RENAISSANCE OF THE BLACK HOMEOWNER: IMPACT EVALUATION OF MICHIGAN'S RENAISSANCE ZONES

by

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Abstract

This thesis investigates whether renaissance zones, a development incentive policy in the state of Michigan, can be used to incentivize Black Americans to take a step towards owning a home through mortgage applications. This thesis uses a comprehensive mortgage dataset, through the Home Mortgage Disclosure Act, to analyse the effects of kickstarting a policy like this, and its effect when it nears completion. Further, given the systematic and exorbitantly high rate of mortgage applications denials of Black Americans, we also investigate the effect of this policy on denials and success rates of black applicants. This paper aims to find whether this policy actually incentivizes and creates confidence among black Americans in areas within Michigan to achieve their dreams of owning a house. We use multiple evaluation and modelling techniques, including difference-in-differences, dynamic difference-in-difference event studies, and fixed effects regressions, and conduct robustness checks to find that the proportion of black homeownership rises within the treated renaissance zones. We find that the policy has a sharp impact as soon as it begins and then slows down over time. Finally, we also find that mortgage denials of black applicants decrease, and successful applications increase over time after the start of the treatment.

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1 Introduction

Homeownership has often been philosophized as one of the central pillars of the American Dream, signifying an individual's economic freedom, and bringing with it security and stability. But for many Black Americans, this collective dream is often an unattainable privilege and luxury. In the United States, the homeownership gap for Black and White Americans now is worse than what it was during segregation[1]. This gap just worsens during crises. There have been multiple housing crises in the United States, and they hit different parts of the country differently, with the brunt of the effect centered around the Rust Belt, often forgotten during economic downturns[2]. When states and government step in to help incentivize homeownership through a plethora of housing specific policies, they often end up hurting the groups they tried to help seeing as black communities are worse off in the wake of these policies (Brown 2018).

The United States as a long history in using government incentives to encourage economic development, and by 2000s most states and several local governments had some sort of development incentive (Fisher and Peters 1998; Anderson and Wassmer 2000). Economic incentives can be contentious, with economists in constant dialogue about the efficacy of them. For homeownership, as will be discussed in the paper, some economic incentives like income tax credits have no positive effects, while some specific property tax credits do (Harris et. Al 2013; Gale et. Al 2007).

In July of 1995, the Governor of Michigan John Engler introduced an ambitious program to stimulate growth in economically distressed areas called "renaissance zones." According to the Engler administration, disincentives to work and reside in a city were so big that only massive tax cuts offset them. The zones would abolish all local and state

[1] "A Five-Point Strategy for Reducing the Black Homeownership Gap." Urban Institute, February 14, 2019. https://www.urban.org/urban-wire/five-point-strategy-reducing-black-homeownership-gap.

[2] Associated Press. "The Rust Belt: A Forgotten Housing Crisis." NBCNews.com. NBCUniversal News Group, May 4, 2009. https://www.nbcnews.com/id/wbna30563630.

property and income taxes in the areas that are chosen (Wilson 1996). The rationale and the implementation of these zones are like the longstanding enterprise zones, except enterprise zones target specific types of qualified businesses with special tax incentives (Zhu 2005). Renaissance zones, on the other hand, provide more drastic tax reductions not just to any business located within the zone, but also residents which is a first. There is anecdotal evidence of families moving to renaissance zones to reap the benefits, and developers using the benefits to build residential properties, however, there is no research done on the matter (Harger 2011).

Nothing like renaissance zones have ever been tried before, which provide the most extensive tax credits in the nation. The discussions we have had about incentives, black homeownership, and the Rust Belt is a motivation for the focus of this thesis. This thesis investigates whether a development incentive policy can be used to incentivize Black Americans to take a step towards owning a home, applying for a mortgage, in the Rust Belt state of Michigan. We analyse the effects of kickstarting a policy like this, and its effect when it nears completion. Further, given the systematic and exorbitantly high rate of mortgage applications denials of Black Americans, we also investigate the effect of this policy on denials and success rates of black applicants. This paper aims to find whether this policy actually incentivizes and creates confidence among black Americans in areas within Michigan to achieve their dreams of owning a house.

The schema of this thesis is as follows. Section 2 provides background information about renaissance zones. Section 3 outlines important papers, motivating and providing a baseline to this thesis. Section 4 describes the data sources and Section 5 describes our final dataset that we use for the analysis. Section 6 describes the methodology used for the paper and Section 7 describes the results from the analysis. Finally, section 8 discusses the implications of the results and Section 9 concludes the paper.

2 Background

2.1 What are Renaissance Zones?

Act 376 of 1996 successfully passed the "Michigan Renaissance Zone Act" in the state legislature, as it believed and found that in the state of Michigan, there still exists a need for developmental programmes that assist specific local governments in incentivizing economic development and growth. The legislature deemed that to achieve this purpose the creation of renaissance zones was important, to provide relief from certain taxes. The purpose of the Act is:

> "...to foster economic opportunities in this state; to facilitate economic development; to stimulate industrial, commercial, and residential improvements; to prevent physical and infrastructure deterioration of geographic areas in this state; to authorize expenditures; to provide exemptions and credits from certain taxes; to create certain obligations of this state and local governmental units; to require disclosure of certain transactions and gifts; to provide for appropriations; and to prescribe the powers and duties of certain state and local departments, agencies, and officials."

Renaissance Zones would in theory revitalize 'distressed areas' in the state and individuals living in a zone would be able to benefit from the zone as the state will waive all state taxes, except sales taxes, if the local government waive all local taxes within the zone. We will investigate the full list of taxes that are abated under the Act.

2.2 Selection of Renaissance Zones

The renaissance zone selection process is extensive and thoroughly vetted. A state review board of the State Treasurer, the Director of the Michigan Jobs Commission, and the Director of the Department of Management and Budget will recommend the zones for approval to the State Administrative Board, which is made up by the Governor, the

Lieutenant Governor, the State Treasurer, the Secretary of State, the Attorney General, and the Superintendent of Public Instruction.

2.3 Eligibility Criteria

The six criteria that will be used for selection is:

1. Evidence of adverse economic and socio-economic conditions;
2. Private sector involvement in the zone's plan and design;
3. Community commitment to the success of the tax free zone;
4. The municipality's commitment to providing essential services to the zone;
5. Other local resources committed to the zone;
6. How the zone relates to a broader plan for the community as a whole.

The legislature made an executive decision that there would not be a fixed set of criteria which a community must meet to be nominated or selected by default. The prospective zones must try to use the above criteria to describe why their area should be designated as a renaissance zone over the other applicants. They submit a development plan as part of the application process, and they will be judged based on the plan's practicality, innovativeness, and creativity during the selection process.

To achieve a certain number of Renaissance zones within the state, the Act uses the phrase "economically distressed" areas, while setting the criteria loosely to judge the levels of unemployment, educational attainment, and poverty in competing zones.

2.4 Benefits of Renaissance Zones

The goal of these zones is to promote residential, industrial, and commercial growth, and can be for any use. The tax credits and abatements would be extended to residential, industrial, and commercial taxpayers, which stees it apart from longstanding economic development policies and tools, like enterprise zones which were aimed mostly towards businesses and their investment. The list of taxes that taxpayers are exempted from paying:

- Single business tax
- State personal tax
- State education and property tax
- Local real/personal property tax
- Local income tax
- Utility user tax (in Detroit)

The first-round and the second-round zones will mostly expire within 15 years, a list of which will be included in the next section. The tax abatement was phased out during the final years of the renaissance zone —– in the last three years of the policy, the taxpayer will pay 25% of the tax liability in the third last year, 50% in the penultimate year, and 75% in the final year. The renaissance zone would provide tax benefits to all taxpayers within the zone. Taxpayers in a zone would receive a complete reduction of all the local and some of the state taxes.

2.5 List of Renaissance Zones

After the rigmarole of the application and the selection process, the renaissance zones are chosen. The spread of renaissance zone counties throughout the state of Michigan is depicted in Figure 1. The figure includes both first and second round renaissance zones.

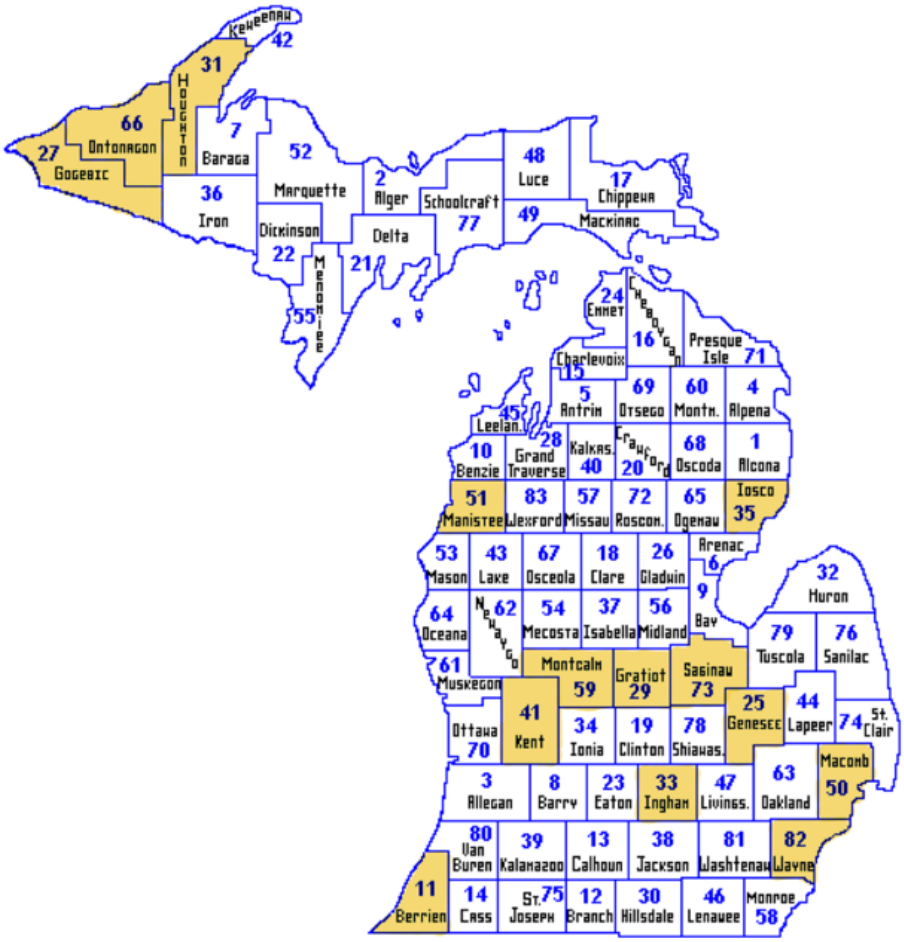

Figure 1

Visually, the counties seem to be spread throughout Michigan. The list of the renaissance zones is listed in Table 1. It lists the zone name, and which round it was implemented in — Round 1 started in 1997, at the outset of the Act passing in the state legislature, and Round 2 implemented in 2001 —– along with the county name, the start year, the expiration year, and the length of time of the zone being a renaissance zone, in years.

Table 1: Renaissance Zones

Zone	County	Round	Start Year	Expiration Year	Length *(in Years)*
1st Round Zones					
Benton Harbor/St. Joseph	Berrien	1	1997	2008	12
Detroit	Wayne	1	1997	2012	16
Flint	Genesee	1	1997	2011	15
Grand Rapids	Kent	1	1997	2011	15
Lansing	Ingham	1	1997	2008	12
Saginaw	Saginaw	1	1997	2014	18
Gogebic	Gogebic	1	1997	2011	15
Ontonagon	Ontonagon	1	1997	2011	15
Houghton	Houghton	1	1997	2011	15
Montcalm	Montcalm	1	1997	2011	15
Gratiot	Gratiot	1	1997	2011	15
2nd Round Zones					
Jackson	Jackson	2	2001	2014	14
Kalamazoo/Battle Creek	Kalamazoo	2	2001	2015	15
Muskegon/Muskegon Heights	Muskegon	2	2001	2014	14
Van Buren	Van Buren	2	2001	2010	10

Source: Michigan Economic Development Corporation (MEDC)

2.6 Renaissance Zones and Housing

There have been strong links between other analogous economic incentive policies and housing. There have been positive links between policies like enterprise and empowerment zones, and housing (Engberg and Greenbaum 1999), however, not much has been said about the effects of renaissance zones and housing. Theoretically, the huge levels of tax abatement within the counties, would help businesses build and invest more in these counties, be it commercial or residential investments, and the average taxpayer would be more empowered to think about owning a home and applying for a mortgage. This would, in theory, would be more prevalent to those who prior to the renaissance zones, could not afford to even think about owning a home. This is different from other economic incentives, like enterprise zones, as the businesses are the ones that benefit from those policies, but under renaissance zones, both businesses and taxpayers benefit from the tax

abatements. These policies, which could help a lot of families ease their financial stressors a little bit, could be a great incentive for taxpayers to start thinking about investing, or even owning a home.

3 Literature Review

There has been extensive research done on other economic development policies like enterprise zones, perhaps the closest relative to the renaissance zones, but nothing links homeownership to the policies directly. When we look at literature specifically for renaissance zones, something completely different from other pre-existing economic development incentives and policies, it is surprising that we find that it has been the subject of very little research. In the field, there have been barely a handful of papers contributing to and studying the effect of the zones, and none of them focus on the effects of these renaissance zones on mortgage applications or homeownership.

One of the first and important papers on the renaissance zones is by Gary Sands (2003), which discussed the zones and how eliminating taxes attracts investments and jobs in those communities. His method was to use surveys of the businesses located within the designated areas, and asked questions regarding their business activities and changes in employment, after the area was declared a renaissance zone. He found out from his surveys that their employment had increased, adding a total of almost 3750 jobs since the inception of the renaissance zones. Further, they have also brought in $367 million in private investment in just 3 years since the start of the act, and he found that state and local government benefitted from the positive publicity generated by the zones. This paper lays the foundation for interest in the renaissance zones, however, this had just been observing the data for only the first 3 years of the policy, and my paper can break down the policy and focus not just on the start of the policy, like Sands' paper does, but also look at the effects of the end of the policy. Furthermore, he only looks at round 1 renaissance zones, whereas I will consider both rounds of renaissance zones and look at non-renaissance zones. To further Sands' findings, the Michigan Renaissance Zone Act 2010 Legislative Report,

summarised that since its inception to the 2011, the program created 10,944 jobs and $3.1 billion in private investment.

Yuanlei Zhu (2005), in his paper evaluates the renaissance zones from a variety of perspectives, asking the question whether the zones are effective in helping distressed urban areas, with respect to employment. The paper works on the assumption that various firms would be sensitive to tax breaks in one way or another, and examines the effect and impact on firms, manufacturing, and service, large and small. The dataset they use is unique ES202 data, part of the Michigan Unemployment Insurance Report, and contains information from tax reports filed by employers, with comprehensive data on employment and payroll information for almost all of Michigan's employers. The subsidiary data they use in the 2000 Census Data, for details on demographic information. To correct for selection bias, the comparison groups for the study is the 2nd round renaissance zones, which they use to study the 1st round zones. They create an unbalanced panel data using their datasets and use a couple models to estimate the effect of the zones on employment and wage namely: fixed effects regressions, random growth rate model, lagged dependent variable model and difference-in-difference tests. They find positive effects of the renaissance zones on employment, but negative on wage effects, and estimate the effects of the zones to fizzle out over time. This inspires my paper in a few ways. My main dataset is a comprehensive mortgage dataset, that I describe in section 4, as I am interested in the effects of renaissance zones in the proportion of black mortgage applicants, but my supplementary data uses similar census data, only for a longer duration. Instead of comparing renaissance zones by rounds, I compare them with non-renaissance zones. Most renaissance zones studies have usually been investigating the zones by themselves, but in my paper, I try to understand the effect the treatment and tax abatements have on the renaissance zones. Compared to Zhu's paper, my panel data is balanced, but like his paper I also conduct difference-in-difference tests and fixed effects regressions. One issue with the Zhu paper is that since it was written in 2005, and the policy had just been enacted in 1996, it was difficult to see the long-term impacts of the policy. The author tries to work around this by estimating and predicting the long-term effects of the policy, but we can

cover all our bases and measure what actually did happen long term, even after the policy was over.

The link, however, between the renaissance zones and homeownership is not explored at all in the papers we discussed. There are, a couple of papers linking different kinds of tax incentives to homeownership, sometimes at odds with each other. A paper by Gale, Gruber, and Stephens-Davidowitz (2007) gives us one window as how we could view homeownership and mortgage applicants through the renaissance zone benefits. Their paper tries to rethink whether income tax deduction actually incentivizes homeownership. In the paper they analyse time-series evidence in the US to see whether the incentives have an influence on homeownership and find that they have no reason to believe It does. They find that despite several variations in inflation and income tax benefits, over the past 40 years the homeownership rate has barely budged. At the same time, another paper by Harris, Steuerle and Eng (2014) discussed the effects of flat property tax cuts and credits to promote homeownership. They find that property taxes are a substantial cost for homeowners, as it makes up nearly 20% of homeownership costs for a median homeowner in the US. Their data is from a public use file produced by the IRS Statistics of Income Division, which contains details of federal individual tax returns filed in 2004 and use demographic data from the Census of 2005. Further to estimate the effect of the tax credits, they needed to obtain data on whether taxpayers in their database purchased a house that year and what the purchase price of house was, which they used the Survey of Consumer Finances data for. In the dataset that I use, a lot of this is done for me, as I have information about the value of the mortgage, which behaves as a proxy for the value of a house, and their income status. They use probit regressions to estimate whether that a taxpayer purchased a home given they received some sort of property tax reduction given that year. They find that the tax abatement actually does end up promoting homeownership and they conclude that it could be a good policy initiative to pursue.

A question that remains after discussing these tax benefits is whom does the benefits end up benefitting? A paper by Dorothy Brown (2018) discusses the role of tax policy in exacerbating increasing housing inequity. They find that the current tax laws value the experiences of white homeowners and keep the experiences of black homeowners invisible

and out of public discourse. According to their findings, tax credits flow disproportionately to white homeowners and black homeowners are found more towards zip codes with lower credits. They also find that around $70 billion of tax revenue is lost to help higher-income, white homeowners disproportionately benefit from tax subsidies. This motivates the reason I solely look at black homeowners for this paper. I am interested in whether these renaissance zones gave potential black homeowners the confidence to apply for a mortgage. That would mean that these tax cuts in the policy would bring the community one step closer to achieve one important life goal a lot of people have.

