in the Mountain West such as Nevada, Utah, and Colorado. The maps highlight that the geographic incidence of the OZ program depends not only on which OZ tracts receive QOF investments, but also on the residential locations of QOF investors.

FIGURE 7: GEOGRAPHY OF QOF INVESTORS

Panel A: Total QOF Investment (mil $), by Investors' State of Residence



Panel B: QOF Investment Per Capita, by Investors' State of Residence



Notes: We link QOF investors to their state of residence by linking QOZ partnerships to their partners using IRS Form 1065-K1, an information return that must be filed annually for all partners. Panel A shows the resulting aggregate QOF investment that we assign to each state, scaled in million of dollars, and shows that the bulk of QOF dollars flow from populous and relatively wealthy states such as California, Texas, Florida, New York, and Illinois. Panel B shows these aggregate totals scaled by state population, and shows that investors disproportionately reside in the Northeast and Pacific Coast, as well as a few states in the Mountain West and Great Plains such as Nevada, Utah, and Colorado. The maps highlight that the geographic incidence of the OZ program depends not only on which OZ tracts receive QOF investments, but also on the residential locations of QOF investors.

4 New Panels from IRS Microdata

We construct new annual panels of individual tract-level outcomes using rich data from federal tax records. We provide an overview of our data sources below, and provide more detailed discussion of our data processing in Appendix A. We then show how these measures correlate with the available data on OZ investment.

4.1 Individual- and Business-Level Federal Tax Records

We leverage the universe of de-identified federal individual- and business-level tax records from the Internal Revenue Service (IRS) to construct novel tract- and block-level measures of economic activity. On the individual side, our work builds on Larrimore, Mortenson, and Splinter (2019), who map virtually all individuals residing in the United States to household identifiers using address data from 1040's and information returns. While taking stringent precautions to protect taxpayer privacy, we use open-source and commercial geocoding services to match household addresses with latitude and longitude coordinates, and to locate households within 2010 census tract boundaries.

We use the individual-level tax data to construct measures of household and family income, poverty, employment, wages, migration, and commuting that closely correspond to analogous measures from publicly available data. The new measures incorporate data from both income tax returns and information returns (such as W2s and 1099s), and thus allow us to observe income even for individuals and households that do not file income tax returns.

On the business side, our sample of firms includes the universe of corporations and partnerships, and excludes self-proprietorships. We link all businesses to their parent companies using the crosswalks constructed by Dobridge, Landefeld, and Mortenson (2019), and geocode them based on the address information provided on the cover form of their annual tax returns. We further link firms to their employees using W2s, and construct firm-level measures of real investment from Form 4562 following Yagan (2015). These measures of real investment capture firm spending on tax-dedeductible depreciable assets such as buildings, machinery, computer, vehicles, and office furniture.

A limitation of the business tax data is that we are unable to observe the establishment locations

of multi-establishment firms. This means, for example, that if a large national retail chain were to purchase new buildings in multiple states, we would be unable to observe the location of such investments. Thus, the firm-level measures must be interpreted with caution. When aggregating the firm-level data, we differentiate firms based on firm size: since smaller firms are less likely to have multiple establisments, they may provide a more geographically accurate picture of local economic conditions even if they are not represenative of all firms.

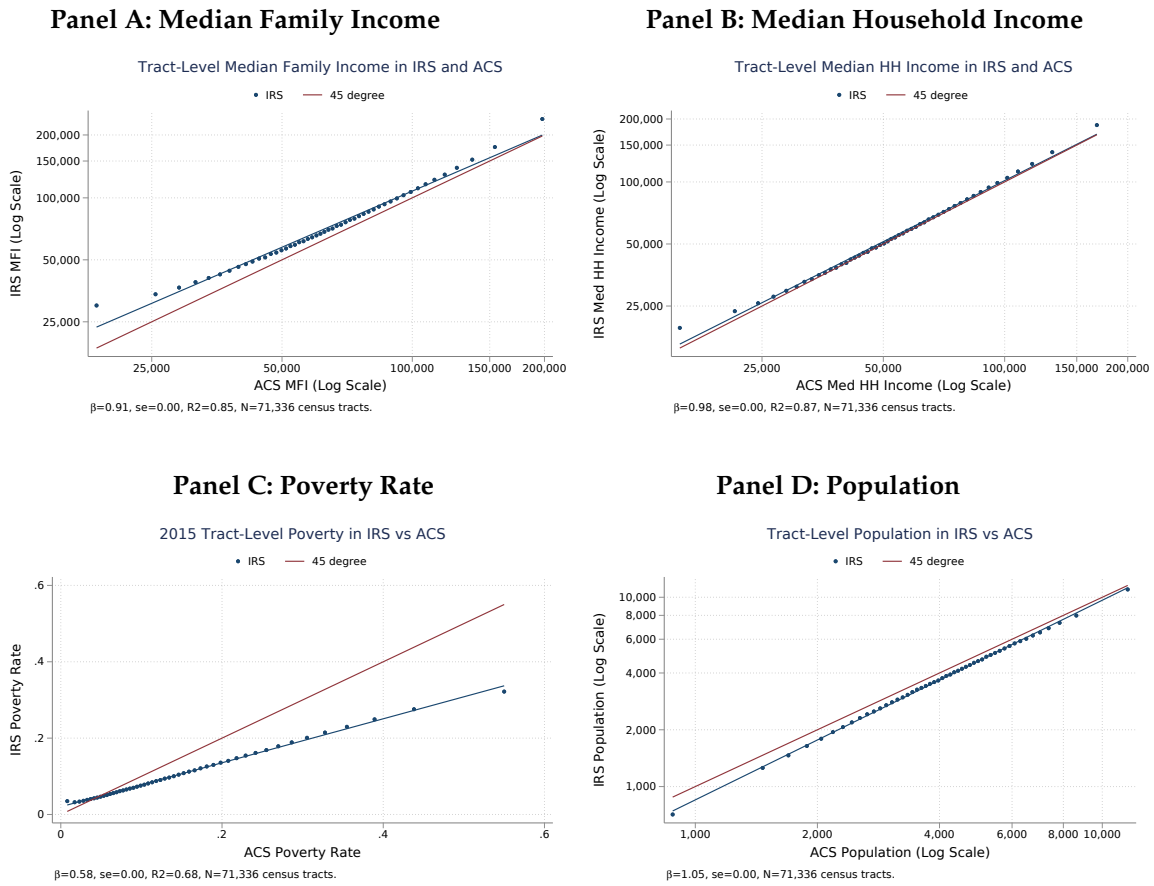
In total, we geocode more than one billion individual- and business-level tax returns from 2010 to 2019. We aggregate our resulting measures to the census-tract level and, in the following section, evaluate their validity in relation to publicly available datasets. We then correlate these measures with the available evidence on OZ investment.

