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The effect of ACA Marketplace subsidies on residential mortgage applications and originations

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Abstract

This paper examines the impact of health insurance subsidies on the financial investments of low-income households. Specifically, we estimate the impact of Affordable Care Act (ACA) health insurance exchange (Marketplace) subsidies on mortgage applications and originations using comprehensive mortgage application record data. We use a difference-in-differences approach that exploits variation in county health insurance coverage rates at the time of reform. We find that the subsidies increased the amount of residential mortgages applied for by low-income households and the amount actually originated by financial institutions. To explore potential mechanisms, we use survey data and find that these subsidies increased low-income households' health insurance coverage rates, reduced large-scale household medical expenditures and mortgage delinquency rates. These findings highlight an aspect of the broader economic impact of the ACA health insurance subsidies beyond increasing coverage rates among the targeted group.

Keywords: Residential Mortgage, ACA Marketplace, Health Insurance
JEL codes: I130, R310, G21, H15, I180

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1. Introduction

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The Affordable Care Act (ACA) was designed to expand health insurance coverage and reduce financial barriers to healthcare access for individuals with low to moderate incomes. As one of the major components of ACA, the ACA Health Insurance Exchange (Marketplace) increases health insurance coverage and reduces health care costs for low-income people by subsidizing premiums and providing out-of-pocket cost reductions. Through providing families with a means to cope with excessive healthcare expenses and mitigate the uncertainty associated with future medical expenditures, access to health insurance not only improves health (Barbaresco, Courtemanche, & Qi, 2015; Courtemanche et al., 2018; Miller, Johnson, & Wherry, 2021), but also enhances the financial well-being of low-income uninsured households³ (Barcellos & Jacobson, 2015; Mazumder & Miller, 2016; Gallagher, Gopalan, & Grinstein-Weiss, 2019; Carey, Miller, & Wherry, 2020). Even though survey data indicates that improvements in financial well-being exhibit a strong positive correlation with housing demand, particularly among disadvantaged households (Fuster & Zafar, 2021), we do not yet know whether the enhanced financial well-being associated with access to health insurance translate into more housing investments.

This paper seeks to bridge this research gap by examining the influence of the establishment of the ACA Marketplace on mortgage applications at both extensive and intensive margins. Specially, we explore how the ACA Marketplace affects the number

³ Data shows that millions of uninsured individuals in the U.S. use health care services every year. <https://www.kff.org/wp-content/uploads/2014/05/8596-uncompensated-care-for-the-uninsured-in-2013.pdf> While uninsured patients are charged much higher rates by hospitals than insured patients (Xu et al., 2017) and medical expenses are one of the leading causes of low-income household bankruptcy. <https://www.cnn.com/id/100840148>

of mortgage applications and originations as a percentage of the population, as well as the dollar amount of applications and originations using mortgage application record data. Homeownership serves as a significant means of saving, offering families protection from economic uncertainties (Zhang & Lerman, 2019). In addition, it also functions as a vital investment asset, facilitating wealth accumulation (Wainer & Zabel, 2020). Given that more than two-thirds of U.S. households utilize mortgages to purchase owner-occupied properties⁴, this study addresses a particularly salient aspect of household finance by providing evidence on the relationship between public-sector health spending in the form of subsidized health insurance and mortgage applications.

This paper exploits the enactment of the ACA Marketplace and the provision of Marketplace subsidies as a quasi-random shock in health insurance coverage rates and analyzes the effect of these coverage changes on mortgage applications and originations. Specially, we employ a difference-in-differences (DiD) strategy that leverages the variation in uninsurance rates across counties at the time of the reform. The intuition is that ACA Marketplace subsidies motivate the eligible uninsured to obtain health insurance. According to the Kaiser Family Foundation, a single 40-year-old adult who earned slightly more than 150% of the federal poverty line (FPL) would receive Marketplace subsidies equal to \$3,773, or 26% of this person's annual income⁵. In addition, in 2014, the Congress enacted the health insurance mandate that individuals must have health insurance or face a penalty. Therefore, counties with higher

⁴www.urban.org/urban-wire/mortgage-debt-has-peaked-why-has-share-homeowners-mortgage-fallen-13-year-low

⁵ The budget data is obtained from <https://www.cbo.gov/topics/health-care/affordable-care-act> and the subsidy value is calculated using the following website: <https://www.kff.org/interactive/subsidy-calculator>.

uninsurance rates among target groups prior to the establishment of the ACA Marketplace are expected to experience larger increase in health insurance coverage⁶, thereby further impacting mortgage applications (Mazumder & Miller, 2016; Duggan, Goda, & Jackson, 2019). It is this variation in the potential effect of the ACA marketplace that we use to measure the impact of the reform on mortgage applications.

We use loan-level mortgage application record data obtained from the Consumer Financial Protection Bureau (CFPB). These data are derived from comprehensive reports provided by over 4,000 financial institutions as required by the Home Mortgage Disclosure Act (HMDA). This dataset is estimated to cover approximately 88 percent of all closed-end mortgage originations in the United States, providing a representation of the U.S. mortgage market⁷. The HMDA data include information on family incomes at the time of the application, allowing us to focus our analysis specifically on the targeted groups eligible for Marketplace subsidies. Considering that those with family income above 200% of the FPL receive relatively few subsidies, to get more precise estimates, we only focus on individuals with family incomes between 138% and 200% of the FPL in this study.

Our analysis begins by utilizing county-level data to investigate the influence of ACA Marketplace subsidies on the proportion of individuals applying for mortgages, and the proportion of originated mortgages. We use the ratio of county mortgage originations

⁶ The mandate and new Marketplace have led to a 5.4 percentage point increase in private health insurance coverage, accounting for approximately 40% of the ACA coverage increase (Freaan, Gruber, & Sommers, 2017; Hinde, 2017).

⁷ https://files.consumerfinance.gov/f/documents/cfpb_2019-mortgage-market-activity-trends_report.pdf

or applications to the county population to capture loan volume, which serves as our extensive margin measure. Then, we use loan-level data to explore the influence of ACA Marketplace subsidies on the dollar amount of mortgage applications and originations, capturing changes at the intensive margin.

While we did not observe statistically significant changes in mortgage applications or originations associated with ACA Marketplace subsidies, we find that the ACA Marketplace subsidies led to an increase in mortgage application and origination amounts. These estimates suggest that ACA Marketplace subsidies primarily enhance mortgage demand at the intensive margin, influencing the mortgage amount, rather than expanding the pool of individuals applying for mortgages or increasing the overall number of mortgage originations. In addition, we observe more pronounced effects among Black people, indicating that ACA Marketplace subsidies not only increase the mortgage amount across all racial groups but also contributed to a reduction in inequality within the real estate market. This suggests a potential role for ACA Marketplace subsidies in mitigating disparities and promoting equitable access to mortgage financing.

Next, we test the robustness of our estimates by implementing three additional approaches. First, to provide a broader assessment of the ACA Marketplace, we replicate our primary regression analysis encompassing all income eligible groups within the ACA Marketplace. In other words, we expanded the sample to people whose household incomes fall between 138% and 400% of the FPL. Second, we explore an

alternative source of variation in ACA Marketplace subsidies exposure by narrowing our focus to individuals residing in states that did not expand Medicaid. Those earning between 50% and 100% of the FPL in non-expansion states are ineligible for Marketplace subsidies and typically ineligible for Medicaid coverage (Gallagher, Gopalan, & Grinstein-Weiss, 2019). Accordingly, we use these households as a control group and those earning between 101% and 150% of the FPL, who are eligible for Marketplace subsidies, as a treatment group. This selection allows us to compare the outcomes of individuals who are eligible for ACA Marketplace subsidies with those who do not receive subsidized Marketplace coverage. Third, we use the American Community Survey (ACS) data to explore the impact of ACA Marketplace subsidies on house values corresponding to mortgages. We find that ACA Marketplace subsidies significantly increased the house values, which may imply that the increase in the mortgage amount is not due to a deterioration in the applicant's financial situation forcing them to apply for a higher mortgage amount, but rather due to the applicant's purchase of a higher-value house. Our analyses using the above alternative approaches yield results that align with our primary findings, bolstering the robustness and validity of our conclusions.

What are the potential mechanisms that cause ACA Marketplace subsidies to increase the mortgage application and origination amounts? The health insurance subsidies provided by the ACA Marketplace have the effect of reducing the premiums payment associated with obtaining health insurance (by APTC) and out-of-pocket payments

when use healthcare services (by CSRs). The income effect of these subsidies may stimulate demand for housing and, in turn, demand for mortgages. Furthermore, by expanding insurance coverage, the reform has likely bolstered household financial stability by mitigating the risk associated with unforeseen out-of-pocket medical expenses. The reduced uncertainty associated with future expenditures might induce people to allocate more of their disposable income to risky assets, such as leveraging mortgage to purchase a house (Leland, 1968; Caballero, 1990). The reform may also have indirectly improved the demand for mortgages. The ACA Marketplace has enhanced the health of its enrollees, leading to increased productivity and higher wages. These employment improvements may further impact income levels and ultimately mortgage applications. Finally, from the perspective of financial institutions, the ACA subsidies improved households' financial condition (Mazumder & Miller, 2016; Gallagher et al., 2019), which is the impetus for financial institutions to be willing to approve higher mortgage amounts.

To explore the potential mechanisms, first, we use ACS data to explore insurance coverage. We identify a significant increase in the number of insured individuals, particularly under privately purchased health insurance, subsequent to the establishment of the ACA Marketplace. Second, we use the large-scale, out-of-pocket medical expenses as a measure of family financial uncertainty. Our analysis reveals a noteworthy decrease in large-scale out-of-pocket medical expenditures after 2014. Furthermore, to explore the households' financial conditions, we use data from Survey

of Income and Program Participation (SIPP) and find that ACA Marketplace subsidies reduced delinquency rates for mortgage, rent, and utility payments, which is also the impetus for financial institutions to be willing to approve higher mortgage amounts.