These different papers tackle the various sections of what my goal is. These papers act as great motivating influences, guiding my analysis methods and the intentions of this paper, and give me a head start on how to better the literature, or rather add to the scant renaissance zones literature.

4 Data

The dataset I use for this study is a panel dataset comprising of the 83 counties of Michigan and between the years of 1990 and 2017. The panel dataset was built using the following individual datasets —– HMDA mortgage data, Census Demographic data, and FRED Economic data.

4.1 Home Mortgage Disclosure Act's Mortgage Data

4.1.1 Background and Sources

The main dataset for this paper is a comprehensive mortgage dataset from the years 1990 to 2017, and which lists the specifics of each mortgage applicant in the state of Michigan between the specified years. This data is publicly available under the auspicious of the HMDA. The Home Mortgage Disclosure Act (HMDA) was enacted in 1975, which required financial institutions to report and disclose publicly their loan-level mortgage information. Their reason for making this valuable data public for researchers, academics, and analysts to use was to see whether lenders followed the fair and anti-discriminatory

practices, and for government officials and analysts to make better policies. My panel dataset contains data from 1990 to 2017, and no source for the dataset has all of it in one place. The source for the dataset, hence, is split into two — for the data from 1990 to 2006, it has to be requested from the National Archives[3], through openICPSR[4], and for the data from 2007 to 2017, the data is available at the Consumer Financial Protection Bureau.

4.1.2 Dataset

The dataset, especially for the historic data from 1990 to 2007, needed to be heavily cleaned, which was done in Rstudio, because of the conversion from paper and floppy disks to the electronic format it currently is in right now. After cleaning the data, the dataset contains information on 14.51 million mortgage applications from 1990 to 2017 in the state of Michigan. Each line in the dataset corresponds to one mortgage application, and then there is specific information about each of the mortgage applicant. The information that is available for each candidate is the purpose of the loan, the amount of the loan, their county, their race, their sex, their income, whether it was denied, along with some supplementary information about the co-applicants' information as well (race and sex), if there was one.

4.2 Census Demographic Data

4.2.1 Background and Sources

The Census Bureau's Population Estimates Program (PEP) produces estimates for the population and its demographics for not just the United States, but also states, counties, metropolitan areas, cities, towns, and municipalities. PEP produces annual time series of census data of multiple estimates, but for this paper I will be using the *State and county*

[3] An agency of the US Government that is tasked with preservation and upkeep of historic documents, along with conversion of paper documents into an electronic form that can be used by researchers.

[4] Housed at the University of Michigan, openICPSR, is a "no-cost, self-publishing repository for social, behavioral, and health sciences research data."

resident population by age, sex, race, and Hispanic origin estimate, to better understand the counties and their make up In Michigan. the source for the data was from the Census Bureau website, which has detailed time series of Michigan's demographic data by county and by year.

4.2.2 Dataset

The dataset dimensions are the same as the one for the panel dataset that I use for the analysis, that is for 83 counties and 28 years, which comes up to 2324 observations. Each line in the data corresponds to a county and a year, example Wayne County in 1993. The data I obtained from the Census bureau has population estimates of total population of Michigan, total population in each county given the particular year, population by sex (male and female), population by race (White, Black, Asian and Pacific Islander, Native American, and Hispanic), and population by age group (from 0 to 85+).

4.3 Federal Reserve Economic Data (FRED)

4.3.1 Median Household Income

The next data I use for the paper is a panel dataset of the median household income in each county of Michigan for each of the years, to understand the economic demographic of the people in each of the counties. This data was obtained from FRED[5]. Since FRED lists each counties data in separate webpages, I used the package 'fredr' in Rstudio to parse through all the data and produce a neat panel dataset of each counties median household income by year. However, there were some missing data for a few years for all counties, which I extrapolated to have a balanced panel dataset. The dimension of this dataset is the same as the final panel dataset.

[5] Short for Federal Reserve Economic Data, an online database of economic time series data for a multitude of categories.

4.3.2 Unemployment Data

Another supplementary data I use in the analysis is the unemployment data by county for our time-period. This data, originally from the Bureau of Labour Statistics, is also from FRED, and is obtained in the same way as the median household income. The only difference is that it is a complete panel data, with no missing values.

4.4 Private Housing Structures

This is another supplementary dataset I use in the paper to see whether the number of housing structures built in the counties have an effect on the makeup of the mortgage applicants. The dataset from Department of Housing and Development (HUD) is called Residential Construction Permits by County (SOCDS) and describes the total number of building permits for the following structure types —– single family, multifamily 2 units, multifamily 3 or 4 units and multifamily 5 or more units. The dataset contains data on permits for residential construction collected in the Census Bureau's Building Permits Survey and is aggregated at the county level.

5 Dataset

The dataset, as mentioned before, is a balanced panel dataset, so it has 2324 observations (that is observations for 28 years, 1990 to 2017, and for 83 Michigan Counties). Each row in the data corresponds to a county for a year, e.g., Alcona County in 1995, and consists of information regarding that county, mortgage, demographic, and economic.

5.1 Descriptive Statistics

Figures 2 to 5 will describe the nature of the data that we have for our analysis in the paper. Since the data is a panel one, it is difficult to depict the variations by county and year, however, it is worth seeing this rich data as a time series and analysing it. In figures 2 and 3, the variables vary by year but are aggregated by the counties, so theoretically, they should appear as a microcosm of the data pertaining to the state of Michigan as a

whole, while in figures 4 and 5, the variables vary by year and by renaissance zones (whether they received the treatment or not).

In figure 2, we have 4 time series of average loan amounts, incomes, proportion of mortgage applicants and proportion of population, all split by race. Splitting the data and describing it with respect to the race divisions, specifically black and white, will help us lay a foundation to understand the effect on black mortgage applicants later.

In figure 2a and 2b, we see that there is a steady increase in the mortgage loan and income amount amounts for all mortgage applicants, even when split by race. There are some falls and rises for black applicants, especially after the 2005 and especially after the Great Recession, but the recovery has been steady and slowly converging to the overall loan amounts. White applicants seem to be much more representative in the overall loan amounts in Michigan. In figure 2c, we see that the proportion of White applicants was always much higher than the Black applicants. We could still see a small rise in proportion of Black applicants through the years, however, the 2008 neighbourhood saw a huge fall in the proportion of Black applicants, which possibly backs up the findings that Black and African American were more adversely affected by the Great Recession than the White population (Adejumo 2022). In the last part of figure 2, in 2d, we confirm that our data reflects the population spread by race in Michigan over time, and it does. We see that approximately 14% of Michigan's population is Black, which is accurate according to the current census reports.

Figure 3, like figure 2, consists of time series of new building permits, which is split into single family permits and multi-family permits (by the number of units), median household income and the average unemployment rate. These graphs, however, are not split by race categories like figure 2 was. In figure 3a, we see that the number of new single-family housing permits are much more than the multi-family permits, both of which steadily rose till around 2004. There seems to have been a dip in the number of permits between 2004 and 2009, however, since then it has been on the rise, but still below the historic values. According to the State of Michigan's Bureau of Labour Market Information and Strategic Initiatives, this seems to be backed up by fluctuations of construction patterns in the state of Michigan, which state that the housing and the financial crises that preceded the Great

Recession forced the decline in permits being issued for residential construction in the mid to late 2000s (Reindl 2017). Figure 3b describes the median household income in Michigan between the years of 1990 and 2017, which as explained in section 4 has a few interpolated values to make up for the missing data in the beginning of the dataset. Figure 3c, depicts the unemployment rate for the state of Michigan, which we can see declined after the 1990-1991 recession, but sharply rose during the Great Recession in 2008.

The next two graphs will describe the data according to whether they received the treatment, that is whether they are renaissance zones or not. Figure 4 consists of four graphs which describe what figure 2 described, but now split by whether they are renaissance zones. In figure 4a, we see that the average loan amounts of renaissance zones are slightly less than the other counties for all applicants and specifically black applicants. This is also true for figure 4b, which describes the average income of the applicants. From figure 4c, which describes the proportion of applicants by race, we see that in renaissance zones, there is marginally a greater number of black applicants than in non-renaissance zones, and the reverse for white applicants. Figure 4d shows how the black population in renaissance zones is almost 4 times that of the non-renaissance zones, which is extremely significant. In section 2, we discussed how the criteria for eligibility for the program is not set in stone, which could bring us to think whether this could be a significant indicator of which counties got chosen, or whether it says something about the social dynamics of the racial population distribution versus the economic conditions of the county, which lead them to receive the renaissance zone distinction.

Finally, the final data description by renaissance zones in figure 5, describes the number of building permits, the median household income, and the unemployment rates in the counties. We see that non-renaissance zones have many more building projects, given by the disparate spread in the data, compared to renaissance zones, however, as time went on, they seem to converge and the gap between them seems to shrink. The huge gap in the first years in the graph, could be one reason why the state thought that renaissance zones needed a boost in investment. In figure 5b, we see that the renaissance zones also seem to have less median household income, however, the gap is not that big between the two.

Finally in figure 5c, we see that the unemployment rates also seem to follow each other's trends roughly with the renaissance zones having slightly lower unemployment rates.

6 Methodology

The main inspiration behind the method of analysis for this paper is a basic difference-in-difference (DiD), commonly used to measure the impact of policies, for example Card and Kruger (1994). However, since the implementation and the expiration of the policy is time varying, we cannot use a simple DiD method. To account for the staggered time, we use a Difference-in-Difference (DiD) Event Study, otherwise also called a Dynamic DiD model. This will help us calculate the treatment effects of pre- and post-treatment without hassle, and while taking into consideration the various times the policy is in the works in particular counties. Since the data is a panel data, this would provide us with a model that can evaluate the treatment effects in the particular counties that were Renaissance Zones, while accounting for the staggered time of the policy enaction. In this section, I explore the different data methods I will use to analyse my data, how I will structure my analysis, and the robustness checks I will perform to further solidify my findings.

6.1 Renaissance Zone Treatment Assignments

For my analysis, the most important variable in my regression is a dummy that identifies the treatment zones, here called the Renaissance Zones. The list of the counties that classify as renaissance zones are derived from Table 1. For the treatment dummies, it is usually a dummy that turns on, as in equals 1, when the treatment is dispensed, as in when they receive renaissance zone status, and turns off, becomes 0, pre-treatment or when the treatment expires. This is the dummy used in most models, unless specified.

6.2 Model 1: OLS Fixed Effects Model

The first basic model to conduct analysis for this paper is inspired by the event study method and is an ordinary least squares model, OLS:

$$y_{it} = \alpha + \theta\, 1[\tau_i \leq t \leq \pi_i |\, i \in Renaissance\ Zones] + \epsilon_{it} \tag{1}$$

Here, y_{it} is the dependent variable, such as proportion of black mortgage applicants, proportion of black applicants by loan type, proportion of denied black applicants, and proportion of successful black applicants, for county I and time or year t. The explanatory variable here is a dummy $1[\tau_i \leq t \leq \pi_i | \ I \in Renaissance\ zone]$ which is a dummy which turns on when the policy is in action, that is if the policy is enacted in 1997 and expires in 2010, then the dummy is 0 from 1990 to 1996, becomes 1 from 1997 to 2010, and back to 0 from 2010 to 2017. The τ_i is the start year of the policy in county I, and π_i is the stop year for the policy in county i.

However, since our data is a panel dataset, within each of the counties and each of the years there could be correlations between the main predictors and possible omitted variables that vary by year or county. So, I account for this by using fixed effect regressions. The method for its analysis is:

$$y_{it} = \alpha + \theta\, 1[\tau_i \leq t \leq \pi_i | \ i \in Renaissance\ Zones] + \delta_t + \phi_i + \epsilon_{it} \tag{2}$$

Where the other variables are still the same, but now we have two additional variables. Δ_t refers to the year fixed effects, and ϕ_i refers to the county fixed effects. Each of the fixed effect variables are unobserved random variable for each year or county, given the fixed effects, and which is correlated with our x, which in this regression is the dummy. In our analysis, we will be running our basic model, then three fixed effect regression — one accounting for county fixed effects, one for time fixed effects and the third accounting for both county and time fixed effects.

In both the cases, θ, which is the coefficient in front of the treatment dummy, will help us understand the treatment effect of being a renaissance zone, but it does not vary with time. It will provide us with the treatment effect when the policy is in use, that is the treatment dummy equals to 1, so we can understand the effect the policy has on our explanatory variable. The next model will try to address the time varying problem and use a different method to conduct the analysis.

6.3 Model 2: Difference-in-Difference Event-Study Model

The second model will use the event study model to conduct analysis. The model is:

$$y_{it} = \delta_t + \sum_{k=-J}^{k=+L} \theta_k \, 1[t = \tau_i + k] + \phi_i + \epsilon_{it} \tag{3}$$

In the model, like the previous model, ϕ_i is the county fixed effects and δ_t is the year fixed effects. The difference is here, there is a separate treatment effect for each period before and after the enaction of the policy. τ_i, again, is period when county I got treated. So, when $t = \tau_i + k$, we would be k periods after I got treated. The treatment effect, θ_k, for $-J \leq k \leq -1$ is expected to be constant, for each k. This would be the pre-treatment gap between treatment and control counties. And, the treatment effect, θ_k, for $0 \leq k \leq L$ is expected to be constant, for each k. This would now be the post-treatment gap between treatment and control counties.

From the last model, we have inched towards a more robust model that gives us a treatment effect at various times, as compared to the basic treatment effect of the treated counties versus the control. We have managed to obtain the treatment effect for both treated and non-treated counties at various time periods, when compared to the treatment period. However, they are still discrete values, constant for every period, k in this equation, which is something we will tackle in the next model. We will try to obtain a treatment effect that is continuous over time and will tell us the time effects on the explanatory variable, that is the treatment effect will no longer be constant for the time periods. They will vary with time.

As an aside for this specific regression, to avoid perfect multi-collinearity in these types of fixed effect regressions, I will drop one of the time periods. Here, I choose to drop the time lag of -1.

6.4 Model 3: Continuous Time Varying DiD Event-Study

This model pins down the potential shortcomings from the previous models, where we had discrete values for the treatment effects over time. In this model, we allow it to change with time. So, our third model is:

$$y_{it} = \alpha + \beta \, t \times D_i + \gamma \, t \times (1 - D_i) + \delta D_i + \epsilon_{it}, \quad \text{where } t \in \{0, 1, \ldots, 27\} \tag{4}$$

Here, we have some modifications to the time variable. Time, t, now is a running variable which goes from 0 up to 27, where 0 corresponds to 1990, 1 corresponds to 1991, and so on till 27 corresponds to 2017. D_i refers to whether the received the treatment or not at the given time, so it is analogous to the treatment dummy we used in the first model. There are three main terms in the explanatory side. The first is the interaction of time and the dummy, the second the interaction between the time and one minus the dummy and the third is just the dummy. From the equation, if the county is a Renaissance Zone that is when $D_i = 1$, then the time varying treatment effect is given by the coefficient β. If the county is not a Renaissance Zone, that is when $D_i = 0$, then the time varying treatment effect is given by γ. Finally, δ captures just the difference in the treatments between the renaissance zones and the control counties, similar to the first OLS, that we ran as model 1. Our dependent variable y_{it} will remain the same as proportion of black mortgage applicants.

6.5 Robustness Checks and Control Variable Choices

Through the discussions of the models, we addressed omitted variable biases partially, mainly through using fixed effects regressions besides just the OLS models. Omitted variable biases arises when the error terms in our regressions are correlated to our dummy variable, or the independent variable, that is $Cov(x,\epsilon) \neq 0$. The way omitted variable biases work is —

$$y_i = \alpha + \beta_1 \, x_{1i} + \epsilon_i \tag{5}$$

$$y_i = \alpha' + \beta_1' \, x_{1i} + + \beta_2 \, x_{2i} + \epsilon_i' \tag{6}$$

$$\epsilon_i = \beta_2 \, x_{2i} + \epsilon_i' \tag{7}$$

Let us say we have a regression like stated in equation (5). But the true relationship is actually equation (6). That means the error term is as in equation (7).

So, if x_1 and x_2 are correlated, then, the covariance between the error term and x_1 is not equal to 0 anymore, which was previously assumed. That means our estimated effect is now,

$$\underbrace{\hat{\beta}_1}_{EstimatedEffect} = \underbrace{\beta_1'}_{TrueEffect} + \underbrace{\beta_2 \frac{Cov(x_1, x_2)}{Var(x_1)}}_{OVBias} \tag{8}$$

This means that there are other variables and factors that affect our regression and our dependent variable, which need to be addressed. Our dependent variable in this paper usually pertains to the proportion of black mortgage applicants in different scenarios, which can be dependent not just on whether the county they reside in is a renaissance zone, but also other factors, which we will add as controls in our regression so we can control for our omitted variable bias. The controls I will be using, by county and year, are the number of mortgage applications (the more number of mortgage applicants would mean perhaps there might be more black applicants), the black population in the county (if there are more black residents, more likely we would see more black applications), unemployment rate (determines whether people have jobs, or some steady income to make mortgage payments, which could be a big driving force in actually applying for a mortgage), total population (if the county is densely populated, like bigger cities, perhaps there is better chances for black applicants), proportion of male population in the county (men are more likely to be homeowners, so perhaps that could affect the applicants depending on the social structure of the households), the average loan amount (if the loan amounts are higher, that means people are taking out bigger loans to purchase homes, could imply that homes were costlier, so it could have a negative impact on the number of black applicants; it also acts as a proxy for the home values in the counties), the mean income of applicants (if only the rich mainly take out a loan and apply for a mortgage, then could be that black applicants could be deterred), and finally new permits issued for single family and multifamily housing (black applications could also depend upon the new constructions in the city, which could incentivize people to invest in property). For the permits, which are authorizations for construction, a single-family housing is a stand-alone home or house, whereas multifamily housing is where multiple separate housing units are self-contained in one building (like an apartment building). The multi-family housing is then split into the type of the buildings determined by the number of units they housed,

that is 2 units, 3 or 4 units, or more than 5 units. The models, including these new controls will look like this ——

Model 1:

$$y_{it} = \alpha + \theta\, 1[\tau_i \leq t \leq \pi_i |\, i \in \textit{Renaissance Zones}] + \delta_t + \phi_i + \beta z'_{it} + \epsilon_{it} \tag{9}$$

Model 2:

$$y_{it} = \delta_t + \beta z'_{it} \sum_{k=-J}^{k=+L} \theta_k\, 1[t = \tau_i + k] + \phi_i + \epsilon_{it} \tag{10}$$

Where, in both models, z'_{it} are the additional control variables that I described prior to this. Including these controls should hopefully make my results more robust and reduce the omitted variable bias and get closer to a true estimate of the coefficient and treatment effect.

