The Price of Homeowners: An Examination of the First-time Homebuyer Tax Credit

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November 30, 2015

Abstract

A major policy response to the 2008 housing crisis was the First-time Homebuyer Tax Credit, worth up to $8,000. I estimate the tax credit increased first-time homeowners by 8.5 or 301,900 between April 2008 and September 2010 using an event study framework. Given an estimated deadweight loss of $7.4 billion, the government paid $24,180 per new homeowner. Compared to previous first-time homebuyers, these new homeowners are younger, cite "Changing Tenure Status" as the primary reason for moving for often, and use smaller downpayments. Only 14 percent of the 301,900 expedited their home purchase decision by a year or less. First-time homebuyers during the eligibility period do not buy more expensive houses or show increased default or prepayment risk after three years. State- and MSA-level FHTC effect size are larger in areas which experienced smaller housing busts, had lower mortgage delinquency rates, and higher housing supply elasticity. These local effects are strongly correlated with average home values, with a doubling in average home values implying a drop in effect size by 19.7 percentage points. I find only small and weak correlations with the tax credit effect size and changes in house prices, employment, or vacancy rates during the eligibility period.

JEL Classification Codes: R21, H5, I38

Keywords: Homeowners, Policy, Public Assistance

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1 Introduction

Home values dropped dramatically between 2006 and 2009, triggering the largest US financial crisis since the Great Depression. In response, the federal government passed a number of programs to boost the housing market. One of the largest of these programs was the First-time Homebuyer Tax Credit (FHTC). Between April 2008 and September 2010, the FHTC provided up to $8,000 to first-time homebuyers. Over 3.3 millionhouseholds claimed the credit at a cost of $21.1 billion. This paper estimates both national and local level FHTC effects sizes to quantify how many of these households were induced by the FHTC into homeownership and to understand where and why the tax credit was most effective.

Evaluating impacts of the FHTC is both challenging and important. While the 2006-2009 housing bust was nearly unprecedented at a national level, housing busts at a regional or local level are fairly common. The scale of the recent housing bust provided enough inertia for policymakers to test numerous policy prescriptions for future busts. However, disentangling the FHTC effects from other relief programs during this time period, such as the Home Affordability Modification and Refinancing Programs, quantitative easing, and the Troubled Asset Relief Program becomes, becomes quite difficult. I focus on isolating the response of first-time homebuyers to the tax credit to estimate FHTC effects, since no other program specifically targeted this group of households.

Several identification issues arise in estimating the FHTC effects. Both the Internal Revenue Service and the Government Accountability Office provide counts on the number of households claiming the FHTC, but these numbers do not inform us of how many households would have bought homes in the absence of the tax credit. Few data sources systemically track first-time homebuyers as a group. The first contribution of this paper is to create a national, quarterly time-series of first-time homebuyer purchases using data from the American Housing Survey (AHS). To track state- and MSA-level first-time homebuyers I combine mortgage origination data from Fannie Mae, Freddie Mac, and the Federal Housing Administration. Combined, these agencies have insured over eighty percent of mortgages originated to first-time homebuyers since 2008. Analyzing local variation in FHTC effects highlights where and why the tax credit was most effective and provides insight for future policymakers on how to improve program design.

To estimate FHTC effects I use both an event study and a difference-in-difference framework. I begin estimating FHTC effects by measuring the increase of first-time homebuyers during the eligibility period relative to historical and future trends. This effect is then verified by using high-income first-time homebuyers as a control group relative to low-income first-time homebuyers since the tax

credit imposed income limits. For local level estimation I also use a difference-in-difference framework using previous owners as a control group for first-time homebuyers. An event study strategy is less desirable at the local level due to shifting market share of the datasources of the FHTC eligibility period. Previous owners provide both a control for general time trends and the market share of Fannie Mae, Freddie Mac, and the Federal Housing Administration.

National FHTC effects are estimated both as a single effect and by iteration since the program underwent multiple revisions. Calculating the FHTC effect allows me to find the price of each new homeowner using program costs and their expected deadweight loss. By analyzing the drop in first-time homebuyers following the expiration of the program, I also estimate of the share of induced homeowners who expedited their homeownership transition by a year or less. These short-term substitutions are likely less valuable from a policy perspective than households which either would have been long time renters or become homeowners further from the FHTC end date.