4.2 Evaluating the New Tract-Level Measures Against Public Data

We probe the validity of our new measures by comparing them with analogous measures from publicly available data. Figure 8 compares our tract-level 2017 estimates of income, poverty, and population based on IRS data with survey-based estimates of these measures from the 2017 5-year Census American Community Survey (ACS). The 2017 5-year ACS pools together and averages survey responses from five consecutive years of 1% national population surveys from 2013-2017, which allows the Census to estimate population demographics at the tract-level using larger sample sizes. By contrast, our IRS-based measures are based on the universe of federal tax returns from a single tax-filing year.

In Panels A and B, we use binscatter plots to compare our tract-level IRS measures of median household income (MHI) and median family income (MFI), respectively, with the ACS data. Each point in these plots represents a simple average of an approximately equal number of census tracts. The plots also report the regresssion coefficient, standard error, and R-squared obtained from regressing the IRS measure on the ACS measure using OLS. The slopes of the lines are close to one, implying that a 1% increase in the ACS income is on average associated with an approximately 1% increase in the IRS income. Our IRS-based estimates are systematically higher than the ACS estimates, due primarily to the fact that our IRS measures are based only on data from tax-year 2017, whereas the ACS is based on five-year averages from 2013-2017. The upward level-shift thus represents income growth and inflation relative to the ACS measure.

FIGURE 8: IRS MEASURES VS. ACS MEASURES



Notes: N=72,349 census tracts with non-missing IRS and ACS measures. The figures compare 2017 5-year ACS tract-level outcomes (horizontal axis) with their corresponding 2017 IRS measure (vertical axis). The blue line shows the line of best fit, and the red line shows the 45-degree line. In Panels A and B, our IRS measures of median household and family income are systematically higher than the ACS measures, since the latter represent five-year 2013-2017 pooled averages whereas the former are based on data only from 2018. We find higher income at the bottom of the tract-level income distribution, due to underreporting of wage and private-retirement income among low-income households in ACS relative to what we observe from information returns in IRS data. This pattern is also reflected in systematically lower poverty rates in our IRS-based measures relative to ACS in Panel C. In Panel D, we find modestly lower population counts in our sample relative to the ACS, driven by households that we are unable to locate from our geocoding procedure.

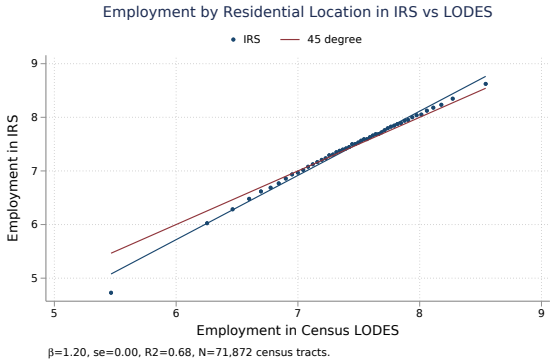
Panels A and B also reveal that the IRS data yield higher estimates of income at the lower end of the tract-level distribution relative to ACS. This difference reflects underreporting of wage and private-retirement income among low-income households in ACS relative to what we observe from information returns in IRS data (Bee and Rothbaum, 2017; Larrimore, Mortenson, and Splinter, 2020). Consistent with this result, in Panel C we estimate systematically lower poverty rates in the IRS data relative to the survey-based ACS measures.

Finally, Panel D compares our IRS population sample with the ACS estimate of tract population. The gap between the IRS and ACS population estimates is driven by individuals for

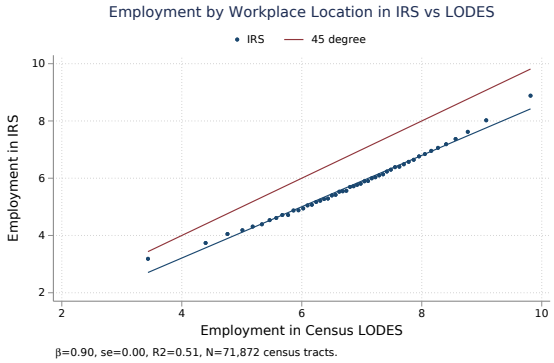
whom we are unable to assign a census tract using the geocoding procedure discussed in Appendix A. Overall, our geocoding procedure captures approximately 81% of the total US population, and approximately 85% of the population that does not report a PO Box address on their tax returns. The close alignment of the IRS- and ACS-based measures of tract-level income in Panels A and B suggest that any biases resulting from non-random biases in the geocoding procedure are likely to be small.

FIGURE 9: EMPLOYMENT IN IRS AND LODES DATA

Panel A: Employment by Tract of Residence



Panel B: Employment by Tract of Workplace



Notes: N=71,809 census tracts with non-missing IRS and LODES data. Panels A and B compare tract employment counts by residential and workplace tract locations, respectively, using our IRS measures and measures from the Census LODES data. The red line is a 45-degree line, and the blue line is the line of best fit. Panel A plots employment counts based on employees' tract of residence. Panel B plots employment counts based on employees' tract of workplace. Our IRS-based measure of workplace employment only covers small businesses with 1-49 employees, since the workplace location data for these businesses is likely to be more reliable; this definitional difference leads to a consistent gap between the IRS and LODES-based measures of workplace employment.Neverthless, the high correlations between the IRS and LODES measures in both panels lend credence to the validty of the geocoding procedure.