6.6 Structure of the Analysis

Given all the models and robustness checks, the analysis section is going to go as follows — the analysis will be split in 6 parts, including the robustness checks (as the last one). The first part will use the panel data as it is and apply the first two models to it. Our dependent variables of interest for this part are the proportion of black mortgage applicants, and then the proportion of black mortgage applicants by the loan purpose, mainly whether the loan was for buying a new house or was it to refinance existing house. The second one will subset the data to measure the impact the start of the policy only, and not worry about the expiration date of the policies, so we can estimate the treatment effect of the commencement of a renaissance zone. We will use all three models for this method. The reason to do this is so see the isolated effect of the start of being a renaissance zone. The third part will be the direct anti-thesis to the second part, where we will measure the winding down effect of being a renaissance zone, as in, does taking away the policy influence the proportion of black applicants. The dependent variables are the same for both these parts as the first part. The fourth part will analyse, using the three models, the effect

of a renaissance zone on the proportion of black denials in mortgage applicants, to see whether black denials decrease or increase if you are in a renaissance zone. The dependent variable here are the proportion of black applicants who were denied. The fifth part would be very similar to the fourth part, except we will be looking at successes and not denials. The dependent variable here is the proportion of black applicants who succeeded in getting a mortgage. The sixth and final part would be the robustness checks where I will use model 1 and 2 and include in the regressions all the controls outlined in section 5.5, to see if the results of my analysis in the 5 parts were robust and whether they hold up if I add other variables in the mix.

As a side, to round out the methodology section as it is encompassing all of the methods and the robustness checks that I perform in this paper, I use heteroscedastic-robust standard errors to account for heteroscedastic errors conservatively in all of my analysis, except for when I perform the two-way fixed effects regressions in models 1 and 2. The autocorrelation of the error terms within the counties exists over all of the years in our panel data. The fact that the data within the counties over the years could have similar variation could threaten our significance tests, so I use clustering for the standard errors. The clustered standard errors allow for that specific correlation with the clusters, which in this paper are counties.

7 Results

This section will describe the results of the analysis done using the models in Section 6. The structure will follow Section 6.6 the as described.

7.1 *Method 1:* Panel Data

This first method considers the constructed panel data as a whole and applies the first two models formulated in the methodology section. The main independent variable in this method is called 'treatment' which equals to 1 when the policy is turned on in the county, and 0 otherwise. For example, Wayne County enacted the zone in 1997, so the treatment variable is 0 from 1990 till 1997, becomes 1 from 1997 to 2012 (which is the expiration

year), and goes back to 0 till 2017. In contrast, if a county was never a renaissance zone, for example Alcona County, then it would be 0 throughout. So, the treatment effect using this variable only gives us the effect of being a renaissance zone and getting the benefits during its tenure as a zone.

The regression results from model 1 is described in Table 2, which gives the results for the mortgage data as a whole, and Table 3, which splits up the data depending on loan purpose. Table 2 column (1) says that in our simple OLS model, without controlling for fixed effects, when the treatment starts in specific renaissance zones (referring to section 2.5), the proportion of black applicants rise by 0.057, that is the number of black applicants who are just applying for a mortgage rise. We then consider the year and county fixed effects and see that even when controlling for them, the policy seems to rise treatment effect, that is the proportion of black applicants by 0.017. The amount is less than when not controlled for county, so applying the county fixed affects decreases the treatment effect, saying that when we controlled and focused on within-county effects of the implementation of a policy, then the value decreased, but is still positive.

Table 3 breaks down the results in Table 2 by the purpose of the loan. It is worthwhile seeing where the increases are happening in the types of loans that are being applied for. We see that from table 3, the size of the proportion of black applicants applying for a new home after the treatment kicks in, seems to be 0.018, which is more than the treatment effect of the applicants applying to refinance their house.

Figure 6 describes model 2 in the methods section. The figure depicts 4 event study graphs, where the fourth graph shows the event study results with county and year fixed effects. In the graph, we see a jump right after the enaction of the policy. Prior to that the estimates seem to be decreasing very slightly over time, and then, after a small jump, it seems to be mostly decreasing over time. In the graph, we also see a jump down at time 14, which means 14 years after the policy was enacted. This jump could be describing the effect of the end of the policy, as from table 1, given the length of the renaissance zone policies in the counties, the average time of expiration seems to be in the ballpark of around 14 years after the policy was enacted. Further, figure 7 shows the same event study graph but specifically for black applicants, applying for a mortgage to buy a new house.

We see the results are almost identical to the previous figure. Both the jumps as we discussed, the start of the policy and the end of the policy, will be thoroughly looked at in method 2 and 3, where we focus solely on the treatment effect of starting the policy and ending the policy respectively. For all methods, the event study graph only ends up depicting the treated counties before and after the treatment. Model 3 will rectify this and depict both the treated and the non-treated and show better coefficients.

In method 1's analysis, the treatment effect we see picks up the effect of just having the treatment switched on in the renaissance zones but does not discriminate between the start of the policy and the end of the policy separately. This will be down in the coming sections, devoted solely to investigating the effects of starting a policy versus ending a policy.

7.2 *Method 2:* Start of the Policy

This second method considers the constructed panel data with respect to start times of the policies and applies all three models formulated in the methodology section. This section aims to determine the treatment effect once the policy has been enacted, to see the difference the start of a policy makes to the black mortgage applicants.

Table 4 describes the treatment effect of the start of the policy following model 1. We see that the results are closely like the values we got for the first method, however, the size of the treatment effect for the subsetted model is now smaller in comparison to the values in the first method. The sign, however, still is a positive, so we see that the proportion of black applicants does increase when the policy is in place by 0.006, given year and county fixed effects. Similarly, Table 5 gives us a similar interpretation. Like in the previous method, we see that from table 5, the size of the proportion of black applicants applying for a new home after the treatment kicks in, seems to be 0.017, which is more than the treatment effect of the applicants applying to refinance their house.

The event study graph and its interpretation for the start treatment would be the same as figure 6, as previously described for method 1. The 0 in the graph corresponds to the start of the policy, so, it picks up the treatment effect of starting the policy in the renaissance zones.

Table 6, and figures 8 and 9 describe the results of model 3, as described in equation (4). Figure 8 is split into two graphs, one which depicts the values of the Round 1 Renaissance Zones and the values of Round 2 Renaissance Zones (both of which are described in Table 1). The reason for the split is because the policy kicks in in different times for both the zones. To consolidate both types of renaissance zones, I make a running variable for time, similar to the one described in the event study model (model 2) and plot them with respect to the time since the treatment was implemented in figure 9. The figures depict the effect of starting the treatment and shows a noticeable jump when the treatment is imposed. Prior to the treatment, the proportion of black applicants seem to be decreasing with time, and after the implementation of the policy, there is a noticeable jump after which the applicant proportion falls with respect to time. Table 6 gives us the exact values of the jumps and the slopes. From the table, we see that with respect to time, there is a significant jump in the proportion of black applicants if it is a renaissance zone, by about 0.094, which is backed up in figure 9. Figure 9 also depicts the falling slopes, as in table 6, of about 0.001 for non-renaissance zones, and a bigger fall over time of 0.003 for renaissance zones.

As a side for figure 9 and all the similar graphs that are included for the other methods, a note on why there is data missing around the blue axis line in the graph. We have data missing for time is equal to -1. One of the periods must be dropped to avoid perfect multi-collinearity, and I use the -1 time lag as the dropped reference.

7.3 *Method 3:* End of Treatment Analysis

The third method considers the constructed panel data with respect to end or the expiration times of the policies and applies all three models formulated in the methodology section. For reference, the expiration times can be seen in Table 1. This section aims to determine the treatment effect once the policy has expired, to see the effect of the end of a policy.

Before embarking on the analysis of this section, because we only want to pick up the effect of the expiration of the policy, that is we want to find out what happens to the proportion of black applicants as soon as the policy is taken away, I will subset my data,

so it doesn't pick up the effect of starting the policy in a renaissance zone. So, the data for this method begins from 2001, which is when the second-round renaissance zones get their treatment started, all the way to 2017. This way we can pick up the isolated effect of the end of a renaissance zone. Further, the treatment variable here captures something different to what we have been used to in the past two methods. In this method, the 'End Treatment' variable describes the expiration of the policy, that is it turns on after the renaissance zone has expired. For example, Kent county's zone expired in 2011, so the 'End Treatment' variable is 0 till 2011, then becomes 1 from 2012 to 2017. For non-renaissance zone counties, it is 0 throughout the time frame. Given this is established, it is worth going over the results from this section.

In table 7, picks up very interesting results. We see that for the basic OLS, the end of the treatment surprisingly increases the proportion of black applicants by 0.02, and if we run a year fixed effects model, it seems to have a similar effect of an increase of 0.028. However, when we control for the county fixed effect, the coefficients change dramatically. When controlled for county fixed effects, we see that the end of the treatment decreases the proportion of black applicants by 0.027 and when controlled for both county and year fixed effects, it has a similar decline of 0.023. One interpretation for this is that over time, even after expiry there is a general trend of increase in proportion of black applicants, when controlled for yearly fixed effects, which change year to year. However, this policy is a county-to-county policy, so counties are going to differ from one another which is going to affect the treatment effect. The county characteristics affects the applicants, and that trend of the applicants will vary by county. So, the important takeaway treatment effect from the first model is in column (4) controlled for both year and county fixed effects and describes a fall in proportion of black applicants by 0.023 as soon as the treatment benefits are taken away. The treatment benefits are discussed at length in section 2. Further, table 8 splits the data by the loan purpose specifically, and we see that we get the same signs as in table 7. The size of the treatment effect is different. We see that the size of the decline in proportion of black applicants who applied for a new home, 0.025, is much greater than the size of decline in black applicants who applied to refinance their house, 0.009 which is also not statistically significant.

In Figure 10, we see that the event study model describes the effects of the sign well enough, where we see that before the expiration of the policy, we see a steady fall in slope and when the policy expires the effect on the proportion of black applicants is to decline. The next model will make the effect clearer.

Table 9 and figure 11 describe model 3. Figure 11 shows that the proportion of black applicants decline over time prior to the expiration, and as soon as the policy expires, there is a jump down in the proportion, after which there is a very miniscule increase in proportion of black applicants over time. The effect of the jump is a decline in proportion of about 0.04, from table 9 and figure 11.

7.4 *Method 4:* Mortgage Denial Analysis

This method discusses the effect of treatment of the renaissance zones on the proportion of black applicants who get denied after applying for a mortgage. This method considers the panel data with no subsetting. The definition of treatment is the same as method 1 and 2. The dependent variable, proportion of denied black applicants, is defined as the number of denied black applicants divided by the number of black applicants, given a county and year.

Table 10 gives us the values of running the regression in model 1. We see that a simple OLS says that if there is a treatment implemented, then the proportion of black denials go up by 0.139. However, this is a rudimentary value as accounting for fixed effects changes matters. We see that for county fixed effects only, being a renaissance increases the proportion of denied black applicants by 0.204, and for year fixed effects, increases by 0.022. When controlling for both county and year fixed effects we see that the proportion of black denials decrease by 0.023, but this value is not statistically significant, so we can take this with a grain of salt.

The event study model's values do not seem to give us a very descriptive behaviour of the effect of the renaissance zones on the proportion of denied black applicants. Figure 12 shows the event study model, and we notice an overall decline in denied black applicants, however the effects do not seem very clear. We can see a small jump up in the proportion

of declines after the treatment has been implemented, after which it seems to decline by a bit.

Model 3 is described in Table 11 and figures 13 and 14 and follows the similar process as in the previous methods. From the table and the figures, we see that getting the treatment for the renaissance zones causes a considerable jump in the proportion of black denials, which ebbs away declining over time. We see that the slope with respect to time for treated zones is -0.026 and the slope for untreated zones is 0.005, which means for untreated counties the denied black applicants is slightly increasing over time and for renaissance zone counties are declining over time at a larger amount. The graph captures this jump, slightly increasing and declining characters of the graph. Figure 13 splits the graph by the round of the renaissance zones since the time goes from 0 to 27, where 0 is 1990 (the first year of my panel data) and 27 is 2017 (the last year of the panel data), and figure 14 consolidates the two different rounds.

7.5 *Method 5:* Mortgage Success Analysis

This final method discusses the effect of treatment of the renaissance zones on the proportion of black applicants who are successful after applying for a mortgage. This method considers the panel data with no subsetting. The definition of treatment is the same as method 1 and 2. The dependent variable, proportion of successful black applicants.

Model 1 is described in table 12, in which we see that getting the treatment seems to decrease proportion of successful black applicants, in all versions of the model — simple OLS and the panel linear models with fixed effects regression. This implies that, given county and year fixed effects, the proportion of successful black applicants decreases when the treatment begins, that means as soon as the treatment is switched on in the renaissance zones, we see a fall in the proportion of successful black applicants. Comparatively, the number of black successes is increasing, as we see in table 13, which says that when the treatment is turned on, the number of successful black applicants in renaissance zones increase by approximately 962 applicants, given year and county fixed effects. This means that although the face value number of successful black applicants are

increasing, when this is considered with respect to the proportion black applicants applying for a mortgage, this value is decreasing.

The event study models are described in figure 15. We see that prior to the treatment, the proportion of successful black applicants are decreasing over time, then there is a jump down when the treatment kicks in, and then after there is an overall increase in the successes with respect to time. Model 3 will capture and magnify the workings of this model better.

Model 3 captures the time varying effect of the treatment effect of the renaissance zones on the proportion of successful black applicants, as described in table 14 and figures 16 and 17. From the figure and the graph, we see that successes for renaissance zones suffered a hard fall from just being a renaissance zone, as we notice a jump down after treatment. We see that the proportion of successful black applicants for non-treated counties increases over time but extremely miniscule amount as the slope is 0.002, statistically insignificant. For the treated counties, the slope is 0.023, which is a bigger increase over time. The discussion section will ascertain the reasons for the sudden decline in successes for the renaissance zone counties and discuss the rise over time in successes.

7.6 Robustness Checks

To verify the robustness of the results we have found through our analysis, I include a robustness check for all the methods using model 1 and 2, as described in equation (9) and (10). The process of the robustness checks for this paper is outlined in section 6.5, along with the control variable choices.

For method 1, which considers the panel data as a whole, we apply the control variables in model 1, and obtain table 15. We see that the values of coefficient of treatment have similar signs as in table 2, which uses model 1, but without the controls. Although the signs of the treatment effect are consistent, we see in table 15 that the size of the treatment effect is now smaller, from 0.017 it has fallen to 0.009, given county and year fixed effects, but it is still statistically significant. We see that the number of mortgage applicants and the proportion of black applicants have a positive correlation, and so does

the black population in the county given a year, total population, and the number of single and multifamily permits (although they are not statistically significant). We see that there is a negative correlation between the proportion of black applicants and the male proportion in the county given the year, and so does the average loan amount. Further, from figure 18, with the two-way fixed effects, we see that the results we had obtained from method 1 are still standing when we add the control variables and perform an event study using model 2. The proportion of black applicants don't seem to change too much before the treatment, then there is a small jump when the treatment begins, and then there seems to be an eventual decline after the treatment started.

For method 2, similar to method 1, we see that our values seem to match up with the values we got without the treatment. When we add the controls, the signs are the same, but we notice in column (4) of table 16, the treatment effect of being a renaissance zone on the proportion of black applicants is 0.009, compared to Table 4, where the size of the treatment effect is 0.006. We see that adding the control variables are risen the treatment effect, given year and county fixed effects. We also see that the sign of the correlation and the effect of the various control variables on the proportion of black applicants are the same, just varying in size. As for the event study model, figure 19, with the two-way fixed effects, shows that the results of the model with the control variables added seems to correspond to the values we found when we considered the model without any control variables. We notice the same effects in this graph where, the proportion of black applicants does not seem to be changing prior to the treatment, then we see a jump in the proportion and then a slow decline in the proportion of black applicants.

For method 3, similarly to the previous methods, in table 17 we see that the sign of treatment effect of the end of the treatment seems to match up with the values we saw in table 7, which we talked about in section 7.3. Further we see that the event study graph in figure 20, with the two-way fixed effects, also seems to show what we have come to expect about our data. The proportion of black applicants decline over time even after the end of the treatment.

For method 4 and 5, tables 18 and 19 shows us that the treatment effect of the renaissance zones on the proportion of black denials and successes are consistent. However,

both have a smaller size of the effect. Further, judging by the event study graphs in figures 21 and 22 for both models, we see that our claims are also backed up after adding the controls. In figure 21, we see that the proportion of denied black applicants seems to jump up after the treatment starts but then declines over time. Similarly, figure 22 also seems to back up the results we saw previously, where there is a decline in the proportion of successful black applicant's pre-treatment, and then after the treatment there is a jump down and then over time the successes increase.

Overall, from the robustness checks for all five methods we see that our results seem to be consistent and thus, robust. In the next section, we will discuss the implications of all the results we have found after our analysis and think about the possible shortcomings in some of the results.

8 Discussion

This section will round out all the building blocks we have assembled and discuss the implications of the results and ways to move forward. We will discuss the implications from each method separately and analyse the results we get to tackle the question of what happens to black mortgage applications once the renaissance zone policy was implemented.

Analysis

From method 1, when we analysed the whole data set using just fixed effects modelling, we see that turning the treatment on, that is the renaissance zones receiving their benefits, including the several levels of tax abatements, caused the proportion of black applicants to increase significantly. This could tell us that the treatment could have actually been perceived to be a good benefit that people, especially black applicants, in the renaissance zones wanted to take advantage of. Homeownership, especially, is a basic life goal for a lot of people, and we see among the type of mortgages that people applied for, the purpose of a new home saw a larger increase compared to the other types, when the renaissance zones received the treatment. This would mean that the policy perhaps provided people with the belief that they might be able to afford a new home, with all the tax breaks, and that is why they should apply to get a mortgage. This effect is also backed up by the event

studies we performed for method 1, which show a jump in the proportion of black applicants as soon as the tax breaks kick in, provided they live in a renaissance zone. It seems to empower black residents in the counties to try to achieve their financial needs with respect to their homeownership status. But how effective was the policy through its lifetime is a conversation that can be tackled by method 2 and 3.