This study contributes to the existing literature in two significant ways. To the best of our knowledge, this study is the first to estimate the impact of health insurance subsidies targeted at low to moderate income households on mortgage applications. While many studies demonstrate that health insurance subsidies could help prevent bankruptcy and default for low-income households, these studies using credit and tax records primarily discuss the existing financial situation of households (Mazumder & Miller, 2016; Gallagher et al., 2019). This paper makes a unique contribution by further estimating the impact of ACA Marketplace subsidies on households' investment behaviors.

Second, our paper contributes to the literature exploring the causal influence of health insurance on the housing market. A few studies have explored the influence of health insurance on homeownership. Kino, Sato, and Kawachi (2018) finds that the ACA Medicaid expansion alleviates housing affordability concerns among low-income individuals. Kuroki and Liu (2021) finds homeownership rates and housing prices for low-income families increased after the ACA Medicaid expansion. These studies primarily focus on equilibrium outcomes in the housing market, such as the number of originated mortgages. Such outcomes represent the combined effect of low-income individuals' willingness to apply for mortgages and the approval decisions by financial

institutions. However, an increase in originated mortgage amounts could indicate higher mortgage demand, while the approval rate remains constant, or vice versa. Our study stands out by employing the most comprehensive nationwide mortgage application data, enabling us to examine the impact of health insurance subsidies on the full mortgage application process. This comprehensive analysis allows us to disentangle the specific dynamics at play and sheds light on the nuanced effects of health insurance on the mortgage market.

The influence of the ACA extends beyond its immediate impact on the health of enrollees and the medical sector. It has also permeated various other dimensions, encompassing financial well-being, child support, and housing stability (Barcellos & Jacobson, 2015; Kucko, Rinz, & Solow, 2018; Hu et al., 2018; Duggan et al., 2019; Brevoort, Grodzicki, & Hackmann, 2020; Bullinger, 2021). Our research complements this literature by examining the spillover effects on a critical aspect of household investment, family mortgage credit within the housing market. Our findings suggest that government policies to subsidize the health sector can spread further to have an impact on the real economy and investment of households.

2. Background on the ACA Marketplace and Mortgage Application

2.1. ACA Marketplace Subsidies and Enrollment

The ACA was implemented with the primary aim of making health insurance coverage more affordable for economic disadvantaged households. The two main parts

of ACA covers people with family incomes below 400% of the FPL. The first component involves Medicaid expansion, which broadened Medicaid eligibility to encompass individuals with incomes below 138% of the FPL. It is important to note that not all states participated in Medicaid expansion, and the list of expansion states can be found in Appendix A. The second component established the ACA Marketplace, initiated by the federal government in 2014.⁸ Within the ACA Marketplace, individuals with family incomes ranging from 100% to 400% of the FPL who are not ineligible for Medicaid or employer-sponsored health insurance have the opportunity to receive APTC. Additionally, individuals with family incomes between 100% and 250% of the FPL, enrolling in the silver plan, may also be eligible for CSRs.⁹ Figure 1 visualizes the eligibility criteria for accessing Medicaid, CSRs, or APTC based on family incomes relative to the FPL.

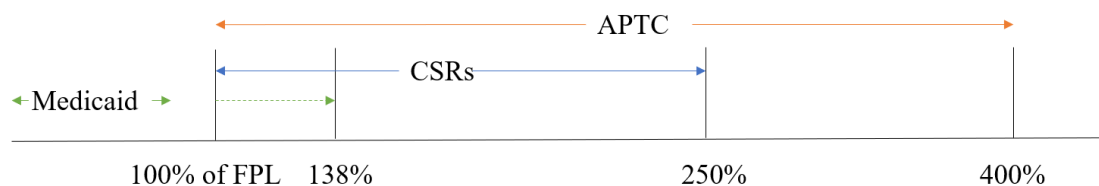


Figure. 1: The eligibility requirements for Medicaid, CSRs, and APTC.

Notes: The green dotted line represents the requirements for Medicaid in Medicaid expansion states. In order to qualify for the CSR, enrollees should also purchase the silver plan.

APTC, known as the premium support, limit the maximum cost when purchasing health insurance based on the individual's income. For example, for a single adult aged

⁸ The ACA Marketplace could be state-based, federally facilitated, or a Federal-State Partnership. All state-based Marketplace should demonstrate the ability to perform all required Exchange activities to the Department of Health and Human Services. (Terrizzi, Mathews-Schultz, & Deegan, 2022) show there is no significant difference in individual enrollment between the state-based and the federal-facilitated Marketplace.

⁹ The ACA marketplace offers four main types of insurance plans: platinum, gold, silver and bronze. In general, Platinum and Gold plans have higher premiums, more comprehensive coverage, and more generous cost sharing than silver and bronze plans.

40, the premium after APTC for the cheapest plan in 2013 ranged from \$0 to \$28 per month. Unlike APTCs, CSRs are only available to people with household incomes between 100% and 250% of the FPL and purchasing the silver plan¹⁰ in the ACA marketplace. CSRs reduce a person's or family's out-of-pocket costs when using health services, such as co-payment. The subsidy rates for different income groups are shown in Table 1. The actuarial value indicates the portion of expenditure covered by the insurer. Table 1 indicates that the actuarial value of the silver plan for those whose family incomes lower than 200% of the FPL is much higher than the actuarial value for enrollees who do not receive CSRs (the actuarial value is 70%) and enrollees whose family incomes is between 200% and 250% of the FPL (the actuarial value is 73%). Considering that teens and seniors are eligible for CHIPs and Medicare, respectively, to get more concrete estimates, we only focus on individuals aged between 19 and 64 with family incomes between 138% and 200% of the FPL in this study. We further examine the impact on people with family incomes between 138% and 400% of the FPL as a robustness analysis.

Table 1. CSRs subsidy rates in 2018.

Income (% of the FPL)	Actuarial Value of a silver plan
100%~150%	94%
150%~200%	87%
200%~250%	73%
Over 250%	70% (No CSR Subsidies)

Notes: Table 1 shows the actuarial value of a silver plan in 2018. For example, for a silver plan enrollee with family incomes between 100% and 150% of the FPL, the maximum copayments rate is 6%. Source: www.federalregister.gov/documents/2020/05/14/2020-10045/

¹⁰ The ACA marketplace offers four main types of insurance plans: platinum, gold, silver and bronze. In general, Platinum and Gold plans have higher premiums, more comprehensive coverage, and more generous cost sharing than silver and bronze plans.

The implementation of the ACA Medicaid expansion and Marketplace in 2014 had a profound effect on reducing the net cost associated with acquiring health insurance, thereby leading to substantial increases in the number of insured individuals. This trend is depicted in Figure 2, which illustrates the enrollment figures for Medicaid and the Marketplace over time. From 2009 to 2013, the number of Medicaid enrollees exhibited a consistent upward trajectory, with an average annual growth rate of 3.8%. After the introduction of the ACA reforms in 2014, the growth rate accelerated more significantly, with an increase of 13.0% in that year and 7.0% in 2015. The number of Marketplace enrollees also experienced steady growth in 2014 and keep stable thereafter. In summary, both the Medicaid expansion and the Marketplace played crucial roles in substantially expanding the number of insured individuals.

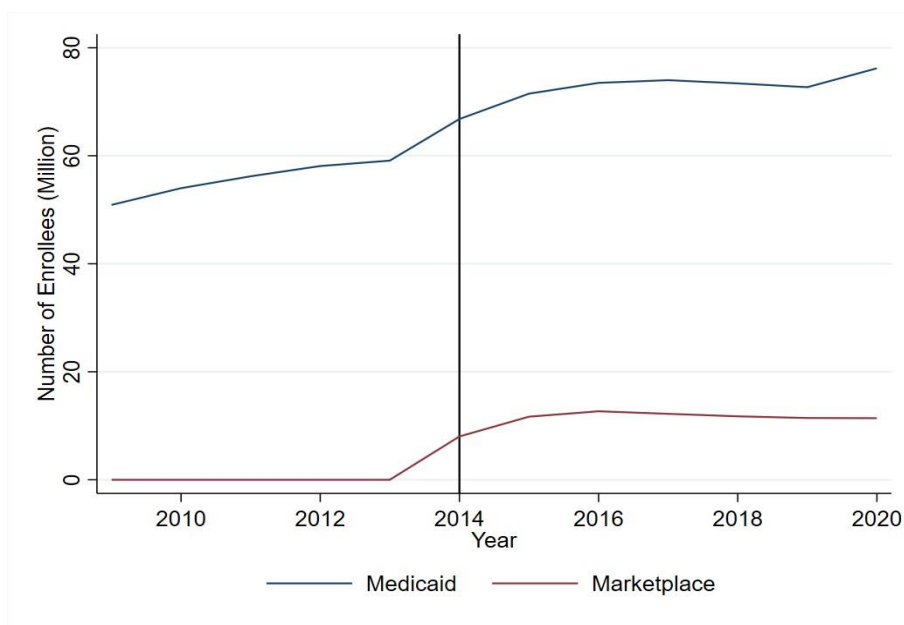


Figure 2. Number of enrollees in Medicaid and the ACA Marketplace. Data sources: Kaiser Family Foundation. (<https://www.kff.org/health-reform/state-indicator/marketplace-enrollment/>), The American Community Survey.

Due to geographical disparities in the uninsured rate, the distribution of individuals benefiting from the ACA Marketplace is likely to vary across different areas. To assess this, we use the county uninsurance rate data from the Small Area Health Insurance Estimates (SAHIE) among individuals aged 19 to 64, with household incomes between 138% and 200% of the FPL, in each county. Figure 3 presents the distribution of health uninsurance coverage rates for individuals within the 138%-200% income range in each county during 2013. The average uninsurance rate across counties is estimated at 32.75%, exhibiting significant variations that range from 6% to 56%.¹¹ Figure 3 indicate that the uninsurance rate in 2013 was not randomly distributed among counties. Leveraging county-level economic indicators from 2013, we find that factors such as the proportion of Black individuals, median household income, and average housing prices collectively account for more than 75% of the observed variation in the uninsurance rate across counties. Conditional on these indicators, we make the assumption that the differences in uninsurance rates among counties are plausibly exogenous to individual mortgage credit.