As a final validity exercise, we calculate employment totals by census tracts of residence and workplace location. We compare these counts from our IRS measures with those available in the census LODES data, shown as binscatter plots in Figure 9. In Panel A, employment counts by tract of residence align well with the corresponding counts from the LODES data. We underpredict employment by residence for areas with little employment, reflecting poorer geocoding coverage among individuals in sparsely populated areas. In Panel B, employment counts by tract of workplace are highly correlated with those seen in the LODES data, although a sizeable gap exists between the two estimates. This gap reflects that we only tabulate workplace employment counts for small businesses with 1-49 employees – that is, businessesthat are more likely to have only a single establishment and whose employees are thus more likely to work at the same physical

location as the address reported on the firm's tax filings. While differences between administrative and survey sources are natural, we find the high R-squared in both plots to be a reassuring signal of the quality of geocoding.

4.3 IRS Correlates of OZ Investment

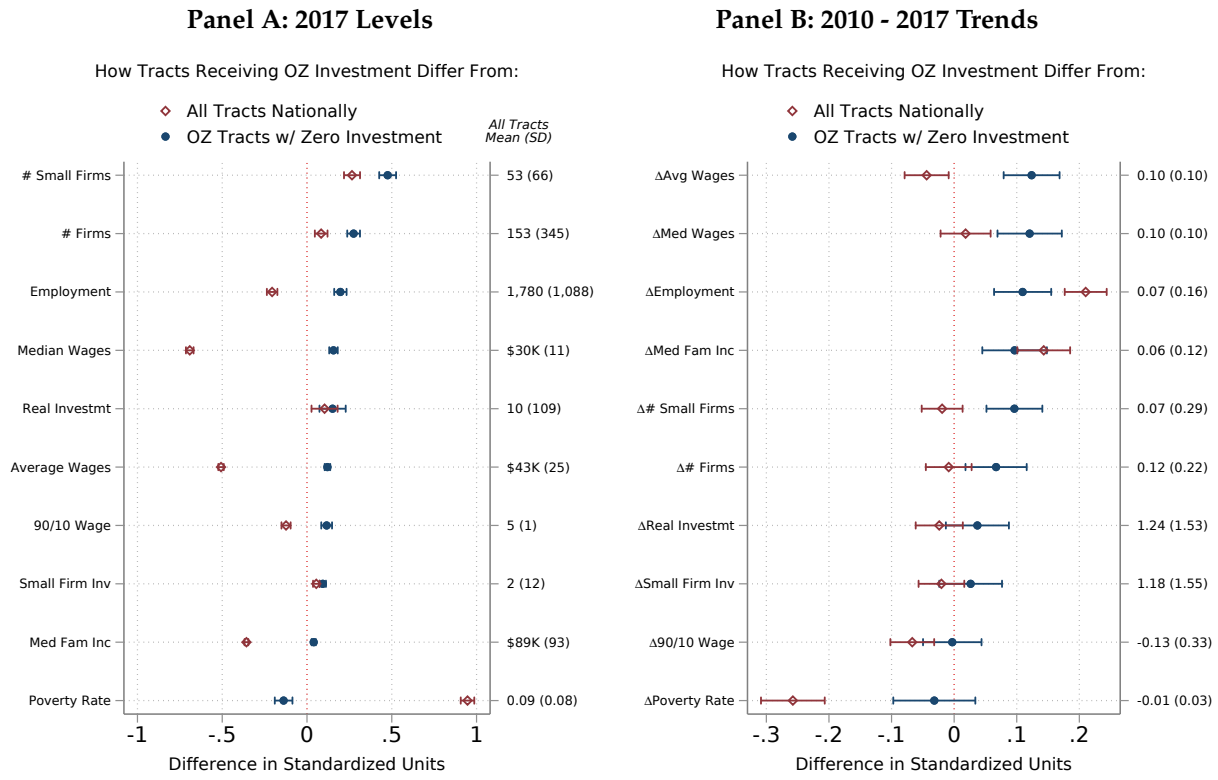
Panels A and B of Figure 10 perform the same analysis as in Section 3.4 using our IRS measures. Panel A uses IRS-based measures from 2017, while Panel B uses changes in those measures from 2010 to 2017.[13] As before, we standardize the variables to have mean zero and standard deviation one, and report how OZ tracts that receive QOF investment differ in standardized units from all tracts (in red) and from OZ tracts that do not receive investment (in blue). The confidence bars report 95% confidence intervals computed using robust standard errors.

The evidence presented in Figure 10 is broadly consistent with the evidence from Section 3. Among OZ-designated tracts, QOF funds invested in neighborhoods with higher wages, lower poverty rates, more employment, more firms, and higher levels of real investment. Still, these tracts receiving investment are economically disadvantaged relative to tracts nationally. Panel B uses 2010 to 2017 changes in the IRS measures to assess the extent to which OZ investment is correlated with recent neighborhood-level trends. While the magnitudes are smaller than those seen in Section 3, we find that QOF investment favored neighborhoods with higher income and firm growth. These patterns are most pronounced when the comparison group is OZs with no investment, but OZs also had higher rates of employment and median family income growth relative to all tracts nationally. The raw means for these figures can be found in Appendix A.1.

This evidence suggests that OZ tracts receiving investment from QOF funds were experiencing substantially different trends in economic activity relative to all tracts nationally and relative to OZ tracts that did not receive investment. A natural implication is that research designs that compare trend growth in OZ and non-OZ tracts to assess the causal impacts of the policy must be interpreted with care and caution. Comparable tracts should be balanced on a broad set of demographic and economic characteristics and trends to avoid spuriously conflating pre-existing trends with the causal effects of the OZ tax subsidy.

[13] For median family income and poverty rates, we use a shorter difference of 2015-2017, since we have not yet extended our IRS sample sample back to 2010.

FIGURE 10: IRS CORRELATES OF OZ INVESTMENT



Notes: N=74,001 census tracts. The figure shows differences in IRS measures for three mutually exclusive groups of census tracts: (1) OZ tracts receiving positive investment; (2) OZ tracts receiving zero investment; and (3) all other tracts. The data in Panels A and B are constructed from IRS microdata as described in Section 4 and Appendix A. All variables are standardized to have mean zero and standard deviation one. Error bands show 95% confidence intervals with robust standard errors. Among OZ tracts eligible for the tax subsidy, QOFs typically invested in neighborhoods with more firms, more employment, higher wages and income, and lower poverty rates.