We see in method 2, which analyses the effect of just starting the policy. Sometimes policy, especially one as attractive as the renaissance zones with its multitude of tax breaks can have a strong effect in the beginning but then ebb away, as more people realise maybe taking away those taxes may not have helped a tremendous amount in terms of their financial health and capabilities. We see that when we zoom into just the start of the policy, there is an initial jolt of increase in the black applications as soon as the policy kicks in, but it seems the initial effect of the policy slowly ebbs away with time and the proportion of black applications decrease with time after the policy start. So, the idea that the most effective period of a policy is right when it starts, seems to be upheld in this case.

Our third method investigates what happens when the policy is taken away from the counties. Is there a rapid drop right after the end of a policy in the proportion of black applicants? Or does it follow the natural trends and show no signs of rapid shifts in behaviour? Turns out, from what we found out, model 1 shows a preliminary sign that the first idea is probably the trend. We see that upon ending the policy the proportion of black applicants seem to decrease. But model 3 spells out this idea very coherently. The trend seems to be decreasing before the expiration of the policy, and as soon as the policy expires the proportion rapidly falls and then stays somewhat constant from there on then. It seems the changes in the application proportions are specifically down to the renaissance zone implementation. As soon as you take away the pronunciation of certain zones as renaissance zones and they stop receiving benefits, the proportion of the black applicants in those places fall rapidly after expiry. This means that the effects of the policy are not really long-lasting. They help while they are there, but on the long run, it doesn't seem to be sustainable for the local government to be making no money and they have no incentives to be giving these tax cuts. So, the policy does not seem to have long-term

potential as a policy that could really change the fabric of homeownership and mortgage application confidence within the black community.

We have discussed the effects of just people applying for a mortgage, which in and of itself, a big signal that the renaissance zone policy seems to make people, especially in this paper black applicants, empowered enough and a bit more confident to try to get a mortgage. However, for the applicants to achieve their dreams of a new home, or to simply ease their financial strains and refinance their house, they need to be successful. Applying for a mortgage is one thing, however, denials, especially within the black and African American and other people of colour communities, are depressingly common (Lerner 2022). According to Zillow, in the US, they find that black applicants were denied a mortgage 84 percent more than white applicants. Since this policy seems to be increasing the proportion of black applicants, it could be that could mean that the number of denials could decrease. Prior to the treatment, and for counties that never received the treatment, there was a steady increase in the denials. And after the start of the treatment, from the results of model 3 for this fourth method, we see that the number of denials had a rapid increase after which it decreased over time. One interpretation for this initial jolt of rise in the proportion of black denied applicants, could be tied to the rise in the proportion of black applicants who apply for a mortgage. If the residents of a county see that it is really convenient to apply for a mortgage and they can now afford to apply, or even think about applying for one, the quantity of applications might rise by a significant amount, but it could cause the marginal quality of each applicant to decrease. That means that they might have increased the number of black applications they do get, however, the quality of each application could be marginally decreasing, now that people are more empowered to try to receive a mortgage. People can now think of applying for a mortgage that could not before, so unless the banks changed their thresholds and criteria for awarding mortgages, we are bound to see an increase the proportion of denials in the renaissance zones. Over time, however, the proportion of denials are decreasing.

We have discussed denials, but successes are equally important to take a closer look at. In the last method, method 5, we saw that after the treatment turns on, in model 5, the proportion of successful black applicants actually decrease, which is perverse to our

thinking, if this renaissance zone policy actually helps black mortgage applicants. This can be seen more exemplified when model 3, magnifies the effects on successes, and we see that as we start the treatment, we see a rapid fall and then an eventual rise in successes for black applicants. While it is heartening to know that the proportion of successful black applicants seems to be rising with time after the treatment starts, the initial rapid drop in the successes seems bizarre at first. However, if we consider what we see with the proportion of black denied applicants, then, our interpretation, which we used to consider the rise in denials also seems to be in effect here. The increase in black mortgage applicants is a good sign but increase in the quantity of the mortgages means that there is a trade-off in the quality of mortgage applications, with the marginal quality per applicant falling. Further, it could be that banks are not approving too many applicants given that they get a barrage of applicants. Coalescing all these ideas, it is a good sign. Although the proportion of successes fall and the proportion of denials rise right after the application of the policy, the fact that the proportion of black mortgage applicants rose with the implementation of the policy and dropped after the policy expires gives us hope that the policy was empowering. The signal that these tax abatements and temporary holds on extra spending could increase chances of black and African American communities inching closer to achieve their dreams of owning a new home more so than before, as well as making them more confident in even applying for a mortgage, no matter whether they end up owning a home or not, is an important takeaway.

Limitations

It is, however, important to talk about the shortcomings of the analysis done here, as it is far from perfect. The robustness checks did its best to control for omitted variable bias, given the data that we had and could obtain, however, there are several issues that could affect homeownership that could not be considered. One could be changing attitudes within communities. More so than before the new millennial generation prefers to rent than buy a house, not because they cannot afford to do so, but they prefer to do so (Hoffower 2019). Especially within black communities, owning a home might sometimes have negative effects. It could reduce mobility among disadvantaged groups, avoiding people from moving

out of impoverished neighbourhoods. There could be politics involved in homeownership statuses as well. We also brought up case that black Americans are more likely to get their mortgage denied, which could affect their spending preferences. Poverty is also a big determinant of what the people in county can afford and their behaviour. It can hugely damage the confidence that people could have to even comprehend owning a home, so it could affect our signal of the number of black applicants applying for a mortgage, because it would seem so out of reach.

The question of reverse causality or simultaneously bias could also be a bit of an issue here. One drawback is that the deliberations of which counties receive the treatment to become a renaissance zone is done behind closed doors, so the factors that affect the treatment is unknown. We only know which counties received the treatment. One possibility could be that homeownership status within the counties factored into part of the reason some counties got chosen. This is a theory, but it could be a fair point to consider as homeownership status of people says a lot about the socio-economic growth within the counties. However unfortunately, there is no way to be sure about this.

Along with this, there are some concerns about the modelling, with respect to the R-squared values for a couple of the models. In a couple of the models, the R-squared values seem to be very small, hovering around 0.1. However, adding the extra variables in the robustness checks seems to have help those values, as the R-squared values become higher, showing that the dependent variable needs those extra variables. Further, there is also usually a concern about over-fitting, however, my R-squared and adjusted R-squared values are not big enough to have that concern. My adjusted r-squared seems to follow along with the r-squared well enough that overfitting is not a concern. If it has strayed far enough away from the R-squared values, then it would have been a problem to tackle.

Measurement bias could also possibly affect the analysis. It harkens back to our reverse causality issue that we have little idea why these particular renaissance zones got chosen. The independent variable, of whether they received the treatment or not, could be impacted by several factors that are omitted, causing a correlation of our independent x variable to the error term. Perhaps having a higher black population leads to a higher chance of being a renaissance zone, which could cause a positive bias, or having higher

median household income could decrease the chances of being a renaissance zone. These are just a few of the confounding variables that could affect the independent variable.

9 Conclusion

Homeownership can be an exciting but daunting prospect to a lot of people. The idea of owning a home is one of pride but the process is long and arduous. What matters is the belief and confidence people have within themselves that they are financial stable enough that they could own a home, and the first step for many towards the ultimate goal is to apply for a mortgage. The process of applying for a mortgage signals belief in themselves, or their situation, in taking that first step to homeownership. In this paper, we saw how residing in renaissance zones tends to increase the proportion of black mortgage applicants, and over time tends to decrease denial rates and increase successes, which is a promising result for the policy. This signals to us, that the policy's tax credits might have given potential black homeowners the financial fortitude to inch closer towards achieving one of the centrepieces of their American Dream.

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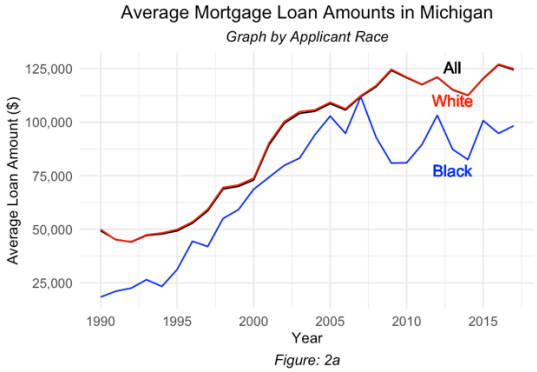
Descriptive Statistics of Variables



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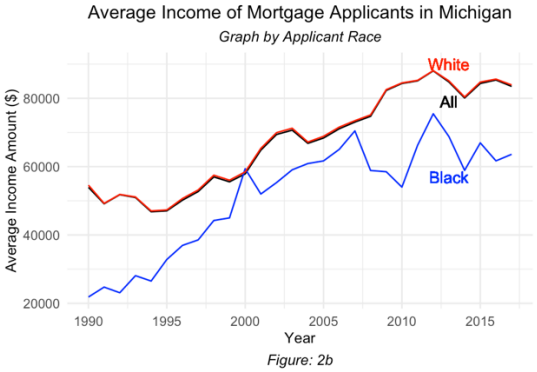

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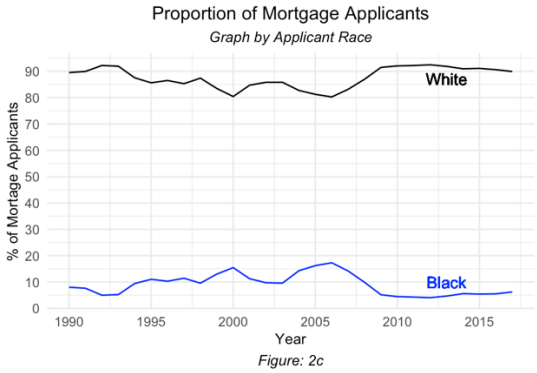

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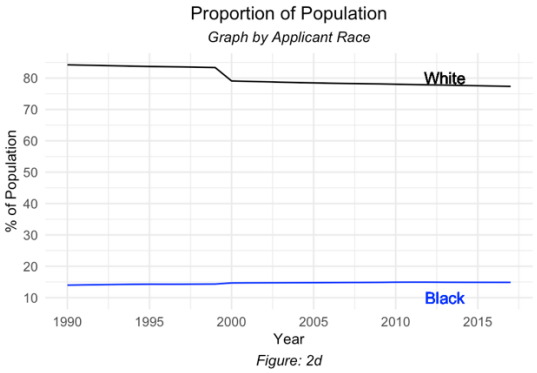

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Figure 2

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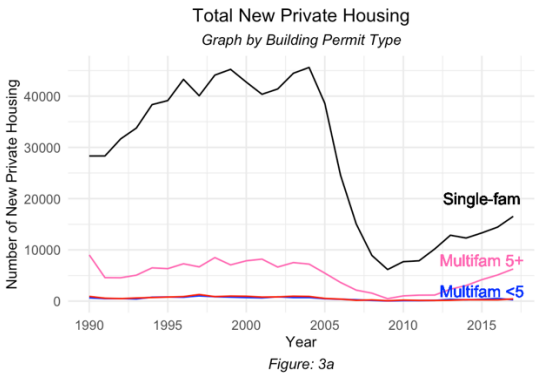

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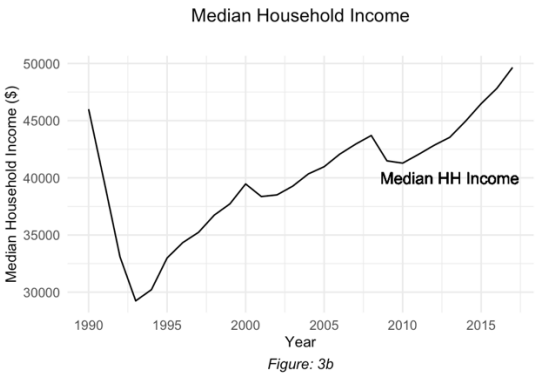

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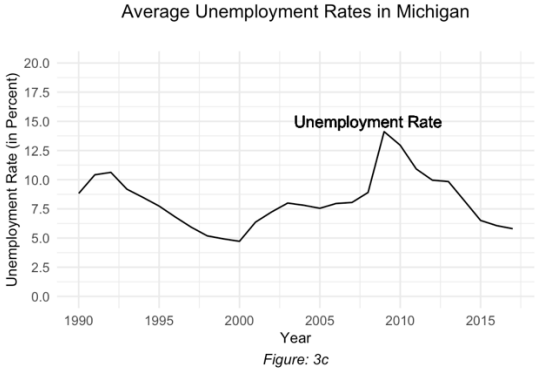

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Figure 3

Figure 4

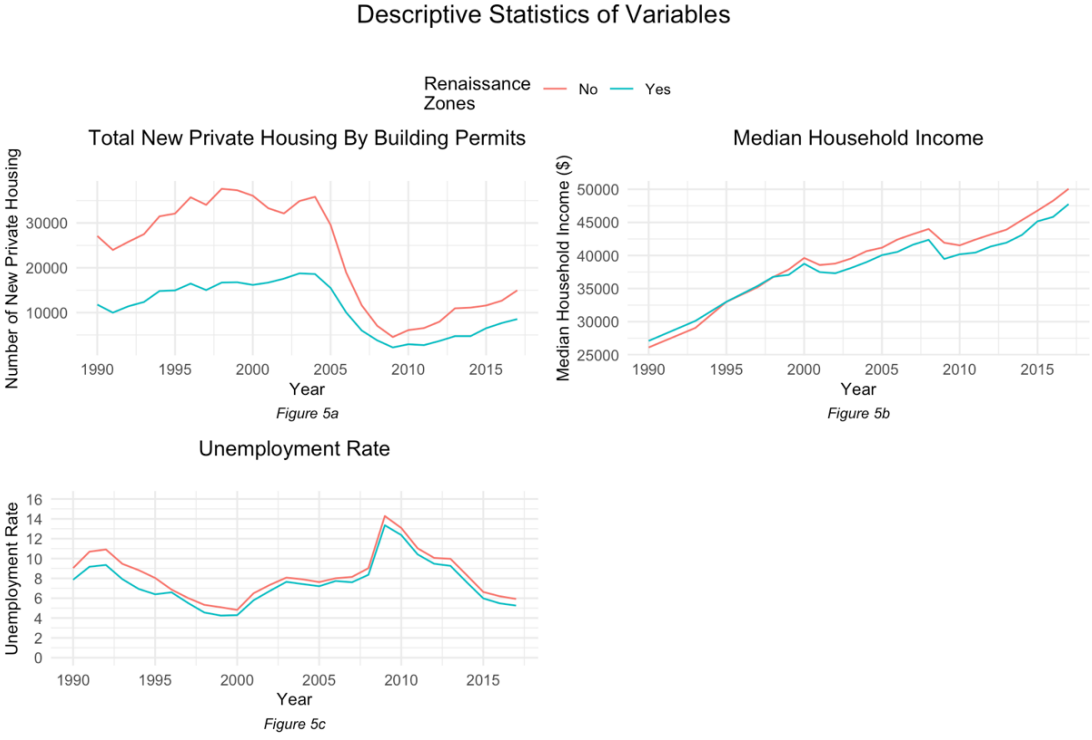

Figure 5

Table 2: Model 1 Regression Results for Method 1

	Dependent variable:			
	Proportion of Black Applicants			
	OLS		*panel linear*	
	(1)	(2)	(3)	(4)
Treatment	0.057***	0.019***	0.059***	0.017***
	(0.003)	(0.002)	(0.003)	(0.002)
Constant	0.015***			
	(0.001)			
Year Fixed effects	No	No	Yes	Yes
County Fixed effects	No	Yes	No	Yes
Observations	2,324	2,324	2,324	2,324
RMSE	0.0405	0.021	0.04	0.0201
R^2	0.144	0.034	0.146	0.025
Note:				+p<0.1 *p<0.05 **p<0.01 ***p<0.001

This table describes the model 1 regression results for Method 1. The Treatment turns on and becomes 1 when the county receives the benefits of being a renaissance zone, and 0 otherwise.

Table 3: Model 1 Regression Results by Loan Purpose for Method 1

	Dependent variable:							
	Black Applicants: New Home				Black Applicants: Refinance			
	OLS		*panel linear*		*OLS*		*panel linear*	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Treatment	0.056***	0.022*	0.057***	0.018*	0.057***	0.010*	0.058***	0.006
	(0.006)	(0.009)	(0.005)	(0.009)	(0.006)	(0.005)	(0.004)	(0.005)
Constant	0.013***				0.022***			
	(0.001)				(0.001)			
Year Fixed effects	No	No	Yes	Yes	No	No	Yes	Yes
County Fixed effects	No	Yes	No	Yes	No	Yes	No	Yes
RMSE	0.0375	0.0194	0.037	0.0183	0.0578	0.0346	0.0577	0.0343
Observations	2,324	2,324	2,324	2,324	2,324	2,324	2,324	2,324
R^2	0.159	0.052	0.157	0.037	0.075	0.004	0.074	0.001
Note:								+p<0.1 *p<0.05 **p<0.01 ***p<0.001

This table describes the model 1 regression results for Method 1. The treatment turns on and becomes 1 when the county receives the benefits of being a renaissance zone, and 0 otherwise.