The availability of ACA Marketplace subsidies creates strong incentives for uninsured individuals to obtain health insurance. Counties with a higher proportion of uninsured individuals are likely to experience more significant increases in health

¹¹Our analyzed population has the highest uninsured rate in the United States. This is due to the fact that people with household incomes below 138% of the FPL are potential eligible to Medicaid, while people with incomes above 200% of the FPL have higher incomes and therefore higher rates of health insurance coverage. Public health insurance is also available to people under age 18 or over age 65. As a result, the uninsured rate for the population analyzed in this paper will be higher than the national average. To exclude the effect of extreme values and provide more robust results, we excluded counties with extreme 1% uninsured rates and then show the results in Appendix C. The results are not significantly different from using the full sample.

insurance coverage following the implementation of the ACA Marketplace. Panel B of Figure 3 illustrates the changes in health insurance coverage rates from 2013 to 2015. It is evident that southern and western regions, which have higher uninsurance rate in 2013, also witnessed greater increases in health insurance rates after the creation of the ACA Marketplace.

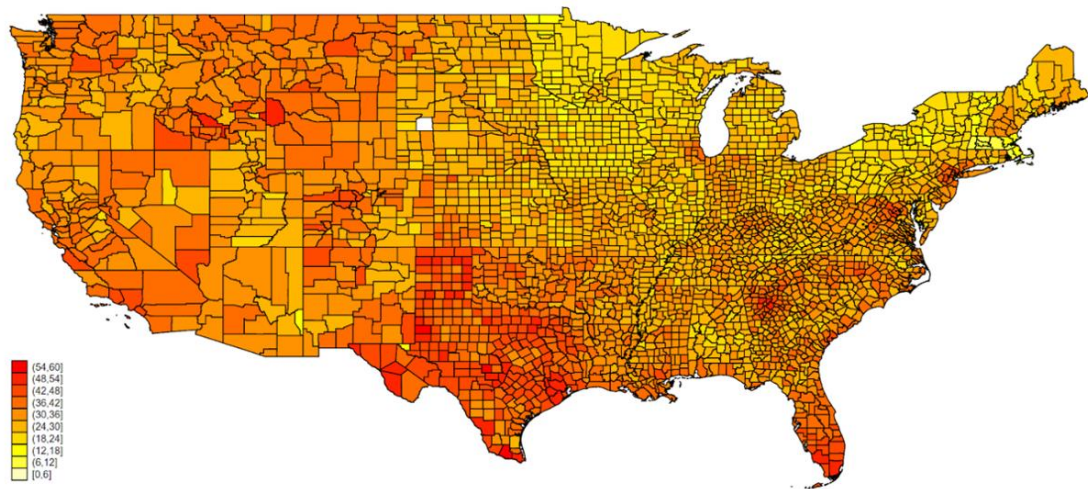


Figure 3 Panel A: Uninsured rate (%) among people with family incomes between 138% and 200% FPL in 2013

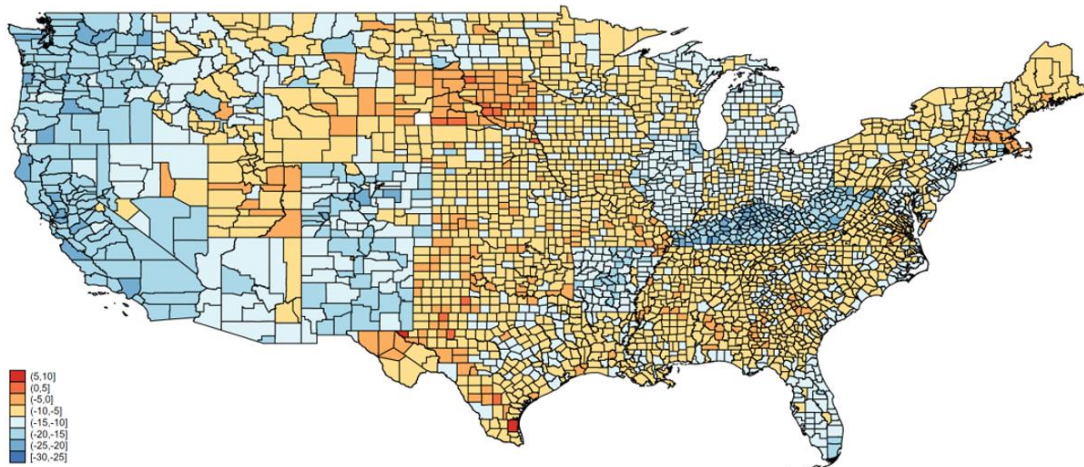


Figure 3 Panel B: Uninsured rate (%) changes from 2013 to 2015

Notes: For presentation purposes, Alaska, Hawaii, and outlying islands are not included in this map.

Data source: Authors analysis of data for the Small Area Income and Poverty Estimates Program data

2.2. Mortgage Application Process

For a typical mortgage application, the initial step involves borrowers requesting mortgages from lenders. The monetary value of the mortgage sought by borrowers at this stage is referred to as the mortgage application amounts, representing a measure of mortgage demand from the perspective of households. The lenders then assess the borrower's repayment ability and decides whether to approve the application. Ultimately, based on the borrower's requested amount and the lender's decision, a mortgage is created. The dollar amount of the mortgage established in this process is termed the mortgage origination amount, serving as a direct measure of mortgage market equilibrium outcome. Through the analysis of this comprehensive process, we delve into the dynamics by which ACA Marketplace subsidies impact the demand for housing credit and, consequently, the subsequent mortgage originations.

3. Data and Summary Statistics

To estimate the causal impact of ACA Marketplace subsidies on mortgage credit, we match the uninsurance rate data obtained from the *Small Area Health Insurance Estimates Program* with information on mortgage applications and originations from the *Home Mortgage Disclosure Act*. Additionally, to enhance the robustness of our analysis and provide additional supporting evidence, we also utilize data from the *American Community Survey* and the *Survey of Income and Program Participation*.

3.1. Home Mortgage Disclosure Act data (HMDA)

We obtain loan application-level mortgage application data from HMDA. The data are collected following the Community Reinvestment Act (CRA) of 1975 (12 U.S.C. 2901), which requires reporting by banks, credit unions, savings associations, and non-depository institutions. From 2010 to 2017, the database has 1.8 billion residential mortgage application records and contains 88% of approved residential mortgages in the United States. The dataset includes information on mortgage application amounts, application decisions (denied or approved), application types (conventional application, Veterans Administration guaranteed applications, or Farm Service Agency and Rural Housing Services), geographic information, applicant characteristics (such as annual income, race and gender), and local characteristics of the property (e.g., population and median income for the corresponding census tract).

In this paper, we only utilize HMDA data from 2010 to 2017. A large number of mortgages defaulted during the subprime crisis in 2008. To avoid the confounding impact of the 2008 financial crisis, we restrict our data from 2010 onwards. We also limit the sample to data through 2017 because the Trump administration cut CSRs to health insurers and reduced the penalty for not having insurance to \$0 in 2017¹². These policy changes create more zero-premium plans and encourage lower-income groups to choose cheaper health insurance, which is a significant change from the original ACA Marketplace established in 2014 (Anderson, Abraham, & Drake, 2019; Drake & Anderson, 2020). Then, we limited the sample to those with household incomes

¹² The elimination of individual mandate takes effect in 2019.

between 138% and 200% of the FPL, as Medicaid is available to those with household incomes below 138% in some states, while subsidies are relatively low for those with household incomes above 200% (as shown in Table 1). In addition, we use only conventional mortgage application records, the most representative mortgage application types. Any other mortgages are excluded, such as Veterans Administration guaranteed applications, the Farm Service agency and rural housing services. Table 2 shows the summary statistics of mortgage applications. The average application amounts increased by \$8,080 after the establishment of the ACA Marketplace (price is adjusted to 2013 by CPI) and the average originated amounts increased by \$5,800. The *Income* is the annual household income, the *Tract Population* term and the *Tract Income* are the population and mean income in the census tract where the house is located, and the *Minority Ratio* term is the proportion of minority people in the census tract.

Table 2. Summary Statistics

	2010-2013		2014-2017	
	Mean	Standard Deviation	Mean	Standard Deviation
<i>Mortgage Amounts</i>				
Application	104.54	72.75	112.62	201.20
Origination	105.28	60.30	111.08	112.66
<i>Applicants</i>				
<i>Characteristics</i>				
Income	31.08	3.95	33.23	4.18
%Hispanic	15.38	35.08	19.48	39.60
%Black	7.48	26.31	9.51	29.34
%White	68.48	46.46	61.26	48.71
%Asian	8.03	27.17	7.87	26.93
<i>Tract characteristics</i>				
Tract Population	5,813.40	2,966.84	5,696.13	2,845.41
Tract Income	25.02	6.32	25.45	6.28
Minority Ratio	35.40	25.83	42.13	26.42

Note: Income and amount terms are in thousands of dollars. Price is adjusted to the 2013 base.

Unfortunately, we could not identify whether the mortgage applicants enrolled in the Marketplace. Thus, what we estimate in the empirical section is the average treatment effects on people whose family incomes level is eligible for the Marketplace rather than people who actually received subsidies from the Marketplace. Figure 4 shows the share of people enrolled in Marketplace insurance plan with family incomes between 100% to 400% of the FPL. On average, 8% of people in the above-income group in each county enrolled in the Marketplace. Instead of being mandatory, people have the autonomy to choose whether or not to enroll in the Marketplace and receive this subsidy. It is, therefore, more realistic to estimate the average treatment effect on those who qualify for ACA Marketplace subsidies.

In order to capture the extensive change of mortgage application, a natural way is to aggregate loan-level application data to calculate the number of mortgage applications and originations for each county-year pair. However, the number of people with family incomes between 138% to 200% of the FPL in each county might change over the years. Therefore, instead of using the number of mortgage applications or originations, we use the proportion of originated or applied mortgages where applicants' family incomes are between 138% to 200% of the FPL to the corresponding county population to capture the change of mortgage applications or originations at the extensive margin.