5 Conclusion

We provide the first available evidence on the response of QOF investors to the OZ tax subsidy. We emphasize that this evidence is preliminary and does not yet incorporate data from paper tax filers, who we estimate account for approximately 78% of QOF investment dollars. The OZ investment data are based on business tax returns from tax years 2019 and 2020, the first two years that detailed OZ reporting requirements have made this analysis possible. We also emphasize that the patterns of investment described in this paper may evolve over time, perhaps particularly in response to the coronavirus pandemic beginning in 2020.

Caveats aside, the early evidence shows several striking patterns. We find that OZ investments

are highly spatially concentrated in a relatively small number of census tracts, and are heavily concentrated in the real estate sector. Among tracts designated as OZs, investors favored neighborhoods with higher income, educational attainment, home values, and pre-existing population and income growth. These neighborhoods have also experienced significant changes in their demographic composition over the past decade, with increasing shares of college educated adults and declining shares of non-white residents. However, tracts that receive OZ investment are nevertheless considerably economically disadvantaged relative to all tracts nationally. We presented evidence consistent with these findings using a broad range of demographic measures from publicly available ACS data, and corroborated the results using a new panel of IRS-based tract-level measures. Finally, we find that the direct incidence of the OZ tax subsidy is likely to benefit taxpayers in the 99th percentile of national income distribution.

Our results help to contextualize findings from other recent studies on Opportunity Zones. As we have noted, a nascent research literature generally finds modest or null intent-to-treat (ITT) effects of the OZ program on neighborhood-level economic outcomes such as real estate prices, employment, job growth (Chen, Glaeser, and Wessel 2019; Atkins, Hernandez-Lagos, Jara-Figueroa, and Seamans 2020; Freedman, Khanna, and Neumark 2021). Our research raises the possibility that these null intent-to-treat effects may be explained by the fact that a majority of OZ tracts have not received any investment from QOF investors. However, existing research does not yet answer the question whether the OZ program induced positive economic changes in the set of neighborhoods that did receive investment from QOF investors.

An important goal for future research, then, is to estimate not only intent-to-treat effects, but also average treatment effects (ATE). Conditional on receiving OZ investment, what are the causal effects of the OZ program on real investment and local labor markets? In other words, to what extent has financial investment from QOF investors translated into business growth, employment, wage growth, and physical capital expenditures that would not have otherwise occured in the absence of the OZ tax subsidy? The answers to these questions will be of central importance public and scholarly understanding of the Opportunity Zone program and of place-based policies more broadly.

References

AREFEVA, A., M. A. DAVIS, A. C. GHENT, AND M. PARK (2020): "Who Benefits from Place-Based Policies? Job Growth from Opportunity Zones," *Job Growth from Opportunity Zones (July 7, 2020)*.

ATKINS, R., P. HERNANDEZ-LAGOS, C. JARA-FIGUEROA, AND R. SEAMANS (2020): "What is the Impact of Opportunity Zones on Employment Outcomes?" *Available at SSRN*.

BEE, A. AND J. ROTHBAUM (2017): "Do Older Americans Have More Income Than We Think?" Tech. rep., SESHD Working Paper.

BELL, A., R. CHETTY, X. JARAVEL, N. PETKOVA, AND J. VAN REENEN (2019): "Who becomes an inventor in America? The importance of exposure to innovation," *The Quarterly Journal of Economics*, 134, 647–713.

BUSSO, M., J. GREGORY, AND P. KLINE (2013): "Assessing the incidence and efficiency of a prominent place based policy," *American Economic Review*, 103, 897–947.

CHANDRA, A. AND J. SKINNER (2003): "Geography and racial health disparities," Tech. rep., National bureau of economic research.

CHEN, J., E. L. GLAESER, AND D. WESSEL (2019): "The (non-) effect of opportunity zones on housing prices," Tech. rep., National Bureau of Economic Research.

CHETTY, R., N. HENDREN, AND L. F. KATZ (2016): "The effects of exposure to better neighborhoods on children: New evidence from the Moving to Opportunity experiment," *American Economic Review*, 106, 855–902.

CHETTY, R., N. HENDREN, P. KLINE, AND E. SAEZ (2014): "Where is the land of opportunity? The geography of intergenerational mobility in the United States," *The Quarterly Journal of Economics*, 129, 1553–1623.

DOBRIDGE, C., P. LANDEFELD, AND J. MORTENSON (2019): "Corporate Taxes and the Wage Distribution: Effects of the Domestic Production Activities Deduction," Tech. rep., Finance and Economics Discussion Series 2021-081. Board of Governors of the Federal Reserve System.

FREEDMAN, M., S. KHANNA, AND D. NEUMARK (2021): "The Impacts of Opportunity Zones on Zone Residents," Tech. rep., National Bureau of Economic Research.

GAUBERT, C., P. M. KLINE, D. VERGARA, AND D. YAGAN (2021a): "Trends in US Spatial Inequality: Concentrating Affluence and a Democratization of Poverty," Tech. rep., National Bureau of Economic Research.

GAUBERT, C., P. M. KLINE, AND D. YAGAN (2021b): "Place-Based Redistribution," Tech. rep., National Bureau of Economic Research.

GLAESER, E. L. AND J. D. GOTTLIEB (2009): "The wealth of cities: Agglomeration economies and spatial equilibrium in the United States," *Journal of economic literature*, 47, 983–1028.

HADJILOGIOU, S., J. LUTZ, AND C. BRUNO (2021): "Highlights from the Final Opportunity Zone Regulations," *National Law Review*, XI.

KLINE, P. AND E. MORETTI (2014): "Local economic development, agglomeration economies, and the big push: 100 years of evidence from the Tennessee Valley Authority," *The Quarterly journal of economics*, 129, 275–331.

LARRIMORE, J., J. MORTENSON, AND D. SPLINTER (2019): "Household incomes in tax data: using addresses to move from tax unit to household income distributions," *Journal of Human Resources*, 0718–9647R1.

——— (2020): "Presence and persistence of poverty in us tax data," Tech. rep., National Bureau of Economic Research.

MORETTI, E. (2012): *The new geography of jobs*, Houghton Mifflin Harcourt.

NEUMARK, D. AND H. SIMPSON (2015): "Place-based policies," in *Handbook of regional and urban economics*, Elsevier, vol. 5, 1197–1287.