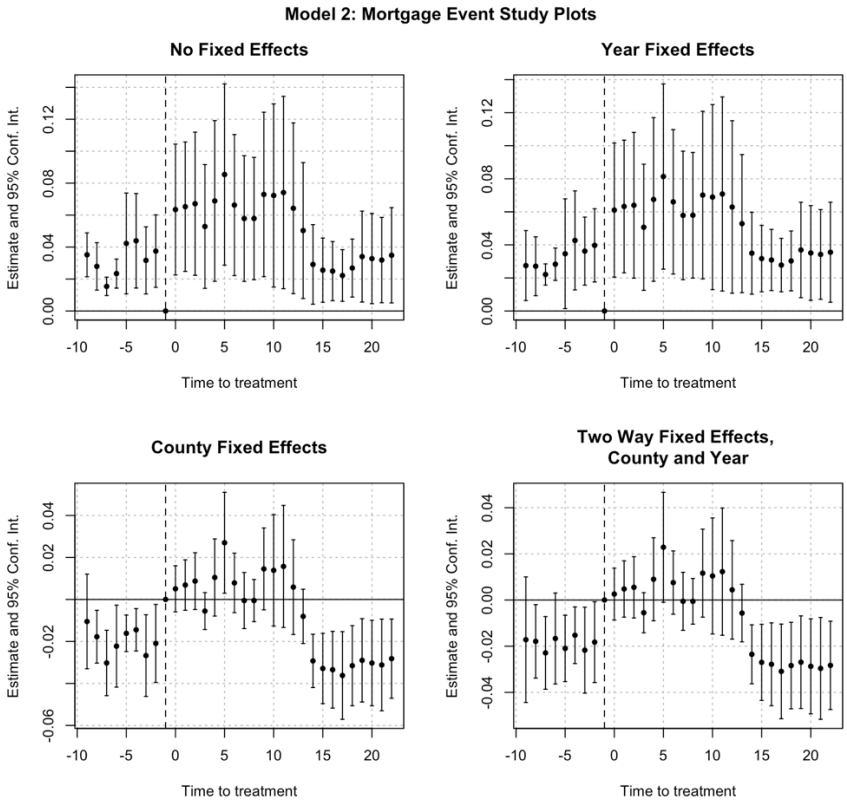

Figure 6

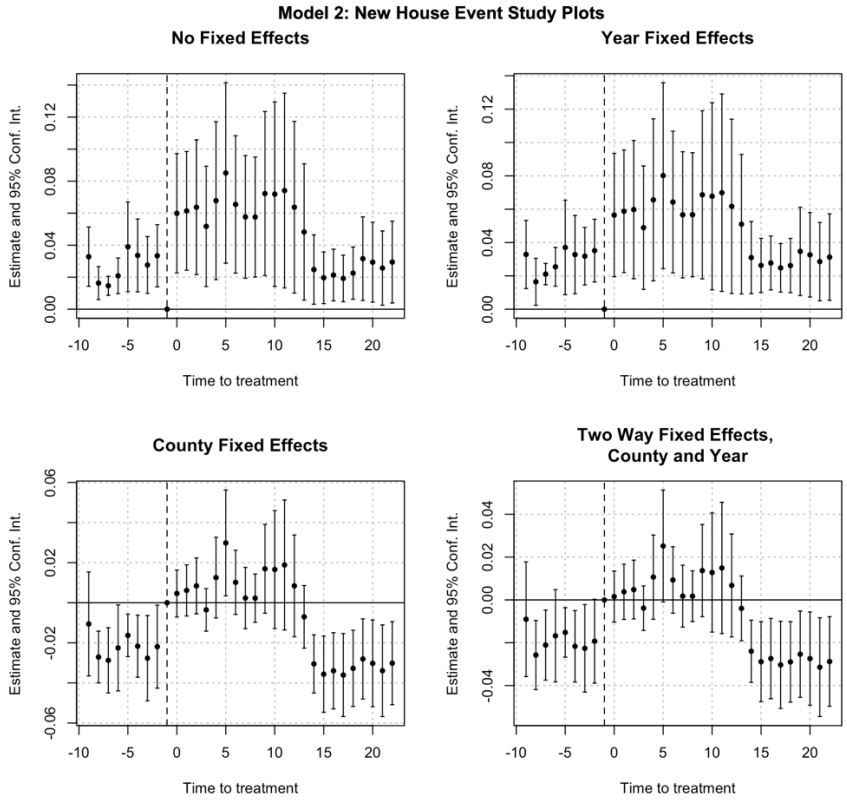

Figure 7

Table 4: Model 1 Regression Results with Start Treatment for Method 2

	Dependent variable:			
	Proportion of Black Applicants			
	OLS		*panel linear*	
	(1)	(2)	(3)	(4)
Treatment	0.051***	0.005*	0.054***	0.006*
	(0.003)	(0.002)	(0.003)	(0.003)
Constant	0.014***			
	(0.001)			
Year Fixed effects	No	No	Yes	Yes
County Fixed effects	No	Yes	No	Yes
Observations	2,158	2,158	2,158	2,158
RMSE	0.0416	0.0217	0.0409	0.0207
R^2	0.139	0.002	0.150	0.003
Note:				+p<0.1 *p<0.05 **p<0.01 ***p<0.001

This table describes the model 1 regression results for Method 2. The treatment turns on and becomes 1 when the county receives the benefits of being a renaissance zone. The data is subsetted to focus on the start of the zones. So, for renaissance zones, once the county gets the treatment it stays equal to 1 till the end.

Table 5: Model 1 Regression Results by Loan Purpose with Start Treatment for Method 2

	Dependent variable:							
	Black Applicants: New Home				Black Applicants: Refinance			
	OLS		*panel linear*		*OLS*		*panel linear*	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Treatment	0.056***	0.020*	0.057***	0.017*	0.057***	0.011*	0.058***	0.006
	(0.006)	(0.009)	(0.005)	(0.008)	(0.006)	(0.004)	(0.004)	(0.005)
Constant	0.013***				0.021***			
	(0.001)				(0.001)			
Year Fixed effects	No	No	Yes	Yes	No	No	Yes	Yes
County Fixed effects	No	Yes	No	Yes	No	Yes	No	Yes
Observations	2,158	2,158	2,158	2,158	2,158	2,158	2,158	2,158
RMSE	0.0384	0.0197	0.0379	0.0186	0.0586	0.0354	0.0585	0.0351
R^2	0.161	0.042	0.161	0.029	0.080	0.004	0.078	0.001
Note:								+p<0.1 *p<0.05 **p<0.01 ***p<0.001

This table describes the model 1 regression results for Method 2. The treatment turns on and becomes 1 when the county receives the benefits of being a renaissance zone. The data is subsetted to focus on the start of the zones. So, for renaissance zones, once the county gets the treatment it stays equal to 1 till the end.

Table 6: Model 3 Regression Results for Method 2

	Dependent variable:
	Proportion of Black Applicants
Time × Treatment Dummy	-0.003***
	(0.001)
Time × (1 - Treatment Dummy)	-0.001***
	(0.0001)
Treatment Dummy	0.096***
	(0.020)
Constant	0.023***
	(0.002)
Observations	2,158
RMSE	0.0411
R^2	0.118
Note:	+p<0.1 *p<0.05 **p<0.01 ***p<0.001

In this regression, treatment dummy is dummy that turns on when the renaissance zone receives the treatment.

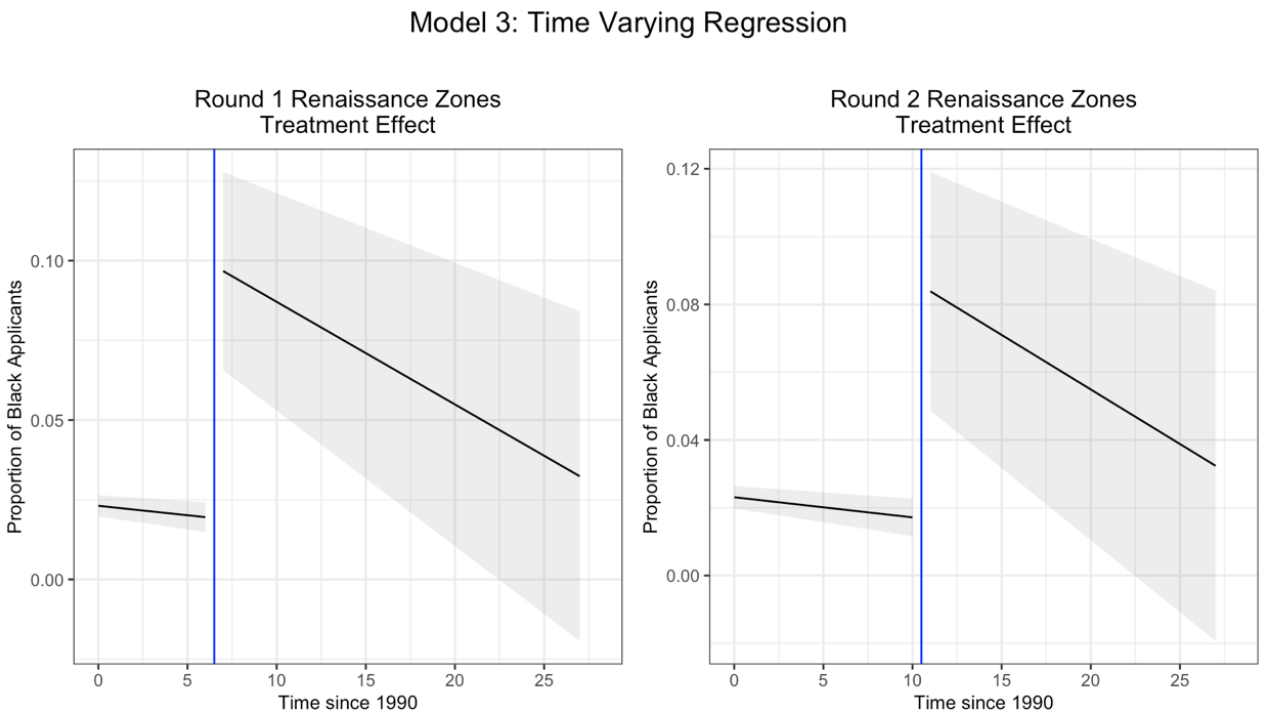

Figure 8

Model 3: Time Varying Regression

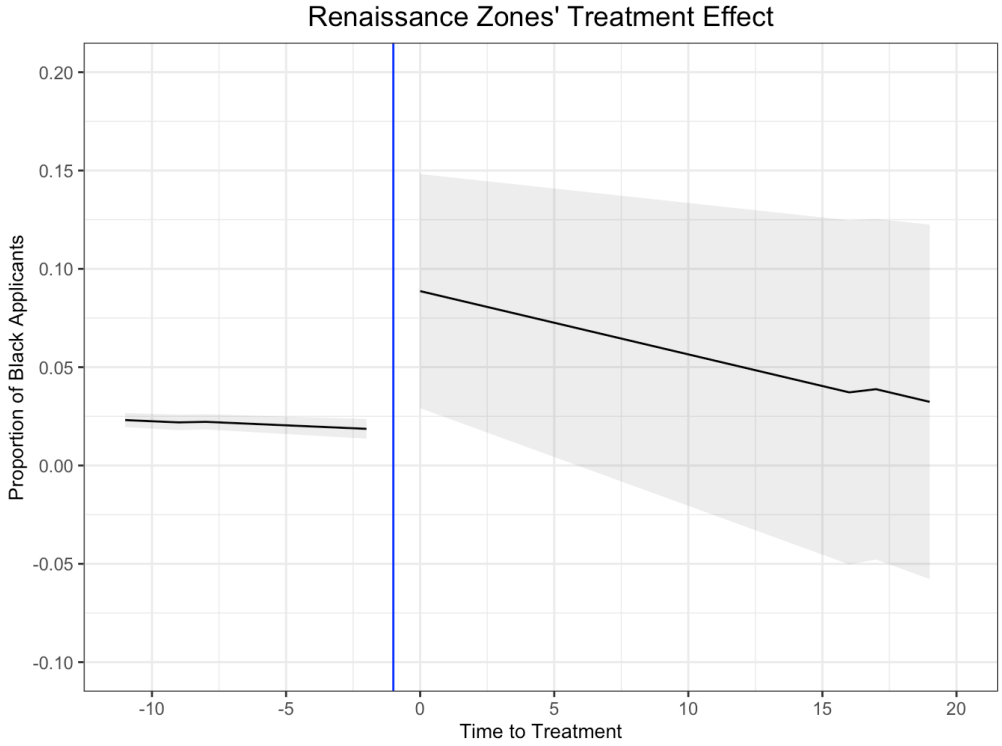

Figure 9

Table 7: Model 1 Regression Results for Method 3

	Dependent variable:			
	Proportion of Black Applicants			
	OLS		*panel linear*	
	(1)	(2)	(3)	(4)
End Treatment	0.020***	-0.027***	0.028***	-0.023***
	(0.005)	(0.002)	(0.005)	(0.002)
Constant	0.018***			
	(0.001)			
Year Fixed effects	No	No	Yes	Yes
County Fixed effects	No	Yes	No	Yes
Observations	1,411	1,411	1,411	1,411
RMSE	0.0406	0.0167	0.0398	0.0157
R^2	0.013	0.088	0.023	0.064

Note: +p<0.1 *p<0.05 **p<0.01 ***p<0.001

This table describes the model 1 regression results for Method 3. The treatment turns on and becomes 1 when the renaissance zone policies expire in the counties and stops receiving the benefits of being a renaissance zone. The data is subsetted to focus on the end of the zones.

Table 8: Model 1 Regression Results by Loan Purpose for Method 3

	Dependent variable:							
	Black Applicants: New Home				Black Applicants: Refinance			
	OLS		*panel linear*		*OLS*		*panel linear*	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
End Treatment	0.016***	-0.030***	0.024***	-0.025**	0.033***	-0.012+	0.039***	-0.009
	(0.004)	(0.010)	(0.002)	(0.010)	(0.006)	(0.007)	(0.005)	(0.007)
Constant	0.017***				0.026***			
	(0.001)				(0.002)			
Year Fixed effects	No	No	Yes	Yes	No	No	Yes	Yes
County Fixed effects	No	Yes	No	Yes	No	Yes	No	Yes
RMSE	0.0393	0.0181	0.0384	0.0169	0.0589	0.0346	0.0586	0.0343
Observations	1,411	1,411	1,411	1,411	1,411	1,411	1,411	1,411
R^2	0.009	0.092	0.019	0.064	0.017	0.004	0.022	0.002
Adjusted R^2	0.009	0.035	0.008	-0.007	0.016	-0.058	0.010	-0.073

Note: +p<0.1 *p<0.05 **p<0.01 ***p<0.001

This table describes the model 1 regression results for Method 3. The treatment turns on and becomes 1 when the renaissance zone policies expire in the counties and stops receiving the benefits of being a renaissance zone. The data is subsetted to focus on the end of the zones. So, for renaissance zones, once the county ends the treatment it becomes equal to 1 till the end.

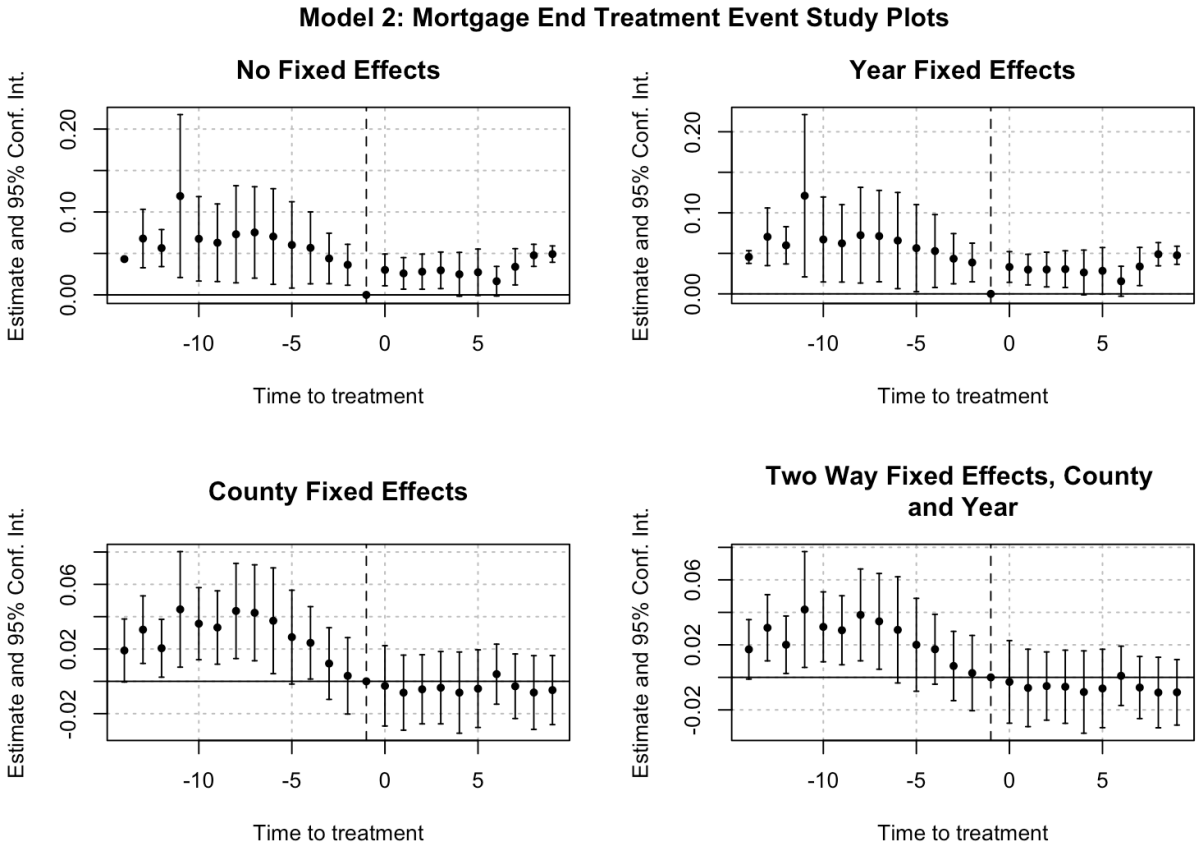

Figure 10

Table 9: Model 3 Regression Results for Method 3

	Dependent variable:
	Proportion of Black Applicants
Time × Treatment Dummy	-0.003***
	(0.001)
Time × (1 - Treatment Dummy)	0.0001
	(0.0001)
Treatment Dummy	0.074***
	(0.012)
Constant	0.011***
	(0.001)
Observations	1,411
RMSE	0.0363
R^2	0.208
Note:	+p<0.1 *p<0.05 **p<0.01 ***p<0.001

In this regression, treatment dummy is dummy that turns on when the renaissance zone receives the treatment.