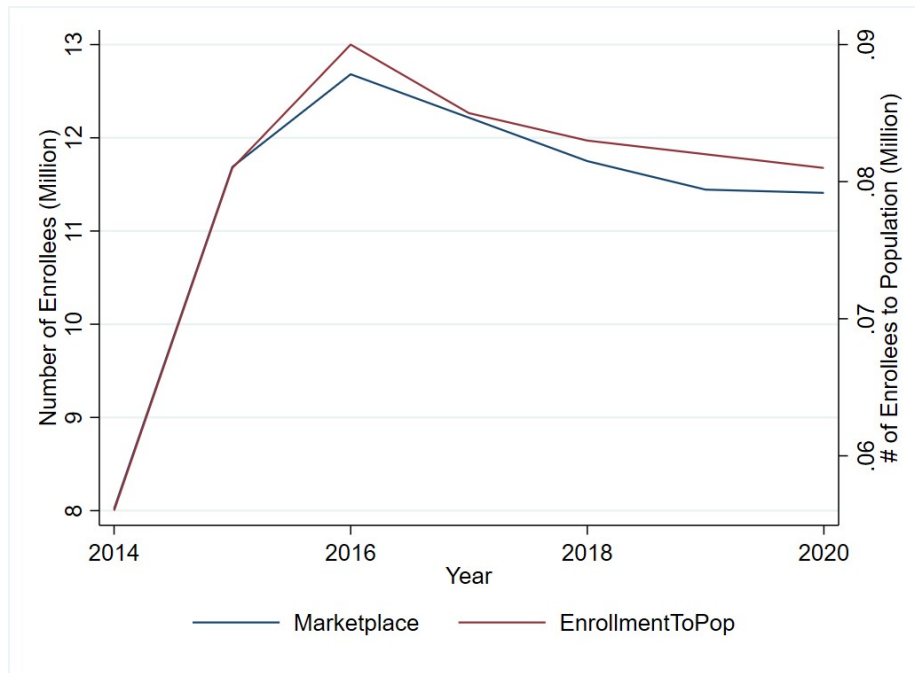


Figure 4. Marketplace enrollment and the ratio to county population among people with family incomes between 100% and 400% of the FPL

Data sources: The enrollment data is from the Kaiser Family Foundation (<https://www.kff.org/health-reform/state-indicator/marketplace-enrollment/>). The population value is from the American Community Survey

3.2. American Community Survey (ACS)

We use ACS to explore the potential mechanisms of ACA Marketplace subsidies on mortgage application. The advantage of ACS is it contains detailed information for several aspects, including health insurance, mortgage status, house value, family incomes, and medical expenditure. The rich information in ACS enables us to explore the intricate relationships among Marketplace subsidies, health insurance, and mortgage payment. Similar to the HMDA data sample selection, we restrict the sample to households whose family incomes lies between 138% and 200% of the FPL and from year 2010 to 2017. In addition, we use the observations where county code is available in public ACS data, covering approximately 60% of the ACS population.

3.3. Small Area Health Insurance Estimates (SAHIE)

To measure the intensity of treatment, we use data from *SAHIE* to calculate the uninsurance rate across counties. The U.S. Census Bureau's SAHIE program provides estimates of the health insurance coverage status of all counties in the United States. Within the SAHIE dataset, we specifically extract the number of insured and uninsured individuals within the age range of 18 to 64 years and with household incomes falling between 138% and 200% of the FPL. By obtaining health insurance coverage rates from the SAHIE program for this specific population in each county and each year, we could measure the treatment intensity across different geographic areas and the dynamic change of health insurance coverage.

3.4. Survey of Income and Program Participation (SIPP)

To capture the financial well-being of ACA Marketplace enrollees, we use a nationally representative longitudinal survey, SIPP. It provides comprehensive information on household finances such as income and the participation in government programs. From this dataset, we obtain household characteristics (e.g., family income, gender, age, etc.) as well as family financial data. We use mortgage and rent defaults and utility bill defaults as direct evidence of whether low-income households' finances improve after obtaining health insurance.

4. Empirical Design

Our empirical strategy combines the regional heterogeneity in health uninsurance rate with the ACA Marketplace reform. The ACA Marketplace is established in all states at the same time.¹³ However, its' impact on each county might vary, as counties had different health insurance coverage rates before 2014. For counties with high uninsurance rates prior to the reform, more people are benefiting directly and indirectly from the ACA Marketplace. Therefore, we use a DID identification strategy that builds on two sources of variation. First, counties had different health insurance coverage rates at the time reform. Second, within the same county, mortgage applications from different years were exposed to ACA Marketplace or not depending on whether mortgage applications years overlapped with the reform.

This approach using pre-reform uninsurance rate as treatment intensity is supported by a substantial body of literature (Finkelstein, 2007; Miller, 2012; Mazumder & Miller, 2016; Duggan et al., 2019). For example, Mazumder and Miller (2016) uses the health insurance coverage rate across counties in Massachusetts as the indicator for treatment intensity and finds the Commonwealth program prevented low-income households' financial distress. Specially, we use the uninsurance rate among people with family incomes between 138% to 200% of the FPL in each county in 2013 as the proxy of treatment intensity. To estimate for the effects of Marketplace subsidy on mortgage application, we use the following DiD equation:

$$Y_{i/c,t} = \alpha + \beta Post_t \cdot UIR_{c,2013} + \delta Post_t + \varphi UIR_{c,2013} + \gamma X_{it} + \rho Z_{i,2013} \cdot Year_t +$$

¹³ Massachusetts had already established a similar platform in 2009, known as the Commonwealth.

$$\theta_{t*s} + \sigma_c + \varepsilon_{it} \quad (1)$$

Where $Y_{i/c,t}$ is the proportion of mortgage application and origination of county c in year t , or the amount of mortgage application and origination of record i in year t . When we examine the amounts, we take the logarithmic form of the mortgage in order to alleviate the impact of extreme value. $Post_t$ equals one for periods after the treatment is implemented, i.e., year 2015. The variable, $UIR_{c,2013}$, is a continuous variable, capturing the intensity of treatment. Considering that the uninsurance rate in 2013 might not be exogenous, we include the interaction of year dummies with $Z_{c,2013}$, a vector of county characteristic variable. The $Z_{c,2013}$ includes county average housing price, median household income, share of black people in 2013. We find $Z_{c,2013}$ can explain more than 75 percent of the variation in uninsurance rate. X_{it} is a vector of applicant and census tract characteristic variables, including applicant's family incomes, gender, race, mortgage purpose, census tract population, tract medium income, tract minority ratio. θ_{t*s} and σ_c are year by state fixed effect and county fixed effect, respectively.¹⁴ Standard errors are clustered at county level. The coefficient of interest is β , which estimates the interaction term between the time and the $UIR_{c,2013}$. We anticipated that the estimate of β would be positive, indicating that as the uninsurance rate increases, the ACA Marketplace have a positive impact on mortgage applications and originations, since more individuals gain access to health insurance.

¹⁴ We cluster standard errors to the county level. We show the results of clustering standard errors to the state level and excluding counties with 1% extreme uninsured rate in Appendix C. House price index is obtained from <https://www.fhfa.gov/DataTools/Downloads/Pages/House-Price-Index-Datasets.aspx>

Our identification assumption requires that if the ACA Marketplace had not established, the mortgage amount in each county would have changed at the same rate. Thus, we estimate a dynamic style regression with the year 2013 as base period (Equation 2). If the estimates for periods before the treatment are significantly different from zero, we can reject the premise of a common trend between groups. Another advantage of Equation 2 is that allows us to observe the dynamic effects of the ACA Marketplace reform after its implementation.

$$Y_{i/c,t} = \alpha + \sum_{t=2010}^{2017} \beta_t Year_t \cdot UIR_{c,2013} + \delta Post_t + \varphi UIR_{c,2013} + \gamma X_{it} + \rho Z_{c,2013} \cdot Year_t + \theta_{t*s} + \sigma_c + \varepsilon_{it} \quad (2)$$

One assumption of our main method is there is no crowded-out from the other insurance source (Duggan et al., 2019). However, in 2013, 8% Marketplace enrollees purchased health insurance by themselves, and 20% received employer-sponsored health insurance or health insurance from other sources (Vistnes & Cohen, 2016). This implies that relying solely on the pre-reform uninsurance rate may omit individuals who, prior to the reform, were already fully insured but subsequently altered their insurance arrangements. In addition, the APTC varies from one rating zone to another based on income and cost of the second lowest silver plan. Given that counties with high uninsurance coverage typically have lower levels of economic development, and thus people face less health insurance premium and therefore are likely to receive lower APTC subsidies, the estimate from our main regression is a lower bound for ACA

Marketplace subsidies on mortgage applications. To address the concerns with this method, we employ an alternative methodology that utilizes a completely unaffected cohort as the control group.

Specifically, we construct a canonical DiD design and the treated groups consist of applicants with family incomes falling between 101% and 150% of the FPL in non-expansion states. According to (Gallagher et al., 2019), the average eligible threshold for Medicaid in 2016 for states that did not expand Medicaid is 45% FPL. Thus, we use those applicants with family incomes ranging from 50% to 100% of the FPL in these non-expansion states as the control group. Those people earn too much to qualify for Medicaid but earn too less to receive subsidy from the ACA Marketplace, thus not affected by ACA. We focus on applicants from non-expansion states, as individuals with incomes between 50% and 138% of the FPL in expansion states are typically eligible for Medicaid, which could potentially introduce confounding factors that may compromise the identification strategy. We estimate the following equation:

$$Y_{it} = \alpha + \beta Post_t \cdot Treated_i + \delta Post_t + \varphi Treated_i + \gamma X_{it} + \theta_{t*s} + \sigma_c + \varepsilon_{it} \quad (3)$$

In Equation 3, the $Treated_i$ equals one for treated groups and zero for control groups. Between 2014 to 2017, 29 states expanded the eligible range of Medicaid to 138% of FPL, which might confound our estimates. Thus, mortgage applications in the other 21 states are used in regression (3). The other variables are the same with Equation

1. We anticipate that β should be positive since the Marketplace improved treated groups' financials.

5. Empirical Results

5.1. Impact on Loan Applications and Originations

In this subsection, we present our main results on mortgage applications and originations using Equation 1. Panel A show the estimates on the proportion of mortgage applications or originations to explore the change on extensive margin, while Panel B show the estimates on the amounts of mortgage applications or originations to capture the change on intensive margin. As described in Section 3, the uninsurance rate across counties in 2013 may not be exogenous. Thus, Columns 2 and 4 control the interaction of year dummies with $Z_{c,2013}$ vector to alleviate the potential bias caused by endogenous uninsurance rate. The most rigorous model specifications, encompassing year-varying county or census tract controls and interaction of year dummies with $Z_{c,2013}$, are reported in Columns 2 and 4 deemed as the preferred specifications.