REARDON, S. F. AND K. BISCHOFF (2011): "Income inequality and income segregation," *American journal of sociology*, 116, 1092–1153.

THE JOINT COMMITTEE ON TAXATION (2020): "Estimates of Federal Tax Expenditures for Fiscal Years 2020-2024," Tech. rep.

WEINSTEIN, I. AND S. GLICKMAN (2020): "The Guide to Making Opportunity Zones Work," Tech. rep., CohnReznick.

YAGAN, D. (2015): "Capital tax reform and the real economy: The effects of the 2003 dividend tax cut," *American Economic Review*, 105, 3531–63.

Appendices

A Data Appendix

A.1 Qualified Opportunity Fund Investment from Form 8996

Our main analysis of OZ investment is based on electronically filed tax records of IRS Form 8996. In this appendix we provide additional details about how the definitions in our analysis correspond to line items from this tax form, available online here.

Form 8996 allows us to separately observe QOF property and business investment (in sections V and VI of the form, respectively), as well as the associated dollar value and OZ census tract receiving the investment. For business investment, QOFs also report the Employee Identification Number (EIN) of the QOBs in which they invest. We use tax records associated with these EINs to compute statistics on QOBs, such as the industry breakdown in Table 4.

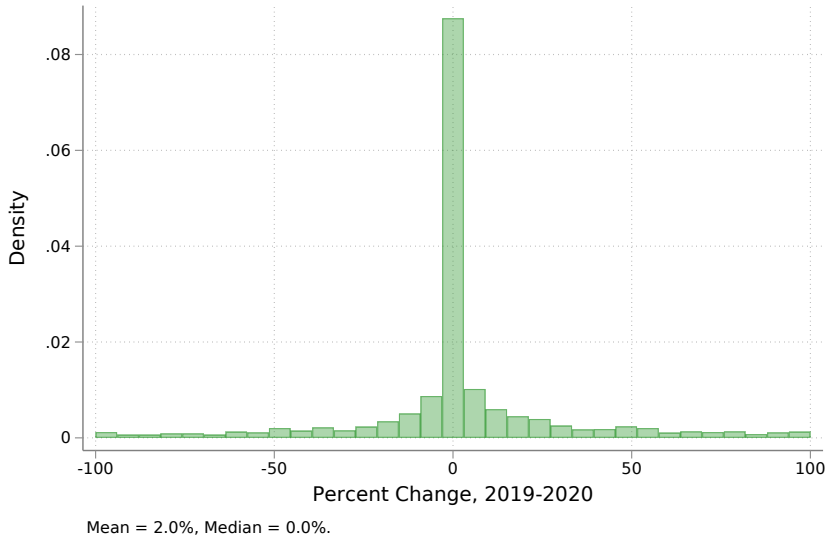
We use end-of-year values for all QOF investment computations. For electronic filers, we define property investment as the sum of columns (d) and (e) in Section V line 1; business investment as the sum of column (f) in Section VI line 1; and total investment as the sum of property and business investment. For paper filers (for whom we do not observe detailed tract-level reporting from Sections V and VI) we measure total investment from Section II, line 11.

These end-of-year values represent stocks, not flows. When analyzing trends in OZ investment over time, the data do not allow us to distinguish between financial inflows/outflows versus appreciation/depreciation of assets. In Table 2 of the main text, we estimate aggregate flows as the change in stock from one year to the next, assuming that net appreciation is equal to zero. In Figure A.1, shown below, we provide evidence that this assumption appears reasonable: the median and average percent change in reported assets from 2019-2020 at the QOF-QOB-tract level is approximately equal to zero. The data thus suggest that the 2019-2020 net difference in reported assets is likely to closely approximate new investment in 2020.

For approximately $3 billion of reported QOF investment, we are unable to match census tracts reported by QOFs on Form 8996 to a legally designated Opportunity Zone tract. We consider two possible reasons for this mismatch. First, regulatory guidance from the Treasury Department allows that QOFs may hold a fraction of their assets (10%) in non-qualifying OZ property. Second,

the mismatches may simply reflect taxpayer or administrative error. In either case, we do not attempt to assign these unmatched tracts to proper OZ census tracts. This choice implies that, beyond our exclusion of paper filers, we may further underestimate the share of OZ tracts receiving QOF investment. As we have emphasized, these data are preliminary and will be subject to revision when more comprehensive data becomes available.

FIGURE A.1: PERCENT CHANGE IN REPORTED OZ ASSETS AT THE QOF-QOB-TRACT LEVEL, 2019-2020



Notes: Plot shows the distribution of 2019-2020 changes in reported end-of-year assets at the QOF-QOB-tract level from electronic filers of IRS form 8996. N = 2,344 QOF-QOB-tract pairs. We exclude changes greater than 100%, as these observations are likely to capture capital inflows rather than appreciation or depreciation.

A.2 Individual, Household, and Family Income Definitions

A.2.1 Individual wage income

We measure wage income at the individual-level using the universe of IRS Form W2. For each individual, we sum up wage and salary income from all employers, and count an individual as employed if they receive at least one W-2 from an employer. These measures currently do not capture self-employed individuals, although we intend to measure them in future revisions of this working paper.

A.2.2 Household income estimates for income tax filers

Our estimates of household income start from the household identifiers and income definitions from Larrimore, Mortenson, and Splinter (2019) and Larrimore et al. (2020). We describe these computations below, and indicate where we make alternate definitional choices to make our estimates more comparable with tract-level estimates from the Census American Community Surveys. These measures use information returns to compute income for non-filers, thus allowing us to construct income estimates for 98-99% of the U.S. population.

1. Start with total income from line 22 of IRS Form 1040, which is the sum of wage income, salary income, business income, dividends, alimony, taxable interest, rents and royalties, unemployment compensation, taxable Social Security income, and taxable private retirement income.

2. Add non-taxable interest from IRS Form 1040.

3. Subtract taxable social security income and add total social security benefits from IRS Form SSA-1099.

4. Subtract taxable private retirement income and add gross private retirement income, defined as savings distributions minus rollovers reported on IRS Forms 5498 and 1099-R.