Model 3: Time Varying Regression for End of Policy

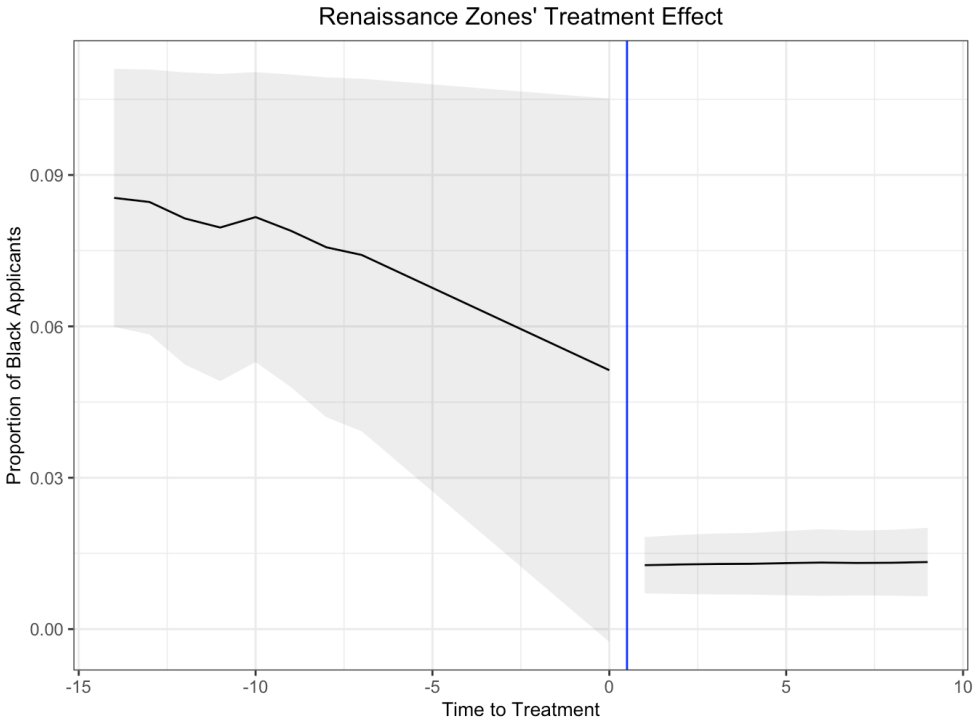

Figure 11

Table 10: Model 1 Regression Results for Method 4

	Dependent variable:			
	Proportion of Denied Black Applicants			
	OLS		*panel linear*	
	(1)	(2)	(3)	(4)
Treatment	0.139***	0.204***	0.022**	-0.023
	(0.024)	(0.020)	(0.011)	(0.020)
Constant	0.223***			
	(0.007)			
Year Fixed effects	No	No	Yes	Yes
County Fixed effects	No	Yes	No	Yes
Observations	2,324	2,324	2,324	2,324
RMSE	0.311	0.3012	0.1889	0.1731
R^2	0.017	0.020	0.001	0.001

Note: +p<0.1 *p<0.05 **p<0.01 ***p<0.001

This table describes the model 1 results for Method 4. The treatment turns on and becomes 1 when the county is a renaissance zone, and 0 otherwise. The proportion of black denials is the ratio between the number of denied black applicants and the number of black applicants given a county and a year.

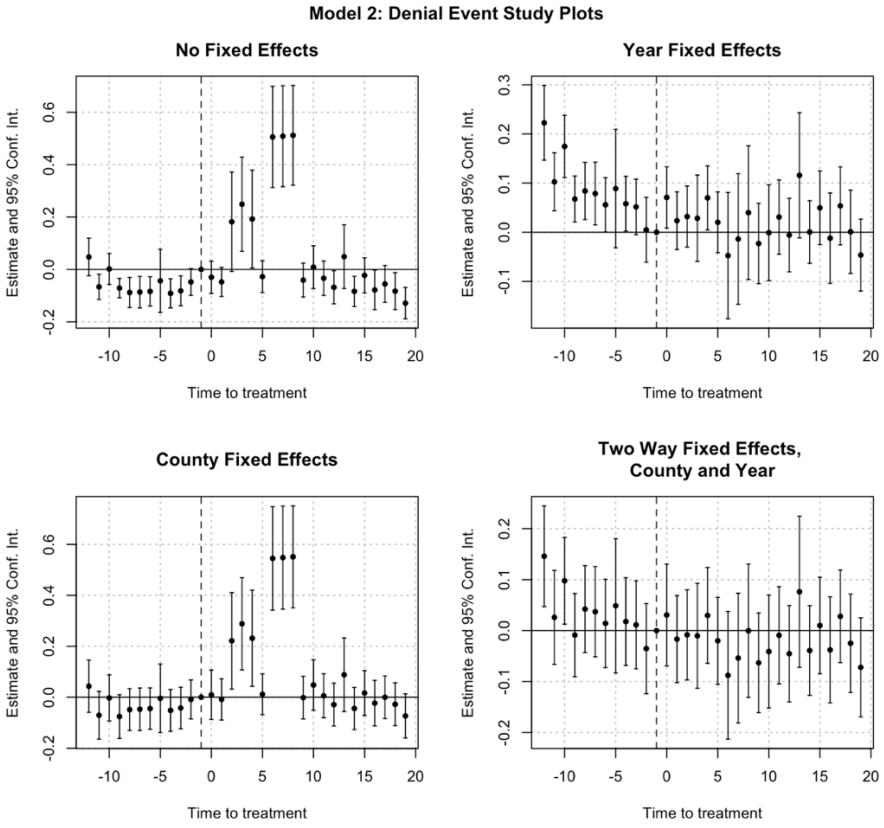

Figure 12

Table 11: Model 3 Regression Results for Method 4

	Dependent variable:
	Proportion of Denied Black Applicants
Time × Treatment Dummy	-0.026***
	(0.004)
Time × (1 - Treatment Dummy)	0.005***
	(0.001)
Treatment Dummy	0.674***
	(0.083)
Constant	0.154***
	(0.008)
Observations	2,324
R^2	0.048
Note:	+p<0.1 *p<0.05 **p<0.01 ***p<0.001

In this regression, treatment dummy is dummy that turns on when the renaissance zone receives the treatment.

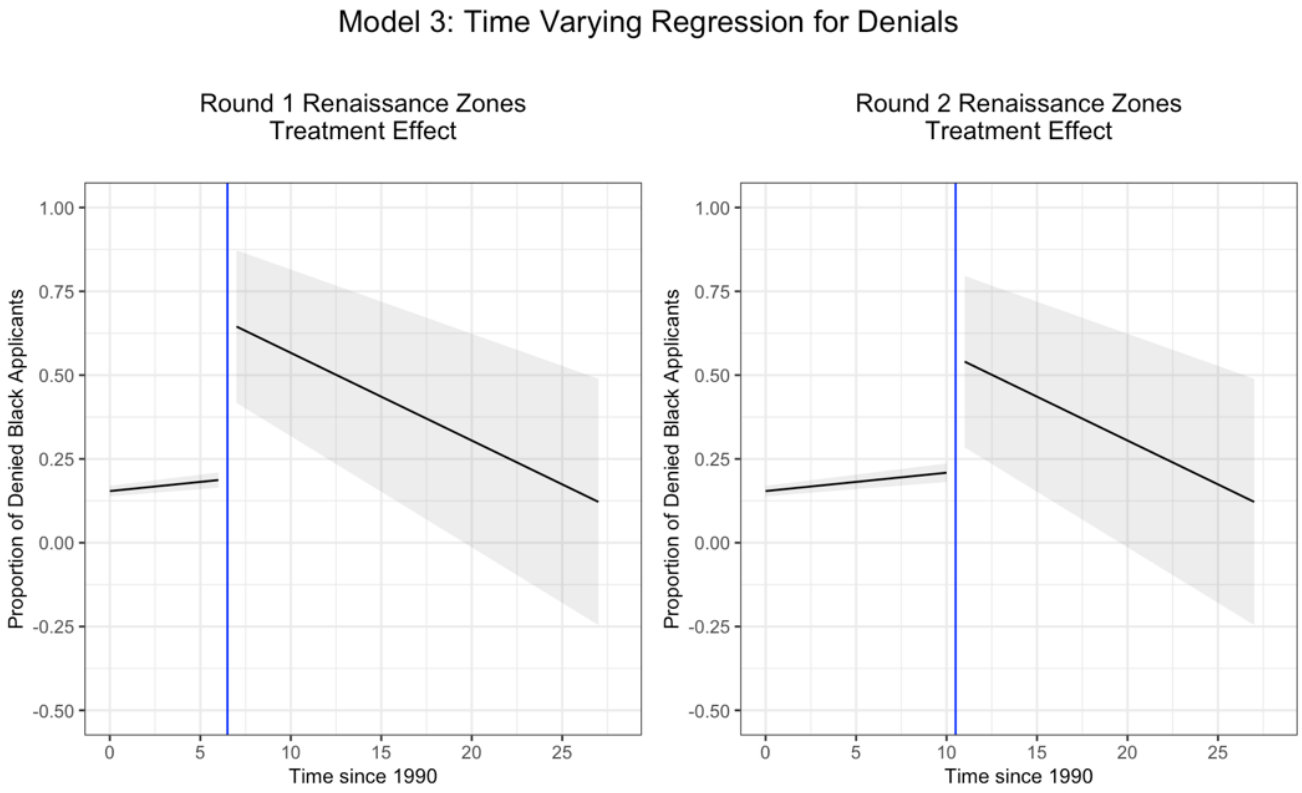

Figure 13

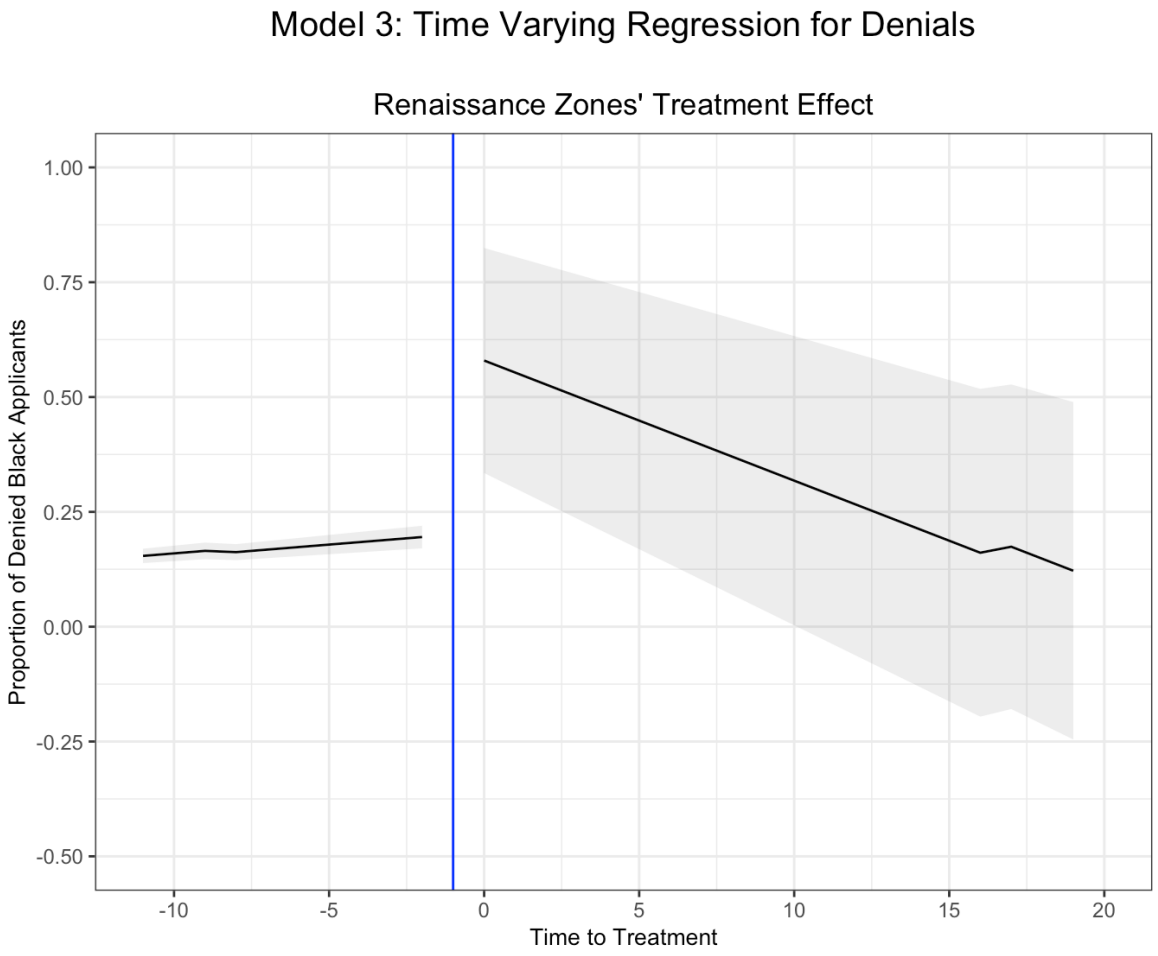
Model 3: Time Varying Regression for Denials
Renaissance Zones' Treatment Effect
Proportion of Denied Black Applicants
1.00
0.75
0.50
0.25
0.00
-0.25
-0.50
-10
-5
0
5
10
15
20
Time to Treatment

Figure 14

Table 12: Model 1 Regression Results for Method 5

	Dependent variable:			
	Proportion of Successful Black Applicants			
	OLS		*panel linear*	
	(1)	(2)	(3)	(4)
Treatment	-0.035	-0.137***	-0.010	-0.102***
	(0.026)	(0.029)	(0.021)	(0.029)
Constant	0.571***			
	(0.009)			
Year Fixed effects	No	No	Yes	Yes
County Fixed effects	No	Yes	No	Yes
Observations	2,324	2,324	2,324	2,324
RMSE	0.402	0.3635	0.3373	0.2879
R^2	0.001	0.006	0.0001	0.005
Note:				+p<0.1 *p<0.05 **p<0.01 ***p<0.001

This table describes the model 1 regression results for Method 5. The treatment turns on and becomes 1 when the county receives the benefits of being a renaissance zone, and 0 otherwise.

Table 13: Model 1 Regression Results for Method 5

	Dependent variable:			
	Number of Successful Black Applicants			
	OLS		*panel linear*	
	(1)	(2)	(3)	(4)
Treatment	1,869.833***	1,016.714***	1,908.401***	961.990***
	(518.851)	(825.512)	(416.978)	(811.762)
Constant	178.024**			
	(22.476)			
Year Fixed effects	No	No	Yes	Yes
County Fixed effects	No	Yes	No	Yes
Observations	2,324	2,324	2,324	2,324
R^2	0.044	0.014	0.043	0.011
Note:				+p<0.1 *p<0.05 **p<0.01 ***p<0.001

This table describes the model 1 regression results for Method 5. The treatment turns on and becomes 1 when the county receives the benefits of being a renaissance zone, and 0 otherwise.

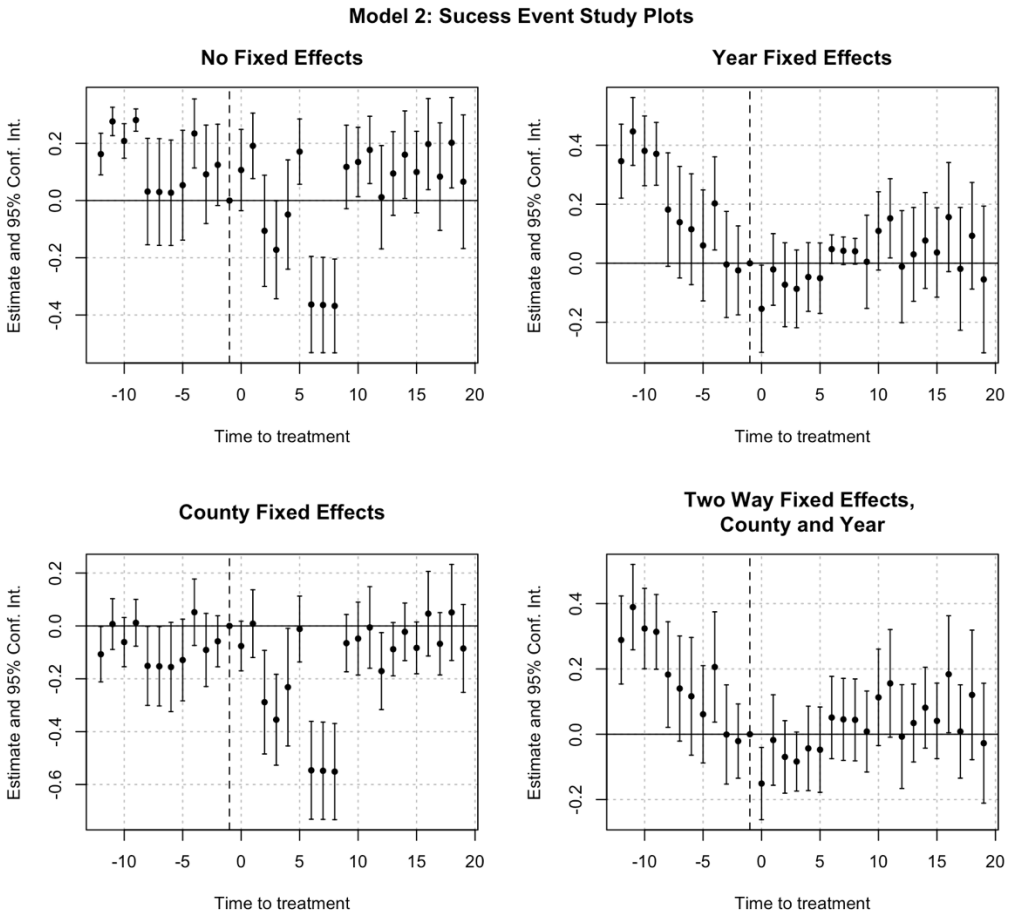

Figure 15

Table 14: Model 3 Regression Results for Method 5

	Dependent variable:
	Proportion of Black Applicants
Time × Treatment Dummy	0.023***
	(0.004)
Time × (1 - Treatment Dummy)	0.002
	(0.001)
Treatment Dummy	-0.412***
	(0.092)
Constant	0.546***
	(0.017)
Observations	2,324
R^2	0.009
Note:	+p<0.1 *p<0.05 **p<0.01 ***p<0.001

In this regression, treatment dummy is dummy that turns on when the renaissance zone receives the treatment.