Table 3. The effects of ACA Marketplace subsidies on applications and originations.

	(1)	(2)	(3)	(4)
Panel A: Proportion of mortgage application or origination				
	All application	All application	Origination	Origination
Post*UIR_2013	-0.036 (0.068)	0.021 (0.047)	-0.015 (0.041)	0.019 (0.031)
$Z_{c,2013}$ *Year FE	No	Yes	No	Yes
Observations	6,227	6,227	6,227	6,227
Panel B: Mortgage Amounts				
	All application	All application	Origination	Origination
Post*UIR_2013	0.498*** (0.101)	0.502*** (0.129)	0.440*** (0.122)	0.413** (0.171)
$Z_{c,2013}$ *Year FE	No	Yes	No	Yes
Observations	18,636,404	18,461,579	9,597,184	9,514,773

Note: All regressions are controlled for level poverty rate, logarithm of population size, tract population, tract income, minority race ratio, annual change of housing price, applicant race, applicant gender, county fixed effect and year by state fixed effect. Standard errors are clustered at the county level. Z_c include share of black, median family incomes, and housing price index in 2013. Robust standard errors in parentheses *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$.

Panel A of Table 3 indicates that no significant changes are found for the proportion of mortgage applications or originations, regardless of which specification is used. As for the change in the application amounts, the first column of panel B in Table 3 show that every 10 percentage points increase in exposure to the reform increased application amount by 0.050 log points. This equates to that the introduction of the ACA Marketplace in 2013 led to an average increase of 0.502% in mortgage application amounts for totally uninsured counties compared to fully insured counties in 2013. There was a similar pattern in terms of the value of mortgages originated, which increased by 0.413%. The robustness of incorporating $Z_{c,2013} * \text{Year FE}$ indicates that our mortgage applications or originations are relatively exogenous to the uninsurance rate in 2013. In general, the results in table 3 indicates that ACA Marketplace subsidies primarily enhance mortgage demand at the intensive margin, influencing the mortgage amount, rather than expanding the pool of individuals applying for mortgages or increasing the overall number of mortgage originations.

In 2013, the average mortgage origination amount was \$112,000 and the average mortgage application amount was \$108,000. Therefore, the increase in mortgage originations was around \$400 and the increase in mortgage applications was \$540. Noticed that not all people with family income ranging from 138% to 200% of FPL

enrolled in the ACA Marketplace. As the average ratio of ACA Marketplace enrollees to the corresponding eligible groups is 8%, we speculate that the ACA Marketplace stimulated mortgage application amount by \$6350 and origination amount by \$4,700 among Marketplace enrollees. However, the ratio of ACA Marketplace enrollment to eligible groups may be higher than the ratio of enrollment to population applying for a mortgage because those who can afford a mortgage might have higher household incomes than those who qualify for the ACA Marketplace. Therefore, the estimated increase in mortgages for those in the ACA Marketplace may be underestimated.

A key assumption of the DiD model is for the affected groups, each county's trend in mortgage applications should not be correlated with $UIR_{i,2013}$ in the absence of ACA Marketplace subsidies. Although the counterfactual is unobservable, an event study can reject this assumption if there exist divergent trends before the policy implementation. Using the specification as the Equation 2, we estimate the coefficients for each period. The results are shown in Figure 5. None of the coefficients for the years prior to the treatment is significantly different from zero. Therefore, the results do not reject the hypothesis of common trends across groups with different treatments.

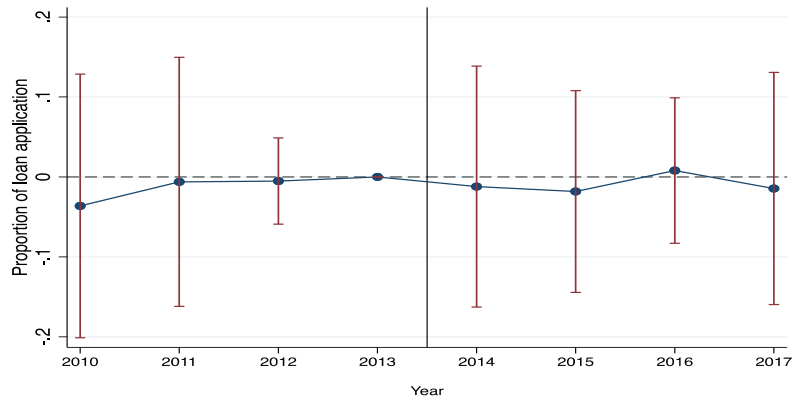


Figure 5 Panel A: Parallel trend for the proportion of mortgage applications

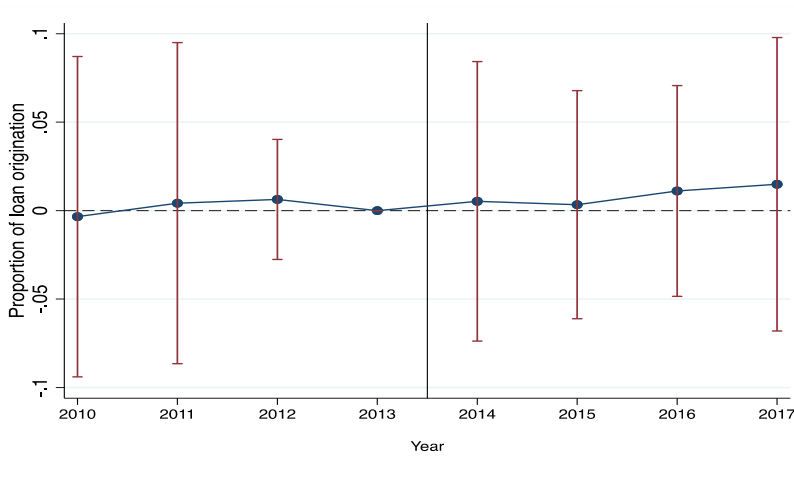


Figure 5 Panel B: Parallel trend for the proportion of mortgage originations

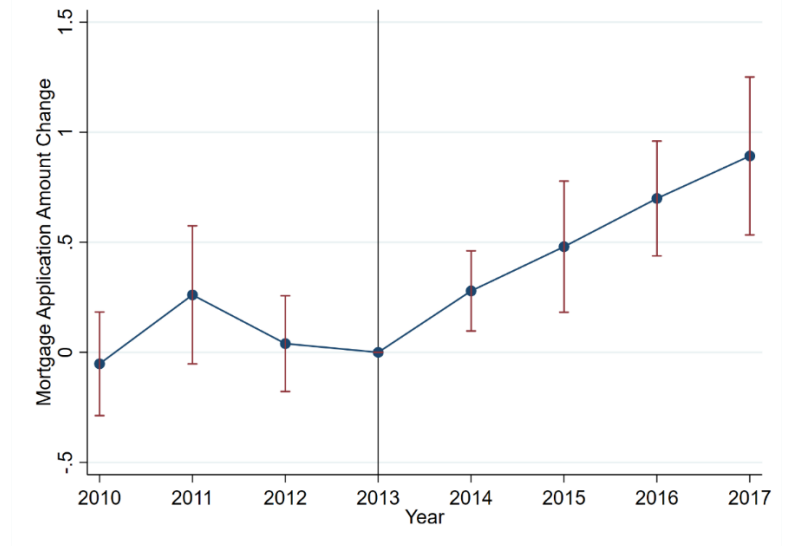


Figure 5. Panel C: Parallel trend for mortgages application amounts

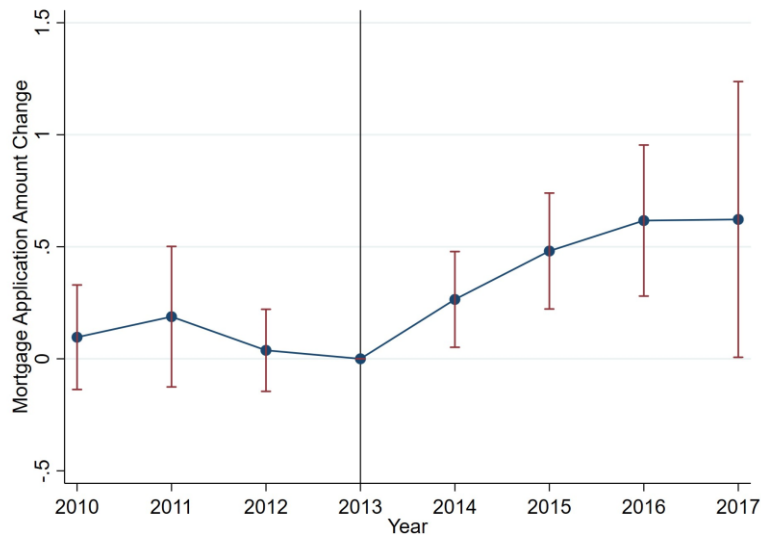


Figure 5. Panel D: Parallel trend for mortgages origination amounts

Notes: Figure 5 plots the dynamic response of mortgage amounts and proportions to the ACA Marketplace. After the ACA Marketplace WAS established, the amounts of applications and originations gradually increase. Prior to its establishment, none of the estimates are significantly different from zero.