5. Bottom-code incomes at zero to mitigate the effects of business losses.

As Larrimore, Mortenson, and Splinter (2019) note, federal tax records do not allow us to observe non-taxable cash transfer income such as public assistance and supplemental security income, which comprise approximately 2.5% of income tabulated by the Census Bureau. We differ from these authors in that we do not subtract capital gains reported on IRS Form 1040 Schedule D, so as to make our measures more comparable with the income definitions used in the Census American Community Surveys.

A.2.3 Household income estimates for non-filers

To estimate income for households that do not file income tax returns, we again follow Larrimore, Mortenson, and Splinter (2020) and sum up income from the following information tax returns:

- Wage and salary income from IRS Form W-2
- Unemployment compensation reported on IRS Form 1099-G
- Social Security and disability income reported on IRS Form SSA-1099
- Interest income from IRS Form 1099-INT
- Dividends from IRS Form 1099-DIV
- Retirement savings distributions minus rollovers reported on IRS Forms 5498 and 1099-R
- Self-employment income from IRS Forms 1099-K and 1099-MISC, scaled by a factor of 0.7 to correct for the fact that these values reflect gross income and do not subtract business expenses. The resulting value is an estimate of *net* self-employment income.
- Business income from partnerships and S-corporations from Schedules K-1 attached to IRS Forms 1065 and 1120S.

We include these income sources since individuals would be required to report them on IRS Form 1040 if they had positive income tax liability.

A.2.4 Family income estimates

The Census Bureau defines a family as two or more individuals related by blood or marriage. To estimate family income, we link individuals living in the same household who we observe to be married or claimed as dependents and assign them a unique family ID variable. We always assign the same family ID to all individuals who appear on the same tax form, and link married couples together even if they file their tax returns separately. To better capture intergenerational families living within the same household, we also link individuals over age 65 to the family ID of a prime-age filer over 30 years old if there is only one such prime-age filer in the household. These measure nevertheless modestly understate family size relative to Census measures, since tax data do not allow us to observe whether individuals in the same household are related by blood. For example, our family definition is likely to exclude adult children who live with their parents and are not claimed as dependents. If these adult children earn income, our estimates will understate family income relative to ACS estimates. However, our comparisons of IRS and

ACS-based measures presented in Section 4.2 suggest that any such differences are likely to be small.

A.3 Firm Employment, Location, and Real Investment Definitions

With the exception of self-proprietors, all US businesses are legally required to file annual tax returns with the IRS. Our firm sample excludes self-proprietors and is based on the universe of C corporations, S corporations, and partnerships. We begin by linking all firms and EINs to their parent company EIN using the crosswalks constructed by Dobridge, Landefeld, and Mortenson (2019). Similarly, we link employers on all IRS Forms W-2 to their parents. We define firm employment as the total number of individuals receiving a W-2 from the parent company. Since individuals may change jobs or leave the labor force throughout the course of a calendar year, and firms may or may not replace those employees throughout the year, our annual estimates of firm employment are higher than point-in-time snapshots of firm employment.

We assign firms the address that they report on the cover page of their annual tax return (IRS Forms 1120, 1120S, or 1065). As we discussed in Section 4, a limitation of these data is that business tax records typically provide only headquarter addresses and do not allow us to identify the establishment locations of multi-establishment firms. To assess the sensitivity of our measures to this data limitation, when aggregating our measures we differentiate by firm size, defined as the number of employes. Since smaller firms are less likely to have multiple establisments, they may provide a more geographically accurate picture of local economic conditions, with the caveat they are not represenative of all firms.

We follow Yagan (2015) in defining firm-level real investment as the sum of the following line items reported on IRS Form 4562:

- Section 179 property reported on line 8
- Tenative deductions reported on line 9
- Basis of assets placed in service during the current tax year using the General Depreciation System, reported on lines 19a-19i
- Basis of assets placed in service during the current tax year using the Alternative

Depreciation System, reported on lines 20a-20c

- Listed property repoted on line 21.

A.4 Geocoding Procedure

For individuals, our starting point is address information reported on IRS Form 1040. For non-filers, we use address information from information returns in the following order of prioritization: IRS Form SSA-1099 (reporting social security income), IRS Form W-2 (reporting wage and salary income), and IRS Form 1099-G (reporting unemployment compensation). For businesses, we use the address that firms report on the cover form of IRS Form 1120, 1120S, or 1065. If multiple addresses are available from different forms, we prioritize PO boxes last. We do not attempt to geocode PO boxes, which account for approximately 3-4% of the general population and are disproportionately prevelant in rural areas.

We clean the addresses to remove non-alphanumeric characters, and shorten street suffixes using standardized abbreviations (for example, "STREET" becomes "ST"). We strip out text preceding the numeric house number or following the street suffix, such as apartment or unit identifiers. To correct minor mispellings, we fuzzy match street names to a file of street names compiled by the US Postal Service, and require that zip codes match exactly. We do not use city or state information, finding that street addresses and zipcodes are less prone to textual error.

To protect taxpayer privacy, we do not share taxpayer address information with any commercial geocoding firms. Rather, we import publicly available address databases from Open Street Maps, the National Address Database, and Nominatum into secure federal government servers and geocode all addresses in-house. We also externally geocode a limited number of publicly available addresses from the US Postal Service using the commerical service OpenCageGeo.

When matching to these databases, we always require that zipcodes match exactly to reduce the prevalence of false positive matches. We obtain the latitude and longitude coordinates from these matches and then link them to 2010 block and tract identifiers using shapefiles provided by the US Census. If we are unable to match an address directly to its geo-coordinates, but observe a house number that is between two higher and lower addresses on the same zip-street for which

we do have geo-coordinates and observe the same tract of block ID, we then infer and impute the missing tract and block ID. For example, if we were to observe that 10 Main St. 10001 and 14 Main St. 10001 are both located in census tract A, we would also infer that 12 Main St. 10001 is located in census tract A.

Overall, we match approximately 81% of the US population to a census tract, which corresponds to approximately 85% of non-PO Box addresses. This match rate is approximately constant with respect to tract population (recall that Census tracts are delineated to be of approximately even populations), but is lower in rural areas than in urban areas. Nevertheless, we obtain significantly larger sample sizes relative to those available in the Census American Community Surveys (ACS), which are based on 1% random stratified samples of the population. Our comparisons of IRS- and ACS-based measures of tract-level income in Figure 8 suggest that any biases resulting from non-random biases in the geocoding procedure are likely to be small.