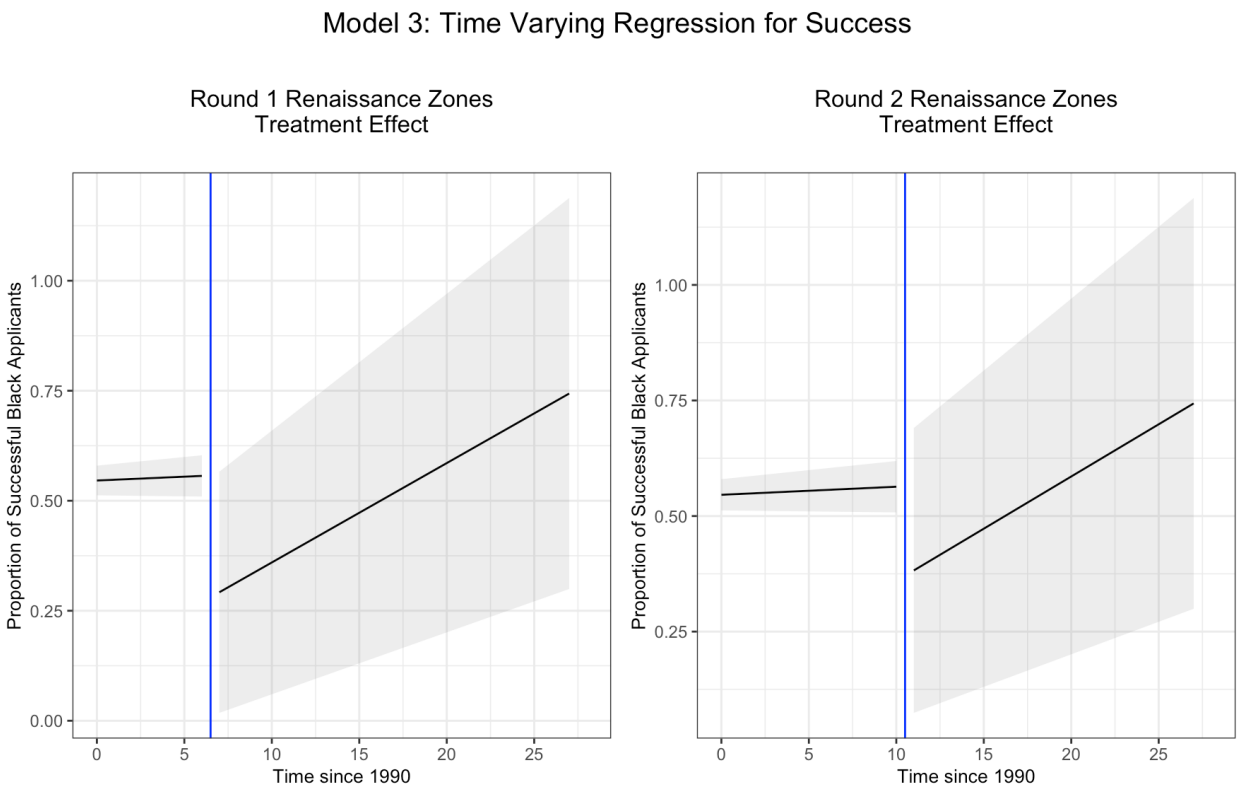

Figure 16

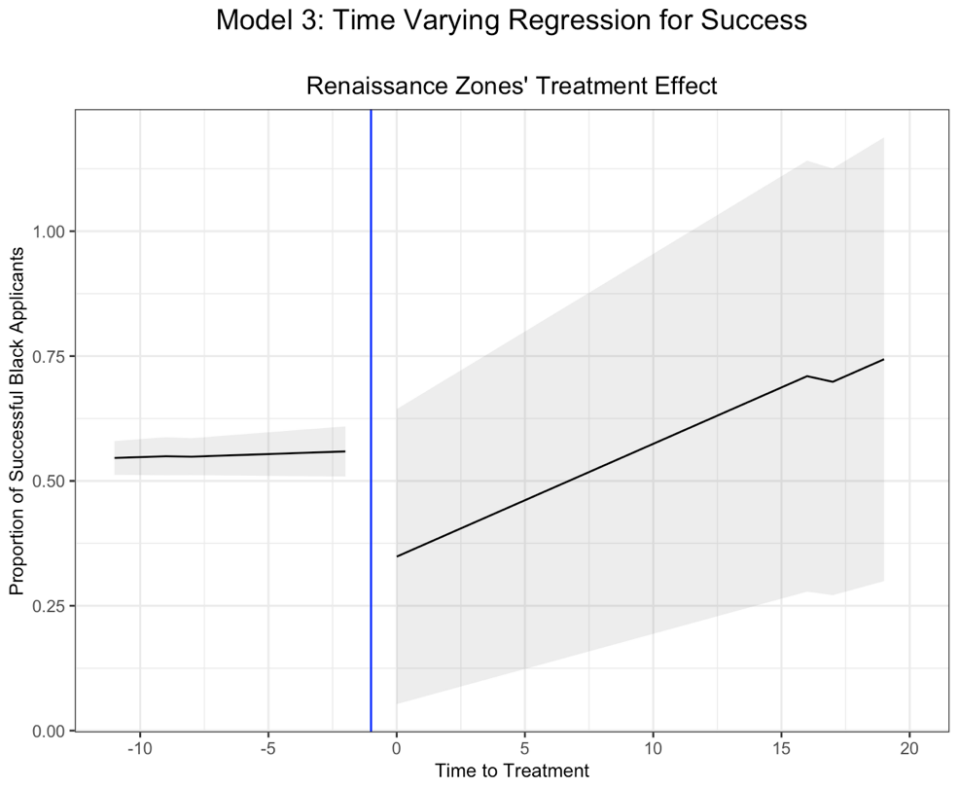

Figure 17

Table 15: Regression Results with Controls for Method 1

	Dependent variable:			
	Proportion of Black Applicants			
	OLS		*panel linear*	
	(1)	(2)	(3)	(4)
Treatment	0.006***	0.012***	0.004**	0.009***
	(0.002)	(0.002)	(0.002)	(0.002)
Mortgage Applications *(in Millions)*	0.952***	0.773***	0.935***	0.795***
	(0.056)	(0.058)	(0.056)	(0.058)
Black Population Proportion	0.489***	0.313***	0.498***	0.327***
	(0.011)	(0.055)	(0.011)	(0.054)
Unemployment Rate	-0.0004**	-0.001***	0.001**	0.001
	(0.0001)	(0.0002)	(0.0002)	(0.0004)
Total Population *(in Millions)*	-0.024***	0.163***	-0.023***	0.160***
	(0.004)	(0.024)	(0.004)	(0.024)
Male Population Proportion	-0.518***	-0.546***	-0.520***	-0.571***
	(0.028)	(0.079)	(0.028)	(0.082)
Mean Loan Amount *(in Millions)*	-0.063**	-0.002	-0.047	-0.091*
	(0.022)	(0.024)	(0.030)	(0.042)
Mean Income of Applicants *(in Millions)*	-0.031	-0.126**	0.016	-0.017
	(0.038)	(0.044)	(0.040)	(0.047)
Single Family Permits *(in Thousands)*	-0.005***	0.0004	-0.005**	0.001
	(0.001)	(0.002)	(0.001)	(0.002)
Multi-Family Permits 2 Units *(in Thousands)*	-0.066+	0.006	-0.044	0.009
	(0.040)	(0.042)	(0.039)	(0.041)
Multi-Family Permits 3 or 4 Units *(in Thousands)*	0.062*	0.054+	0.047	0.048
	(0.030)	(0.031)	(0.030)	(0.030)
Multi-Family Permits 5+ Units *(in Thousands)*	-0.0004	-0.003	-0.0004	-0.004
	(0.004)	(0.004)	(0.004)	(0.004)
Constant	0.269***			
	(0.014)			
Year Fixed effects	No	No	Yes	Yes
County Fixed effects	No	Yes	No	Yes
RMSE	0.02	0.0185	0.0193	0.0179
Observations	2,324	2,324	2,324	2,324
R^2	0.790	0.248	0.802	0.227
Adjusted R^2	0.789	0.216	0.799	0.184
Note:	+p<0.1 *p<0.05 **p<0.01 ***p<0.001			

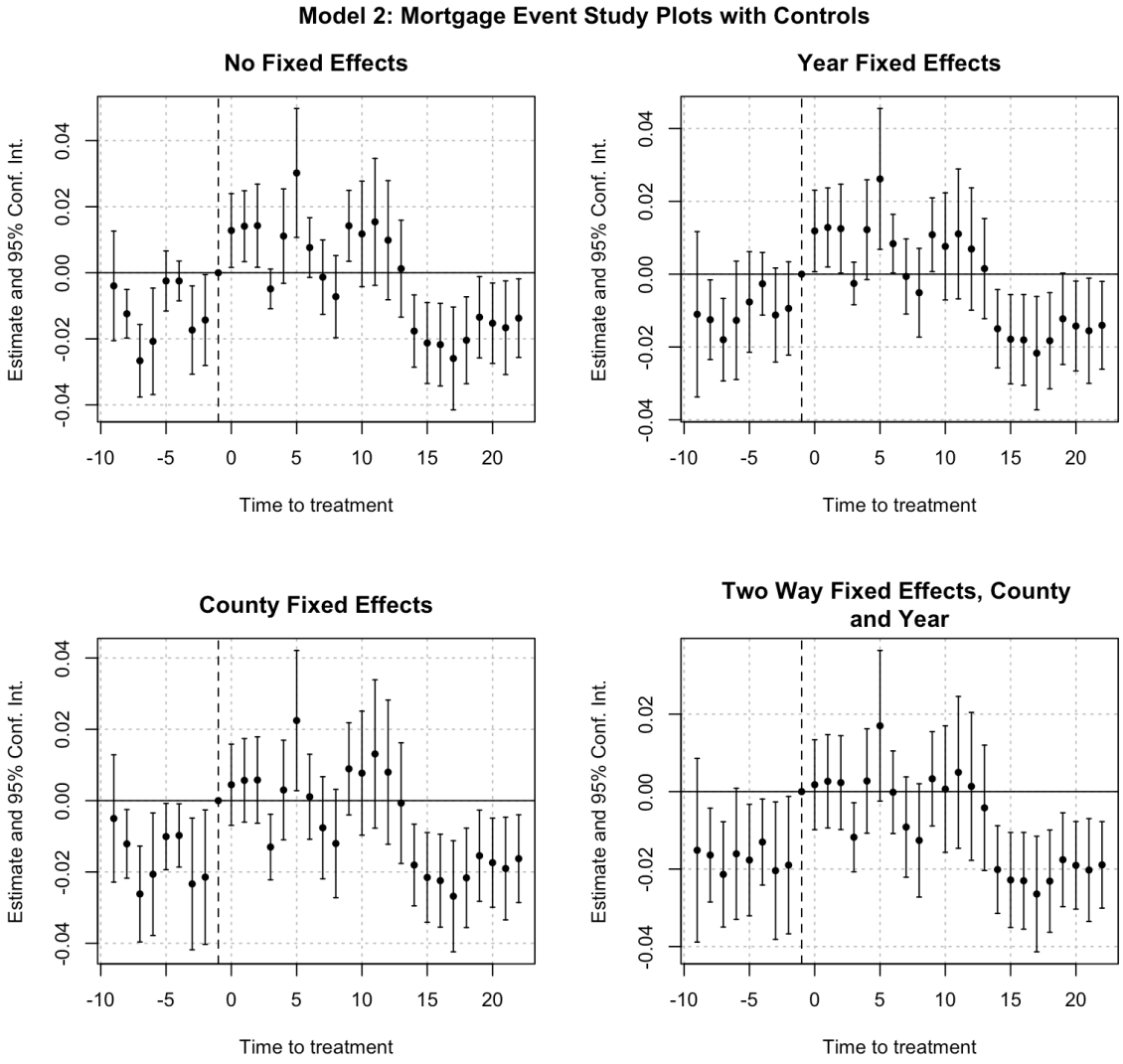
Model 2: Mortgage Event Study Plots with Controls
No Fixed Effects
Year Fixed Effects
County Fixed Effects
Two Way Fixed Effects, County and Year
Estimate and 95% Conf. Int.
Time to treatment
-10
-5
0
5
10
15
20
-0.04
-0.02
0.00
0.02
0.04

Figure 18

Table 16: Regression Results with Controls for Method 2

	Dependent variable:			
	Proportion of Black Applicants			
	OLS		*panel linear*	
	(1)	(2)	(3)	(4)
Treatment	0.005**	0.011***	0.003+	0.009***
	(0.002)	(0.002)	(0.002)	(0.002)
Mortgage Applications *(in Millions)*	0.928***	0.773***	0.904***	0.797***
	(0.058)	(0.061)	(0.058)	(0.060)
Black Population Proportion	0.502***	0.299***	0.512***	0.314***
	(0.012)	(0.060)	(0.012)	(0.059)
Unemployment Rate	-0.0004**	-0.001***	0.001**	0.001
	(0.0002)	(0.0002)	(0.0002)	(0.0004)
Total Population *(in Millions)*	-0.024***	0.152***	-0.023***	0.149***
	(0.004)	(0.027)	(0.004)	(0.026)
Male Population Proportion	-0.521***	-0.545***	-0.525***	-0.569***
	(0.030)	(0.086)	(0.030)	(0.088)
Mean Loan Amount *(in Millions)*	-0.057*	0.004	-0.048	-0.096*
	(0.023)	(0.026)	(0.033)	(0.047)
Mean Income of Applicants *(in Millions)*	-0.040	-0.128**	0.015	-0.013
	(0.040)	(0.047)	(0.043)	(0.049)
Single Family Permits *(in Thousands)*	-0.005***	-0.0003	-0.005**	0.001
	(0.002)	(0.002)	(0.002)	(0.002)
Multi-Family Permits 2 Units *(in Thousands)*	-0.065	0.006	-0.042	0.010
	(0.044)	(0.046)	(0.042)	(0.045)
Multi-Family Permits 3 or 4 Units *(in Thousands)*	0.064*	0.056+	0.048	0.050
	(0.032)	(0.033)	(0.031)	(0.033)
Multi-Family Permits 5 or more Units *(in Thousands)*	0.002	-0.003	0.002	-0.004
	(0.005)	(0.005)	(0.005)	(0.005)
Constant	0.270***			
	(0.015)			
Year Fixed effects	No	No	Yes	Yes
County Fixed effects	No	Yes	No	Yes
RMSE	0.0206	0.0191	0.0198	0.0185
Observations	2,158	2,158	2,158	2,158
R^2	0.789	0.226	0.801	0.205
Adjusted R^2	0.788	0.191	0.798	0.158
Note:	+p<0.1 *p<0.05 **p<0.01 ***p<0.001			

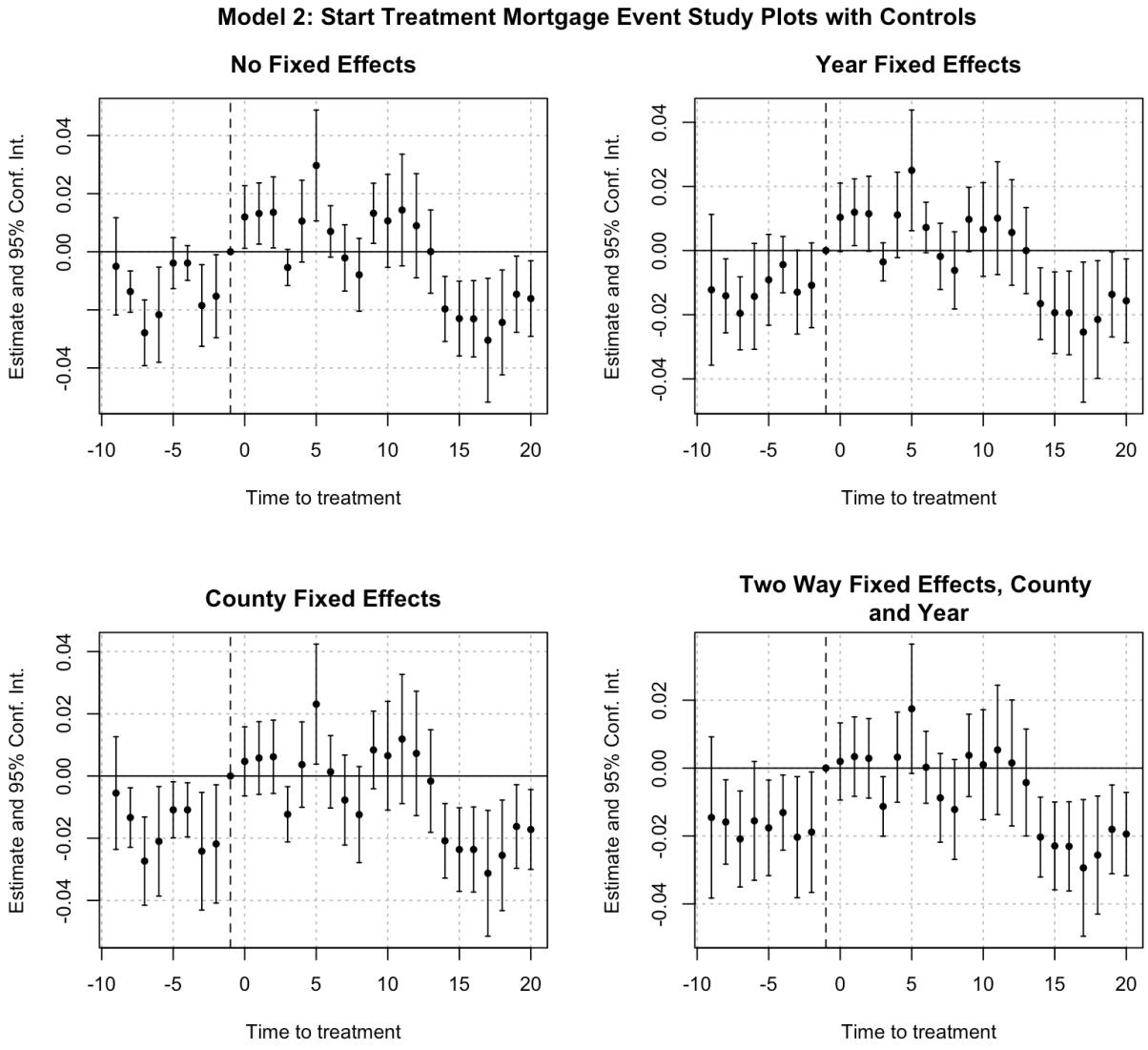
Model 2: Start Treatment Mortgage Event Study Plots with Controls
No Fixed Effects
Year Fixed Effects
County Fixed Effects
Two Way Fixed Effects, County and Year
Estimate and 95% Conf. Int.
Time to treatment
-10
-5
0
5
10
15
20
-0.04
-0.02
0.00
0.02
0.04