While ACA Marketplace subsidies primarily hinge on family income as a determinant, it is noteworthy that individuals from diverse racial backgrounds exhibit distinct socioeconomic characteristics that may potentially influence their responses to ACA Marketplace subsidies. Table 4 shows the impact of the ACA Marketplace on mortgage applications by race/ethnicity. The increase in both the amount of mortgage applications and originations is larger for Black people compared with White people and Asian, while the impact on Hispanic is not significant. In 2013, the average mortgage applications for Black American, White, Hispanic, and Asian were \$86,250, \$108,000, \$101,000, and \$139,000, respectively. The above results suggest that the ACA Marketplace not only increased overall mortgage lending, but also might reduce inequality in the mortgage market.

Table 4. The effects of ACA Marketplace subsidies on mortgage amounts by race/ethnicity.

VARIABLES	Loan Amount (All application)				Loan Amount (Origination)			
	White	(2) Black	(3) Hispanic	(4) Asian	(5) White	(6) Black	(7) Hispanic	(8) Asian
Post*UIR_2013	0.402*** (0.094)	0.760*** (0.134)	0.099 (0.219)	0.516*** (0.154)	0.402*** (0.116)	0.670*** (0.232)	0.019 (0.316)	0.300 (0.208)
Observations	10,481,503	1,404,796	3,152,561	1,298,370	5,961,058	525,324	1,477,104	696,911

Note: All regressions are controlled for county level poverty rate, tract population and income, minority race ratio, annual change of housing price, applicant race, income, and gender, county fixed effect, and state-year fixed effect. Standard errors are clustered at the county level. Robust standard errors in parentheses *** p<0.01, ** p<0.05, * p<0.1. The parallel trend figures are shown in Appendix B.

5.2. Robustness of the Results

5.2.1 Use all ACA marketplace eligible sample

In this subsection, we present our findings derived from a sample of households with incomes falling within the range of 138% to 400% of the FPL. In our primary regression analysis, our primary focus is on individuals with family incomes spanning from 138% to 200% of the FPL, given that this particular income bracket experiences significantly higher cost-sharing compared to those with incomes exceeding 200% of the FPL. Nevertheless, it is important to note that all individuals with family incomes ranging from 138% to 400% of the FPL are eligible to participate in the ACA Marketplace. Therefore, to provide a broader assessment of the ACA Marketplace, we replicate our primary regression analysis encompassing all eligible groups within the ACA Marketplace. Table 5 displays the estimation results for the cohort with family incomes ranging from 138% to 400% of the FPL. Notably, we observe that the estimates, across all specifications, remain positive and statistically significant, albeit with somewhat

reduced magnitude. This finding aligns with the regulatory framework governing subsidies, wherein individuals and families with incomes exceeding 200% of the FPL receive relatively modest CSRs subsidies, as elucidated in Table 1.

Table 5. The effects of ACA Marketplace subsidies on application and origination using all ACA marketplace eligible sample

	(1)	(2)	(3)	(4)
<i>Panel A: Proportion of mortgage application or origination</i>				
	All application	All application	Origination	Origination
Post*UIR_2013	0.01 (0.15)	-0.01 (0.17)	-0.01 (0.09)	-0.02 (0.10)
$Z_{c,2013}$ *Year FE	No	Yes	No	Yes
Observations	4,757	4,757	4,757	4,757
<i>Panel B: Mortgage Amounts</i>				
	All application	All application	Origination	Origination
Post*UIR_2013	0.363*** (0.129)	0.322** (0.136)	0.414*** (0.159)	0.336** (0.161)
$Z_{c,2013}$ *Year FE	No	Yes	No	Yes
Observations	42,154,970	42,518,052	23,499,342	23,683,945

Note: All regressions are controlled for level poverty rate, logarithm of population size, tract population, tract income, minority race ratio, annual change of housing price, applicant race, applicant gender, county fixed effect and year by state fixed effect. Standard errors are clustered at the county level. Z_c include share of black, median family incomes, and housing price index in 2013. Robust standard errors in parentheses *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$.

5.2.2 Use totally unaffected cohorts as control group

In this section, we provide estimates from the Equation 3 as the robustness check. Using the uninsurance rate in 2013 as a proxy for treatment intensity only captures the variations that ACA Marketplace subsidies incentivize people from being uninsured to being insured. However, some people who are insured before 2014 might switch insurance type from their original one to Marketplace. Therefore, we compare applicants whose family incomes range from 50% to 100% of the FPL to applicants whose family incomes range from 101% to 150% of the FPL. Table 6 shows the regression results for Equation 3. It provides a similar result to the main results in Table

3, lending validity of our main results.

Table 6. The effect of ACA Marketplace subsidies on mortgage application and origination

Mortgage Amounts	(1) Application	(2) Application	(3) Origination	(4) Origination
Post*Treated	0.056*** (0.015) (0.13)	0.101*** (0.027) (0.14)	0.055*** (0.014) (0.13)	0.105*** (0.028) (0.15)
Year FE	Y		Y	
County FE	Y	Y	Y	Y
Year by state FE		Y		Y
Observations	3,055,095	3,055,095	1,164,572	1,164,572

Note: All regressions are controlled for county level poverty rate, logarithm of population size, annual change of housing price. Standard errors are clustered at the county level. Robust standard errors in parentheses *** p<0.01, ** p<0.05, * p<0.1.

5.2.3 Use an alternative dataset: ACS

The disadvantage of HDMA is that it lacks the insurance information. Therefore, we replicate our estimates using a survey dataset, ACS data that includes housing and mortgage information as well as health insurance status and medical expenditure. Unfortunately, information on mortgage amounts is not available in the ACS. Considering that mortgage amounts and mortgage monthly payment is positive correlated, we use the monthly mortgage payment as the proxy variable of mortgage amounts.

In conjunction with income-based eligibility criteria, individuals seeking eligibility for ACA Marketplace subsidies must also demonstrate a lack of access to health insurance provided by employers, Medicaid¹⁵ or the other similar programs. The subsets of households that do not receive such coverage are more likely to receive ACA

¹⁵ Individuals with family incomes between 100% to 138% of the FPL in states that have adopted the ACA Medicaid expansion have the option to choose between Medicaid and ACA Marketplace plans with subsidies simultaneously.

Marketplace subsidies, thus referred to as the high participation sample. We replicate our estimates on the high participation group. By excluding those not affected eligible for the ACA Marketplace subsidies, the estimates of remaining high participation sample should be larger.

The results in the Column 1 of Table 7 indicate that no significant estimate of the ACA Marketplace subsidies is found on mortgage ownership. For the monthly mortgage payments in Column 2, we find a positive but insignificant effect. In Column 3, we find that the average home value of mortgages increased after the ACA Marketplace was established, suggesting people were buying houses with higher values. This indicates that the estimated increase in mortgage application amounts may be due to a willingness to buy more expensive houses rather than a decrease in disposable income. We then repeat these estimates on the high participation sample and present the results in Columns 4 to 6. Similar to the full sample estimates, no significant effect on mortgage ownership is found. The estimates of monthly mortgage payments and home values are statistically significant and larger compared to the estimates for the full sample. The larger estimates on high participation sample lend support to the notion that the ACA Marketplace contributes to increased mortgage application activity by virtue of subsidizing health insurance.

Table 7. The effect of ACA on housing and mortgage information at the county level.

	Full Sample			High Participation Sample		
	(1)	(2)	(3)	(4)	(5)	(6)
	Mortgage (Yes=1)	Mortgage monthly payment	House Value	Mortgage (Yes=1)	Mortgage monthly payment	House Value
Post*UIR_2013	-0.031 (0.061)	0.153 (0.096)	0.259** (0.128)	-0.046 (0.095)	0.312** (0.141)	0.403** (0.165)
Observations	575,307	417,270	417,270	173,641	119,777	119,777
Mean	0.361	6.532	11.648	0.336	6.553	11.623

Note: Mortgage monthly payment and house value are in logarithmic forms. All regressions are controlled for individuals' race, gender, age, education level, income, marriage status, county fixed effect, and state-year fixed effect. Standard errors are clustered at the county level. Robust standard errors in parentheses *** p<0.01, ** p<0.05, * p<0.1. The parallel trend figures are shown in Appendix B.

5.3. Potential Mechanisms

5.3.1. Insurance Coverage & Medical Expenditure

First, we estimate the impact of the ACA Marketplace on each type of insurance using ACS. The ACA Marketplace subsidizes households to purchase (and use) private health insurance sold in the Marketplace. Thus, the ACA Marketplace should only improve private and directly purchased health insurance coverage rates, while having no (or a small) impact on public health insurance coverage rates among our analytic group. More importantly, we explore how the ACA Marketplace subsidies help reduce large out-of-pocket medical expenditures. According to the survey conducted by (Himmelstein et al., 2019), medical problems, particularly large unexpected medical expenditures, account for 66.5% of household bankruptcies in the U.S. Being insured could reduce large out-of-pocket spending as well as financial risk, which might increase the current investment. Column 5 of Table 7 shows that the ACA Marketplace

increased the probability of out-of-pocket medical expenditures, which is an indicator of use of health insurance. This suggests that more people receive healthcare service after the establishment of the ACA Marketplace. Column 6 of Table 8 indicates that subsidies in the ACA Marketplace decreased the likelihood of incurring significant out-of-pocket medical expenses (i.e., the 10% highest medical expenditure in the sample data). Evidence suggests that health insurance induced by ACA Marketplace subsidies reduce large household medical expenditures, which served as a channel for the estimated impacts of ACA Marketplace subsidies on mortgage applications and originations.

Table 8. The effect of ACA Marketplace subsidies on the status of health insurance by types

	(1) Any HI	(2) Private HI	(3) Purchased HI	(4) Public HI	(5) Expenditure (Yes=1)	(6) Large Expenditure (>\$6227)
Post*UIR_2013	0.129*** (0.041)	0.091** (0.044)	0.104*** (0.026)	0.031 (0.030)	0.030** (0.014)	-0.006* (0.004)
Observations	1,616,071	1,616,071	1,616,071	1,616,071	1,601,523	1,601,523
Mean	0.783	0.499	0.131	0.316	0.758	0.019

Note: All regressions are controlled for individuals' race, gender, age education level, income, marriage status, county fixed effect and state-year fixed effect. Standard errors are clustered at the county level. Robust standard errors in parentheses *** p<0.01, ** p<0.05, * p<0.1. Data are from ACS 2010-2017. The parallel trend figures are shown in Appendix B.