B Appendix to Section 3: Descriptive Statistics

B.1 Demographic and Economic Indicators from ACS and IRS

TABLE A.1: CHARACTERISTICS OF NEIGHBORHOODS RECEIVING OZ INVESTMENT

Panel A: Correlates with Census ACS

	2017 Demographics			2010-2017 Trends		
	OZ Inv>0	OZ Inv=0	All	OZ Inv>0	OZ Inv=0	All
Population	4,297	3,840	4,385	0.05	-0.01	0.04
Median Family Income	46,386	40,174	72,109	0.12	0.08	0.11
Poverty Rate	0.27	0.28	0.15	0.01	0.02	0.01
Median Home Value	181,806	134,859	244,328	-0.00	-0.05	0.00
Gini	0.46	0.46	0.43	0.02	0.02	0.02
White	0.57	0.59	0.73	0.01	-0.00	-0.01
Black	0.26	0.25	0.14	-0.01	-0.00	0.00
Hispanic	0.24	0.34	0.17	0.01	0.01	0.02
Non-Citizen	0.10	0.08	0.07	-0.01	-0.01	-0.00
College Graduate	0.13	0.10	0.21	0.02	0.01	0.02
Age 65+	0.13	0.15	0.16	0.01	0.02	0.02
Age 18-	0.22	0.24	0.22	-0.02	-0.02	-0.02
Unemployed	0.10	0.13	0.07	-0.02	-0.02	-0.02
Number of Tracts	**3,242**	**5,446**	**74,288**	**3,242**	**5,446**	**74,288**

Panel B: Correlates with New IRS Measures

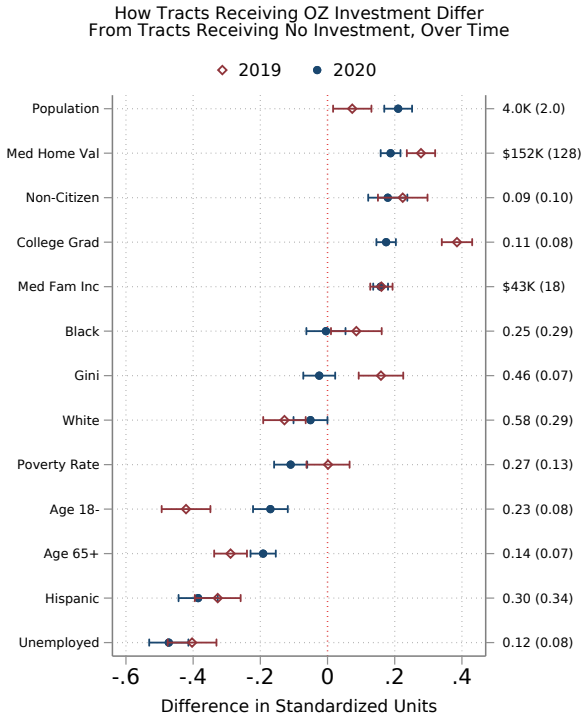
	2017 Demographics			2010-2017 Trends*		
	OZ Inv>0	OZ Inv=0	All	OZ Inv>0	OZ Inv=0	All
Median Family Income	57,531	53,860	89,209	0.08	0.07	0.06
Poverty Rate	0.16	0.17	0.09	-0.01	-0.01	-0.01
Employment	1,566	1,352	1,780	0.11	0.09	0.07
Average Wages	30,758	27,713	42,998	0.09	0.08	0.10
Median Wages	22,214	20,425	29,784	0.10	0.09	0.10
90/10 Wage Ratio	4.43	4.36	4.50	-0.15	-0.15	-0.13
Real Investment (mil)	20.92	4.54	10.18	1.21	1.15	1.24
Small Firm Real Investment (mil)	2.12	1.04	1.52	1.15	1.11	1.18
# Firms	181	86	153	0.11	0.10	0.12
# Small Firms	70	38	53	0.07	0.04	0.07
Number of Tracts	**3,242**	**5,446**	**74,288**	**3,242**	**5,446**	**74,288**

Notes: This table provides summary statistics comparable with the estimates provided in Figures 2 and 10. The table compares average demographic and economic characteristics for three groups of census tracts: (1) OZ tracts receiving positive investment from QOFs; (2) OZ tracts receiving zero investment from QOFs; and (3) all tracts nationally. *Trends for IRS measures of median family income and poverty are constructed from 2015-2017, as we have not yet extended the IRS sample back to 2010.

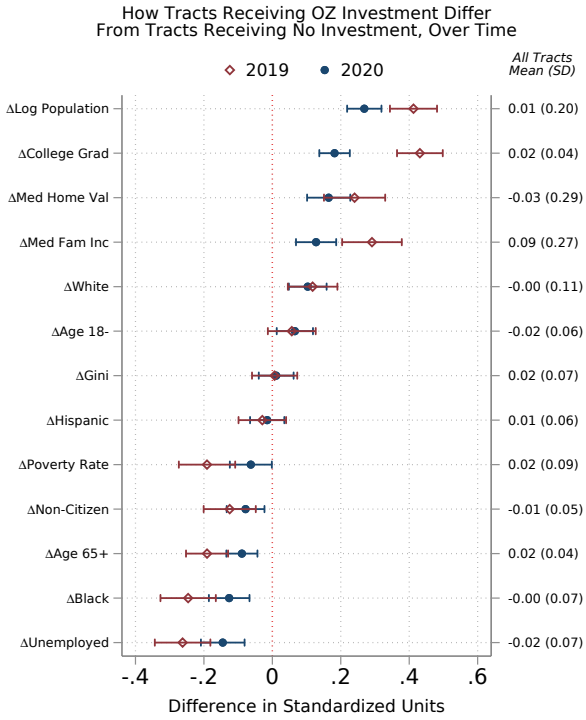
B.2 Demographic Correlates of OZ Investment Over Time

FIGURE A.2: CHARACTERISTICS OF NEIGHBORHOODS RECEIVING OZ INVESTMENT OVER TIME

Panel A: 2017 Demographics



Panel B: 2010-2017 Demographic Trends



Notes: N=8,764 census tracts. The figure shows average differences in demographic characteristcs for three groups of census tracts: (1) OZ tracts receiving positive investment in 2019; (2) OZ tracts receiving positive investment in 2020 (but not in 2019); and (3) OZ tracts receiving zero investment in both 2019 and 2020. The data are from the 2017 and 2010 5-Year ACS. All variables are standardized to have mean zero and standard deviation one. Error bands show 95% confidence intervals with robust standard errors.