Figure 19

Table 17: Regression Results with Controls for Method 3

	Dependent variable:			
	Proportion of Black Applicants			
	OLS		*panel linear*	
	(1)	(2)	(3)	(4)
End Treatment	0.036***	-0.030***	0.030***	-0.025***
	(0.004)	(0.004)	(0.004)	(0.004)
Mortgage Applications *(in Millions)*	-2.306***	-1.568***	-2.289***	-1.568***
	(0.128)	(0.135)	(0.124)	(0.134)
Black Population Proportion	-1.032***	-0.707***	-1.032***	-0.828***
	(0.022)	(0.200)	(0.021)	(0.198)
Unemployment Rate	0.002***	0.002***	-0.0005	-0.002**
	(0.0003)	(0.0003)	(0.001)	(0.001)
Total Population *(in Millions)*	0.049***	-0.777***	0.039***	-0.762***
	(0.008)	(0.096)	(0.008)	(0.093)
Male Population Proportion	0.594***	0.181	0.597***	0.296
	(0.057)	(0.279)	(0.055)	(0.270)
Mean Loan Amount *(in Millions)*	0.052	0.122	0.045	0.424***
	(0.064)	(0.088)	(0.071)	(0.110)
Mean Income of Applicants *(in Millions)*	-0.013	0.426***	-0.208+	-0.390**
	(0.100)	(0.116)	(0.108)	(0.139)
Single Family Permits *(in Thousands)*	0.020***	0.002	0.026***	0.004
	(0.004)	(0.004)	(0.004)	(0.004)
Multi-Family Permits 2 Units *(in Thousands)*	-0.035	0.007	-0.090	-0.0005
	(0.092)	(0.081)	(0.088)	(0.078)
Multi-Family Permits 3 or 4 Units *(in Thousands)*	0.146+	0.267***	0.215**	0.259***
	(0.075)	(0.066)	(0.072)	(0.064)
Multi-Family Permits 5 or more Units *(in Thousands)*	-0.020*	0.007	-0.026**	0.004
	(0.009)	(0.008)	(0.009)	(0.008)
Constant	0.669***			
	(0.029)			
Year Fixed effects	No	No	Yes	Yes
County Fixed effects	No	Yes	No	Yes
RMSE	0.0318	0.0248	0.03	0.0235
Observations	1,411	1,411	1,411	1,411
R^2	0.870	0.499	0.881	0.465
Adjusted R^2	0.869	0.463	0.879	0.420
Note:	+p<0.1 *p<0.05 **p<0.01 ***p<0.001			

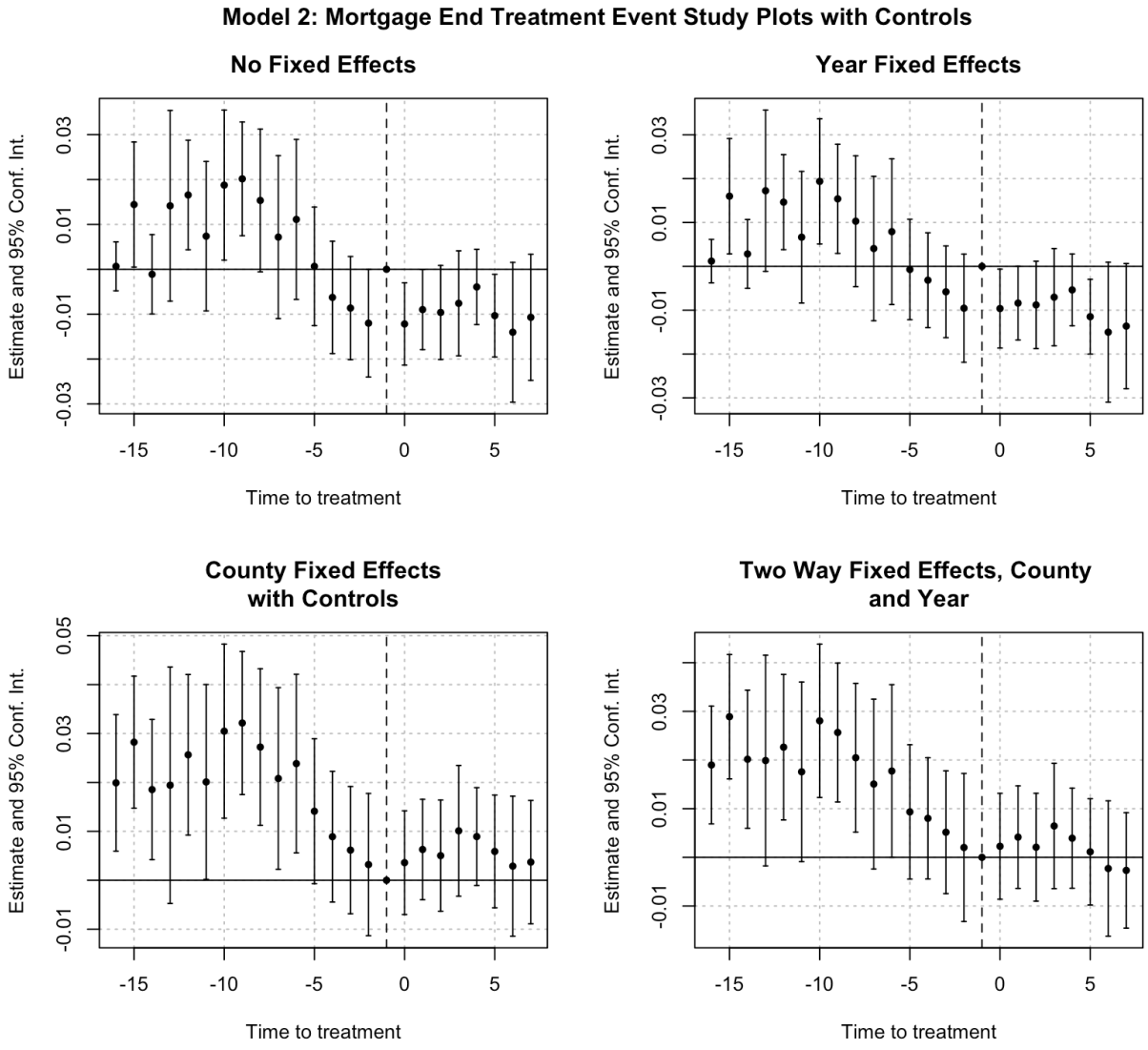
Model 2: Mortgage End Treatment Event Study Plots with Controls
No Fixed Effects
Year Fixed Effects
County Fixed Effects with Controls
Two Way Fixed Effects, County and Year
Estimate and 95% Conf. Int.
Time to treatment
-15
-10
-5
0
5
-0.03
-0.01
0.01
0.03
0.05

Figure 20

Table 18: Regression Results with Controls for Method 4

	Dependent variable:			
	Proportion of Black Applicants			
	OLS		*panel linear*	
	(1)	(2)	(3)	(4)
Treatment	0.086***	0.127***	-0.021	-0.018
	(0.024)	(0.030)	(0.015)	(0.019)
Mortgage Applications *(in Millions)*	2.631**	1.731+	-1.051*	-0.611
	(0.817)	(0.885)	(0.531)	(0.555)
Black Population Proportion	0.509**	-1.660*	0.540***	-0.478
	(0.167)	(0.840)	(0.105)	(0.524)
Unemployment Rate	-0.003	-0.006*	-0.006**	-0.001
	(0.002)	(0.003)	(0.002)	(0.004)
Total Population *(in Millions)*	-0.263***	-0.285	-0.021	-0.159
	(0.060)	(0.368)	(0.038)	(0.227)
Male Population Proportion	-1.417***	2.051+	-1.966***	-0.948
	(0.407)	(1.210)	(0.264)	(0.786)
Mean Loan Amount *(in Millions)*	4.271***	5.404***	0.284	-0.047
	(0.322)	(0.371)	(0.288)	(0.407)
Mean Income of Applicants *(in Millions)*	-5.427***	-6.922***	-0.475	-0.560
	(0.557)	(0.676)	(0.381)	(0.452)
Single Family Permits *(in Thousands)*	0.035	0.103***	0.029*	0.002
	(0.021)	(0.029)	(0.014)	(0.018)
Multi-Family Permits 2 Units *(in Thousands)*	-0.713	-0.954	0.082	-0.031
	(0.589)	(0.639)	(0.371)	(0.395)
Multi-Family Permits 3 or 4 Units *(in Thousands)*	-0.083	-0.785+	-0.091	-0.070
	(0.447)	(0.475)	(0.281)	(0.293)
Multi-Family Permits 5+ Units *(in Thousands)*	-0.091	-0.100	-0.040	-0.003
	(0.062)	(0.064)	(0.039)	(0.040)
Constant	0.933***			
	(0.204)			
Year Fixed effects	No	No	Yes	Yes
County Fixed effects	No	Yes	No	Yes
RMSE	0.2948	0.2833	0.1832	0.1727
Observations	2,324	2,324	2,324	2,324
R^2	0.116	0.133	0.061	0.006
Note:	+p<0.1 *p<0.05 **p<0.01 ***p<0.001			

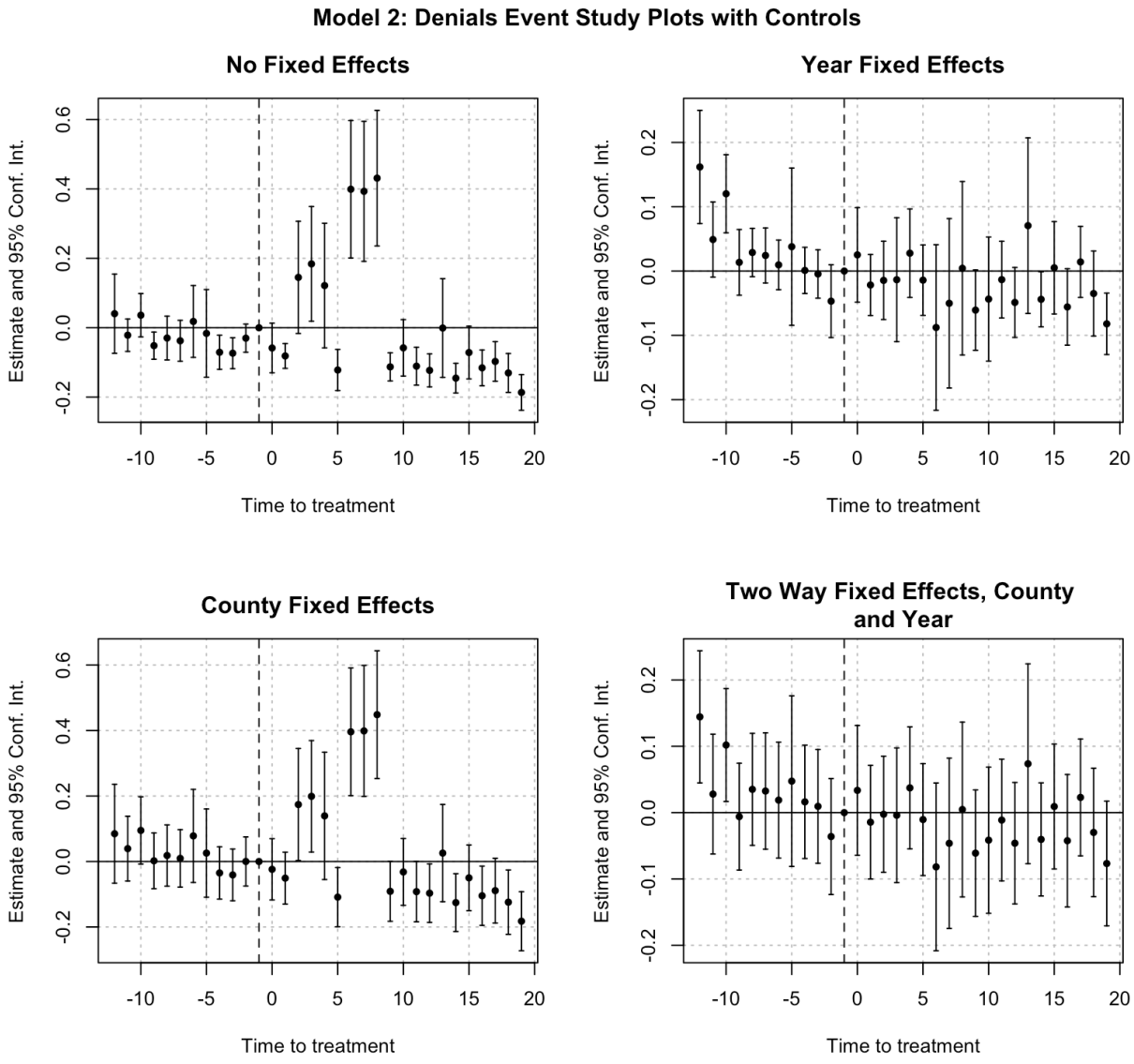
Model 2: Denials Event Study Plots with Controls
No Fixed Effects
Year Fixed Effects
County Fixed Effects
Two Way Fixed Effects, County and Year
Estimate and 95% Conf. Int.
Time to treatment
-10
-5
0
5
10
15
20
-0.2
0.0
0.2
0.4
0.6
-0.1
0.1

Figure 21

Table 19: Regression Results with Controls for Method 5

	Dependent variable:			
	Proportion of Successful Black Applicants			
	OLS		*panel linear*	
	(1)	(2)	(3)	(4)
Treatment	-0.075**	-0.090***	-0.056**	-0.069**
	(0.030)	(0.027)	(0.026)	(0.027)
Mortgage Applications *(in Millions)*	-4.141***	-2.635***	-2.631***	-1.828**
	(1.031)	(0.570)	(0.673)	(0.813)
Black Population Proportion	0.343**	-0.383	0.333*	-0.914
	(0.165)	(1.015)	(0.198)	(0.861)
Unemployment Rate	-0.036***	-0.029***	-0.044***	-0.031***
	(0.003)	(0.003)	(0.004)	(0.007)
Total Population *(in Millions)*	0.230***	0.293	0.107***	0.107
	(0.059)	(0.522)	(0.031)	(0.401)
Male Population Proportion	-3.044***	-1.106	-3.035***	-0.342
	(0.561)	(1.555)	(0.489)	(1.455)
Mean Loan Amount *(in Millions)*	0.428	-1.211*	1.421**	0.612
	(0.440)	(0.628)	(0.693)	(1.046)
Mean Income of Applicants *(in Millions)*	0.659	3.354***	-1.711	-0.382
	(0.765)	(0.959)	(1.106)	(1.276)
Single Family Permits *(in Thousands)*	-0.001	-0.104***	0.022	-0.046*
	(0.021)	(0.037)	(0.021)	(0.024)
Multi-Family Permits 2 Units *(in Thousands)*	1.007**	0.880*	0.185	0.087
	(0.490)	(0.504)	(0.329)	(0.300)
Multi-Family Permits 3 or 4 Units *(in Thousands)*	0.013	0.806	-0.110	0.267
	(0.428)	(0.549)	(0.158)	(0.231)
Multi-Family Permits 5 or more Units *(in Thousands)*	-0.052	0.038	-0.052*	0.021
	(0.046)	(0.053)	(0.028)	(0.029)
Constant	2.286***			
	(0.279)			
Year Fixed effects	No	No	Yes	Yes
County Fixed effects	No	Yes	No	Yes
Observations	2,324	2,324	2,324	2,324
RMSE	0.3791	0.3549	0.3106	0.2852
R^2	0.121	0.053	0.152	0.023
Note:				+p<0.1 *p<0.05 **p<0.01 ***p<0.001

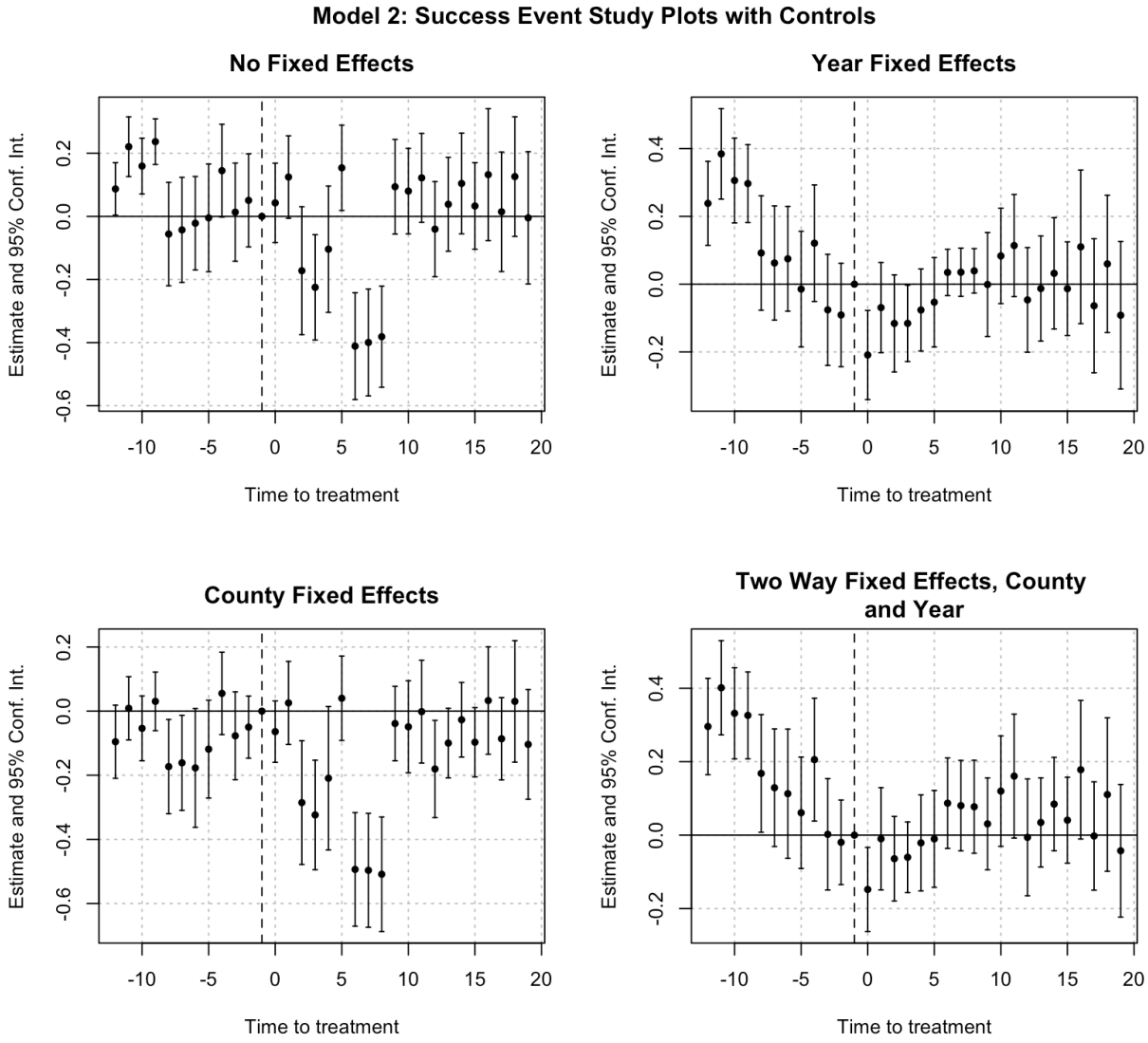
Model 2: Success Event Study Plots with Controls
No Fixed Effects
Year Fixed Effects
County Fixed Effects
Two Way Fixed Effects, County and Year
Estimate and 95% Conf. Int.
Time to treatment
-10
-5
0
5
10
15
20
-0.6
-0.4
-0.2
0.0
0.2
0.4

Figure 22