5.3.2. Delinquency

Health insurance lowers the large medical expenditure and help people cope with financial risks, thus improving household financial situation. This is the impetus for families to apply for higher mortgages and for financial institutions to be willing to approve higher mortgage amounts. In this section, we capture the financial performance

of low-income households using mortgage and rent default, and utility default behaviors in SIPP. Using Equation 3, we find that delinquency probability for both declined after the establishment of the ACA Marketplace (as shown in Table 9). Unfortunately, the SIPP only investigated these related indicators for three waves between 2008 and 2019, (namely 2010-2011, 2014, and 2018, respectively). Therefore, the findings in this section may not be interpreted as causal. However, a strand of literature has consistently demonstrated that access to health insurance or ACA reform reduces household debt default rates and increases credit scores (Mazumder & Miller, 2016; Hu et al., 2018; Gallagher et al., 2019).

Table 9. The effect of ACA Marketplace on delinquency probability

	(1) Mortgage payment and rent	(2) Utilities
Post*Treated (>100% FPL)	-0.043* (0.023)	-0.021 (0.021)
Observations	82,633	82,633
Mean	0.142	0.187

Note: All regressions are controlled for individuals' race, gender, age, education level, income, state fixed effect and year fixed effect. The standard errors are clustered at the state level. Robust standard errors in parentheses *** p<0.01, ** p<0.05, * p<0.1.

6. Conclusion

Our paper complements a growing set of studies that explore possible spillover effects from ACA Marketplace subsidies. While the main purpose of the ACA Marketplace is to increase health insurance coverage and improve the health status of target groups, health policies may have spillover effects on household investment

behaviors. Specifically, we find the ACA Marketplace significantly increased mortgage application amounts by 0.5% and the mortgage origination amounts by 0.4% for totally uninsured counties compared to fully insured counties in 2013. Based on the average uninsurance rate and mortgage amount in 2013 and the average ratio of ACA Marketplace enrollees to the corresponding eligible groups is 8%, we speculate that the ACA Marketplace stimulated mortgage application amount by \$6350 and origination amount by \$4,700 among Marketplace enrollees.

Our analyses of possible mechanisms for our results show that the ACA Marketplace has increased the likelihood of securing private health insurance while diminishing the probability of incurring substantial medical expenses. Secondly, by leveraging data from SIPP, we ascertain that ACA Marketplace subsidies have resulted in a reduction in the probability of delinquency in mortgage or rent payments as well as utility expenses.

We argue that ACA Marketplace subsidies have increased the amount of mortgage lending through both the financial and risk channels. On the one hand, ACA Marketplace subsidies assist low-income people, especially the uninsured, to obtain health coverage and reduced spending on health care. On the other hand, obtaining health insurance reduces uncertainty about the future. Unfortunately, data limitations prevent us from distinguishing between the impact of the risk channel and the financial channel. Future research could address this issue using more detailed data. Another limitation is we could not identify applicants who were uninsured before 2014 and then

enrolled in the Marketplace, which might result in a negative bias on our estimations. Our analysis reveals those individuals of Black experience greater benefits from the ACA Marketplace in the realm of mortgage credit, indicating a potential role of the ACA Marketplace in mitigating economic disparities between Black and White populations. Subsequent research endeavors may delve deeper into the ACA's contributions to reducing such disparities.

The ACA was originally designed to provide affordable health insurance for low-income groups, but like other public policies, it not only has direct impacts on the health of enrollees and on the health sector, but also has important spillovers on the other fields. This paper shows that government subsidy policies for the health sector can spread further on the real economy and household investments.

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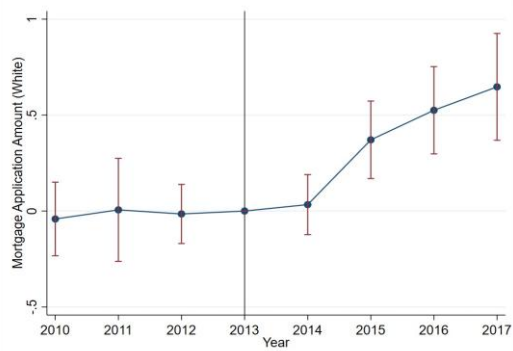
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Appendix A. Medicaid Expansion State (Until 2021)

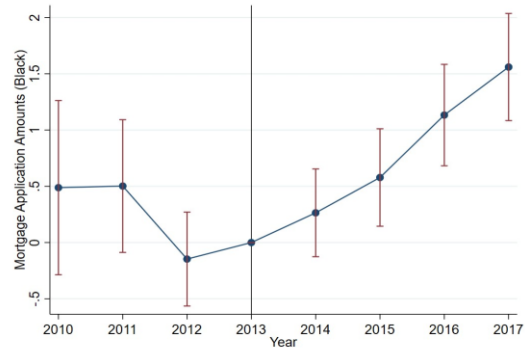
State	Expansion Year	State	Expansion Year
Alabama	Not Adopted	Montana	2016
Alaska	2014	Nebraska	2020
Arizona	2014	Nevada	2014
Arkansas	2014	New Hampshire	2014
California	2014	New Jersey	2014
Colorado	2014	New Mexico	2014
Connecticut	2014	New York	2014
Delaware	2014	North Carolina	2014
D.C.	2014	North Dakota	2014
Florida	Not Adopted	Ohio	2014
Georgia	Not Adopted	Oklahoma	2021
Hawaii	2014	Oregon	2014
Idaho	2020	Pennsylvania	2015
Illinois	2014	Rhode Island	2014
Indiana	2014	South Carolina	Not Adopted
Iowa	2014	South Dakota	2023
Kansas	Not Adopted	Tennessee	Not Adopted
Kentucky	2014	Texas	Not Adopted
Louisiana	2014	Utah	2020
Maine	2019	Vermont	2014
Maryland	2014	Virginia	2019
Massachusetts	2014	Washington	2014
Michigan	2014	West Virginia	2014
Minnesota	2014	Wisconsin	Not Adopted
Mississippi	Not Adopted	Wyoming	Not Adopted
Missouri	2021		

Data source: Kaiser Family Foundation

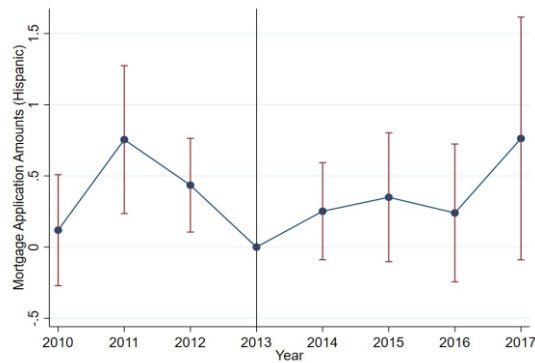
Appendix B. Figures



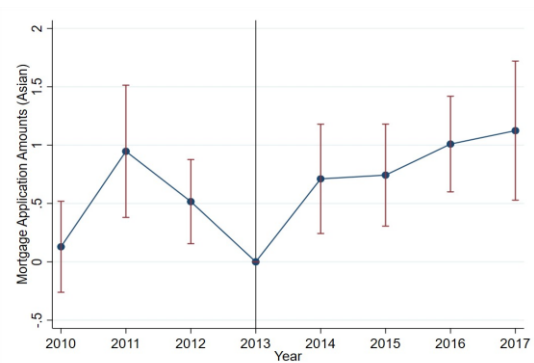
(a) Application Amounts (White)



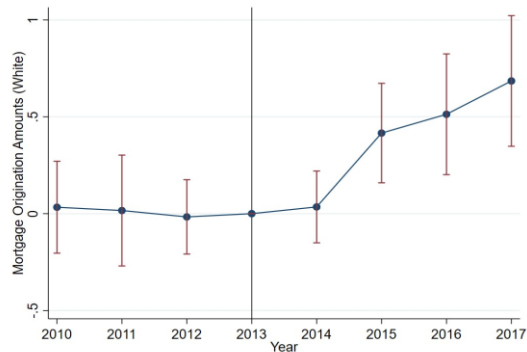
(b) Application Amounts (Black)



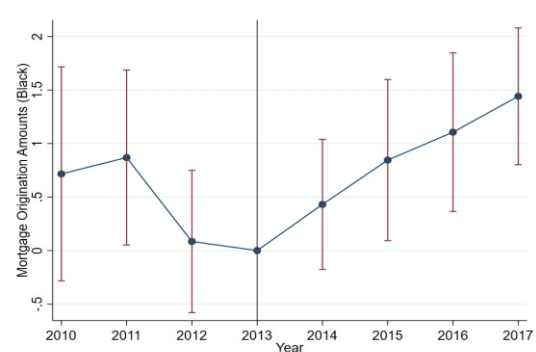
(c) Application Amounts (Hispanic)



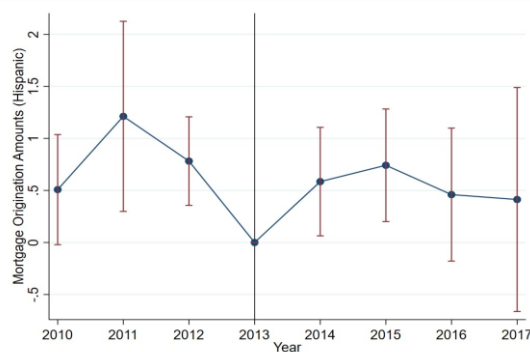
(d) Application Amounts (Asian)



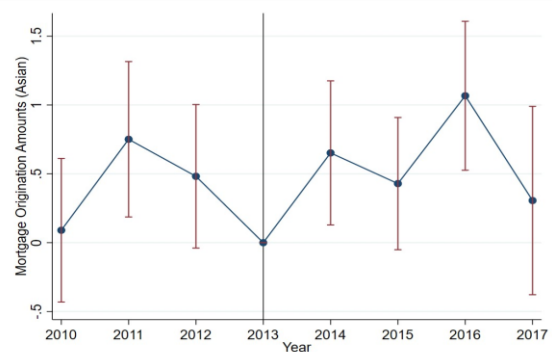
(e) Origination Amounts (White)