B.3 Investment by Industry: 6-digit NAICS Codes

TABLE A.2: INDUSTRY COMPOSITION OF FUNDS AND RECIPIENT FIRMS

Panel A: QOF Investor Funds

NAICS	Industry	# QOF	$ (mil)	$ Share
531390	Activities Related to Real Estate	554	3,742	0.20
520000	Finance and Insurance	445	3,403	0.18
531120	Lessors of Nonresidential Buildings	307	1,998	0.11
531110	Lessors of Residential Buildings and Dwellings	311	1,591	0.08
551112	Offices of Holding Companies	112	1,355	0.07
523900	Financial Investment Activities	98	718	0.04
236000	Construction of Buildings	93	651	0.03
531100	Lessors of Buildings	123	650	0.03
525110	Pension Funds	126	552	0.03
531000	Real Estate	53	514	0.03
531310	Nonresidential Property Managers	70	494	0.03
236110	Residential Building Construction	71	365	0.02
525990	Financial Vehicles	58	253	0.01
531190	Lessors of Real Estate Property	32	235	0.01
236220	Non-Residential Building Construction	24	215	0.01
525000	Funds and Trusts	52	184	0.01
721110	Hotels and Motels	19	173	0.01
523920	Portfolio Management	23	101	0.01
–	Other	158	630	0.03
–	Unknown	20	565	0.03
	Total	**2,756**	**18,906**	1.00

Panel B: QOB Firms Receiving Investment

NAICS	Industry	# QOB	$ (mil)	$ Share
531390	Activities Related to Real Estate	431	3,742	0.20
520000	Finance and Insurance	422	3,403	0.18
531120	Lessors of Nonresidential Buildings	265	1,998	0.11
531110	Lessors of Residential Buildings and Dwellings	280	1,591	0.08
551112	Offices of Holding Companies	84	1,355	0.07
523900	Financial Investment Activities	100	718	0.04
236000	Construction of Buildings	93	651	0.03
531100	Lessors of Buildings	103	650	0.03
525110	Pension Funds	125	552	0.03
531000	Real Estate	45	514	0.03
531310	Nonresidential Property Managers	55	494	0.03
236110	Residential Building Construction	82	365	0.02
525990	Financial Vehicles	45	253	0.01
531190	Lessors of Real Estate Property	24	235	0.01
236220	Non-Residential Building Construction	30	215	0.01
525000	Funds and Trusts	35	184	0.01
721110	Hotels and Motels	12	173	0.01
523920	Portfolio Management	24	101	0.01
–	Other	152	630	0.03
–	Unknown	74	565	0.03
	Total	**2,490**	**18,906**	1.00

Notes: This table shows the industry composition of investing QOF funds and recipient QOB businesses by 6-digit NAICS code. We exclude industries with few QOF investing funds and/or QOB businesses to protect taxpayer privacy.

B.4 Investment by Commuting Zone: Top 50 Commuting Zones

TABLE A.3: OZ INVESTMENT IN 50 TOP COMMUTING ZONES

CZ	Total $ (mil)	$ Per OZ Resident	$ Per CZ Resident
New York, NY-NJ-PA	3,782	3,358	181
Los Angeles, CA	1,701	1,916	92
Phoenix, AZ	1,328	4,274	275
Salt Lake City, UT	1,325	15,416	542
Denver, CO	889	6,277	238
San Francisco, CA	816	4,140	143
Detroit, MI	786	4,666	158
Washington, DC-VA-MD-WV	759	3,146	110
Philadelphia, PA-NJ-DE-MD	734	2,142	111
Portland, OR-WA	703	6,271	295
Huntsville, AL	666	18,305	822
Nashville, TN	600	8,141	302
Miami, FL	571	1,748	86
Seattle, WA	570	2,593	118
Houston, TX	563	1,587	82
Austin, TX	537	3,772	257
Tampa, FL	469	5,815	158
Atlanta, GA	419	2,817	73
Cleveland, OH	365	3,083	127
Charleston, SC	360	5,390	460
Sacramento, CA	355	2,501	149
Baltimore, MD	343	2,569	118
Indianapolis, IN	313	2,979	155
St. Louis, MO-IL	311	5,611	108
Minneapolis, MN-WI	300	2,512	86
Stockton, CA	261	3,729	164
Boston, MA-NH	256	1,466	50
Cincinnati, OH-KY-IN	251	2,864	110
Dallas, TX	230	1,129	30
Richmond, VA	229	4,967	183
San Jose, CA	218	2,512	82
Charlotte, NC-SC	211	1,969	82
Columbus, OH	194	2,100	90
Bakersfield, CA	187	1,063	126
Fresno, CA	183	906	92
Las Vegas, NV	181	2,045	84
Chicago, IL-IN-WI	180	1,611	18
Orlando, FL	172	1,253	58
Bridgeport, CT	157	1,291	44
Omaha, NE-IA	155	3,599	161
Raleigh, NC	143	1,143	67
San Antonio, TX	138	2,054	58
Providence, RI-MA	136	2,292	84
New Orleans, LA	131	3,321	92
Memphis, TN-MS-AR	121	1,389	83
Greenville, SC	121	1,802	115
Louisville, KY-IN	114	2,490	87
Tucson, AZ	111	1,077	97
Kansas City, MO-KS	107	1,152	50
Birmingham, AL	101	2,388	94

Notes: Table shows OZ investment for the top 50 commuting zones. Investment data based on electronically-filed business tax records in tax years 2019 and 2020. Column 1 shows total OZ investment by commuting zone. Column 2 shows investment per OZ-resident, normalizing by the population of tracts with >0 investment. Column 3 shows investment per CZ-resident, normalizing by the total commuting zone population. We exlude commuting zones with few QOF investing funds and/or QOB businesses to protect taxpayer privacy.