(f) Origination Amounts (Black)



(g) Origination Amounts (Hispanic)

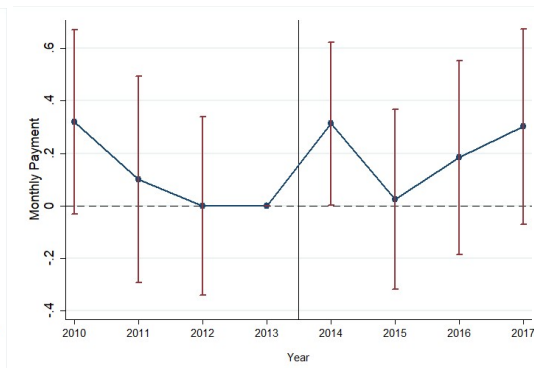


(h) Origination Amounts (Asian)

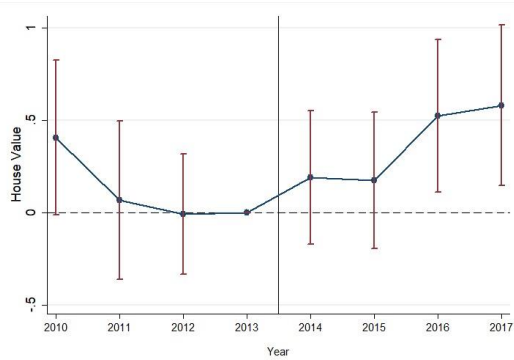
Notes: Above figures plot the dynamic response of mortgage amounts by race.



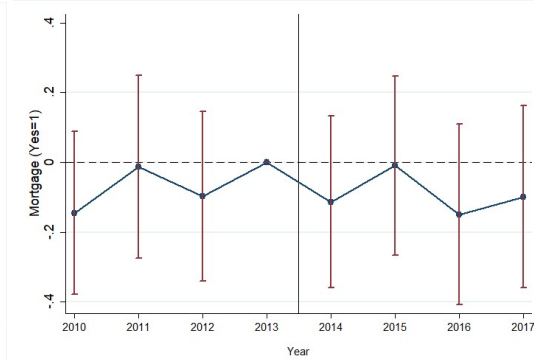
(a) Mortgage Holding (Full Sample)



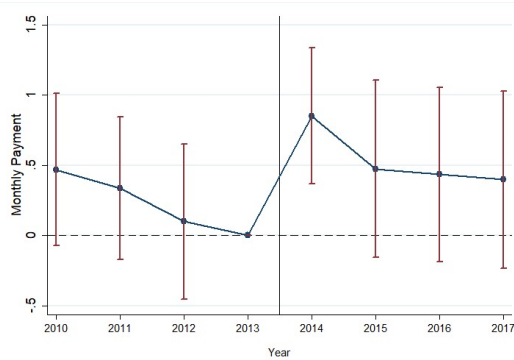
(b) Mortgage Payment (Full Sample)



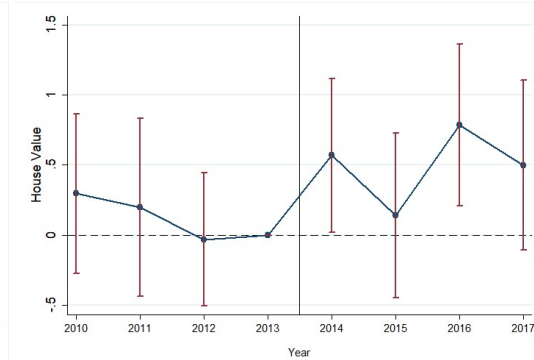
(c) House Value (Full Sample)



(d) Mortgage Holding (High Parti Sample)

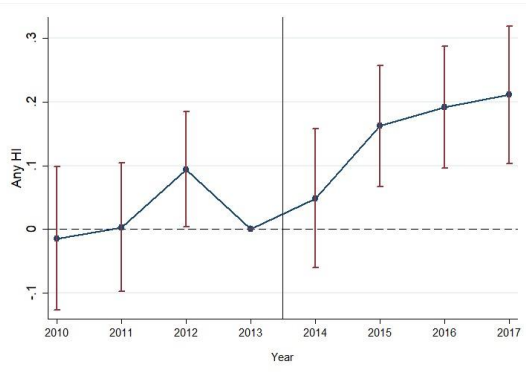


(e) Mortgage Payment (High Parti Sample)

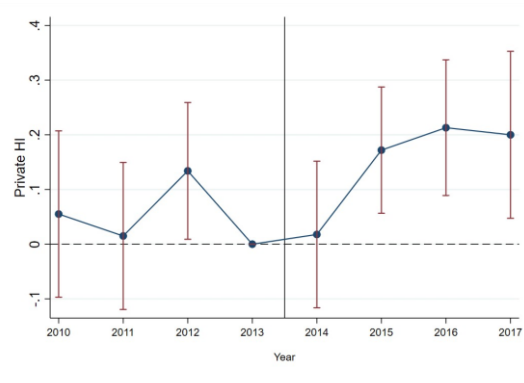


(f) House Value (High Parti Sample)

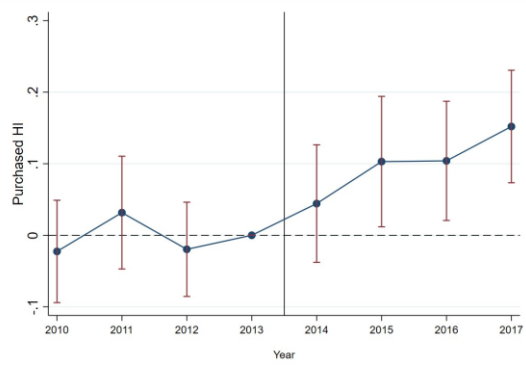
Notes: Above figures plot the dynamic response of mortgage holdings, mortgage monthly payments, and house values to the ACA Marketplace. Figure (a), (b), and (c) use the full sample. Figure (d), (e), and (f) use the high participate sample. Prior to its establishment, none of the estimates are significantly different from zero.



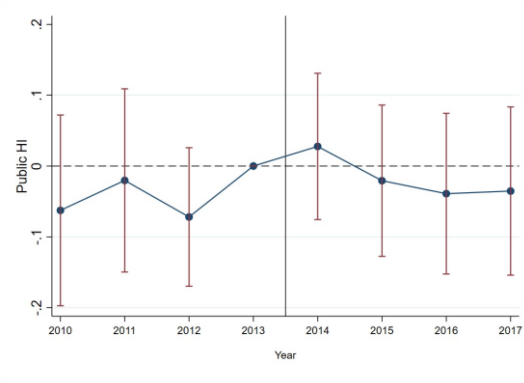
(a) Having any Health Insurance



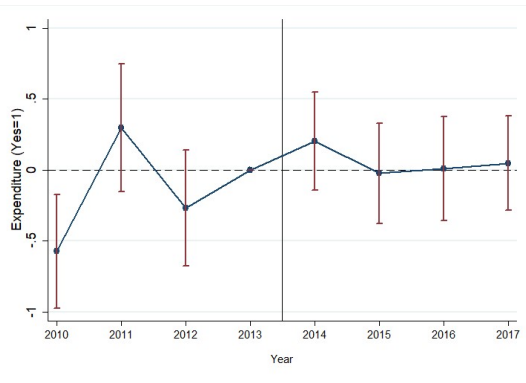
(b) Having Private Health Insurance



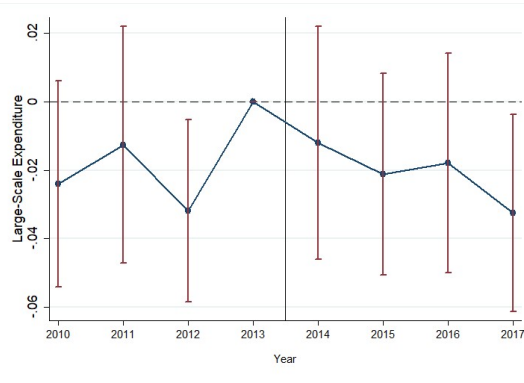
(c) Having Purchased Health Insurance



(d) Having Public Health Insurance



(e) Having Healthcare Expenditure



(f) Large-scale Healthcare Expenditure

Notes: Above figures plot the dynamic response of health insurance holdings and healthcare expenditures to the ACA Marketplace. Prior to its establishment, except the first period in the Figure (e), none of the estimates are significantly different from zero.

Appendix C. Main estimates under different clustering

In Equation 1, we use full dataset and cluster standard errors at the county level because the uninsured rate varies across counties. However, there may be concerns that 1) samples within the same state may have intra-group correlation, as counties within the same state may share some common characteristics. 2) Some counties in Florida and Texas have uninsured rates that are much higher than the national average. Thus, in Columns 1 and 2 of Table 10, we show the results of clustering standard errors to the state level. In Columns 3 and 4, we show results excluding the 1% extremes. All results are not significantly different from the estimates in the main text, proving the robustness of our estimates.

The effect of ACA Marketplace subsidies on the amounts of mortgage application and origination				
VARIABLES	(1) Mortgage Amount (Application)	(2) Mortgage Amount (Origination)	(3) Mortgage Amount (Application)	(4) Mortgage Amount (Origination)
Post*Unins_rate _2013	0.502*** (0.112)	0.413** (0.233)	0.490*** (0.151)	0.417** (0.202)
Observations	18,536,404	9,597,184	18,132,271	9,329,835
R-squared	0.446	0.341	0.443	0.337

Note: All regressions are controlled for applicant and tract characteristics, annual change of housing price, county fixed effect, and state-year fixed effect. Z_c include share of black, median family incomes, and housing price index in 2013. Standard errors are clustered at county level in columns 3 and 4, and at state level in columns 1 and 2. Columns 3 and 4 exclude counties with 1% extreme uninsured rates. Robust standard errors in parentheses *** p<0.01, ** p<0.05, * p<0.1.