Policymakers may be interested in other outcomes than just the extensive margin of the number of households induced into homeownership. For instance, tracking what part of the county the induced homeowners live in, their demographic characteristics, whether they increased their home size, broader economics effects on prices and employment, and their longer term outcomes as homeowners are all potentially important intensive margin FHTC effects. Even if the tax credit has small extensive margin effects, buying larger homes could similarly boost housing demand. Distributive outcomes of the tax credit are equally as interesting. The housing crisis was largely concentrated among a few states, and whether the FHTC was effective there is likely a key policy goal. Additionally, if the tax credit raised home prices then the benefit of the $8,000 is split between new home buyers and home sellers. Boosting homeownership has long been a policy goal in the federal government, but if the FHTC induced households in homeownership that either quickly transition back into renting or are foreclosed upon then the program benefits are dampened or even negative.

Survey data from the AHS provide insight into who the new homebuyers are, what house and mortgage they purchased, where they come from, and why they moved. I consider the housing tenure choices of households both by their previous tenure and by their homebuyer status to see where these households came from and look at average house price and downpayment amounts to look at what home and mortgage they purchased. And analysis of the answer to “primary reason for moving” sheds light onto what motivated the home purchase of first-time homebuyers.

State- and MSA-level effects are used to find out how well the FHTC targeted states hit hardest by the housing crisis, what housing market characteristics resulted in higher effect sizes, and if they are are correlated with economic variables to check whether the FHTC had broader effects on local

economies. Severity of housing crisis is measured both by peak-to-trough drop in house prices and the 2009 mortgage delinquency rates. Housing market characteristics include average home value, percentage of renters, housing supply elasticity, and the Wharton land use regulation index. Effect sizes are compared against changes in house prices, housing starts, employment, and the owner-occupied vacancy rate over the FTHC eligibility period. Loan-level mortgage performance data from is used to track first-time homebuyers outcomes relative to those of previous owners.

I find that the FHTC increased first-time homebuyer purchases by 301,900 or 8.5 percent between April 2008 and September 2010. An back-of-the-envelope deadweight loss estimate of $7.4 billionmeans the government paid $24,180 per induced homeowner. This effect was concentrated in the second two iterations of the tax credit, after it ceased requiring tax credit repayment and 14 percent of induced homeowners simply expedited their home purchase by a year or less. Induced homeowners were more likely to be younger and use a smaller downpayment, but did not buy more expensive houses or be exhibit higher default or prepayment risk. State- and MSA-level analysis reveal a negative correlation between FHTC effect size and magnitude of housing bust. A main driver of FHTC effect size was average home values, as more expensive states such as Hawaii and California displayed undetectable effects while less expensive states such as Nebraska or Oklahoma had over a twenty percent increase of first-time homebuyers. Both state effect size and FHTC utilization rate have only marginal correlations with house prices, housing starts, vacancy rates, or employment, suggesting the tax credit had little stimulus effects on local economies. Overall these findings indicate households clearly responded the tax credit while highlighting both the importance of policy design to target specific areas and revealing a high price of boosting homeownership.

2 The First-time Homebuyer Tax Credit

In 2008, Congress authorized the Housing Recovery Act that offered first-time homebuyers a tax rebate. Initially set to expire in July 2009, Congress expanded the tax credit as part of the 2009 American Recovery and Reinvestment Act and extended its deadline through November 2009. A final version of the FHTC was included in the Worker, Homeownership, and Business Assistance Act. Full details of each iteration of the FHTC are found in Table 1. The initial rebate offered the lesser of 10% of the home purchase price or $7,500 to first-time homebuyers either making under $75,000 for single households or $150,000 for joint filers, repayable over a fifteen year period.[1] The second FHTC iteration increased the maximum tax credit to $8,000 and changed the rebate to non-repayable tax

[1]The tax credit is phased out in the $20,000 income range above each cutoff point.

credit, significantly increasing its value. The third FHTC iteration loosened income limits for single households to $125,000 and to $225,000 for joint filers, as well as offering the tax credit to previous owners in addition to first-time homebuyers. While the third iteration made the tax credit available to most households, this paper will focus only on the effects to first-time homebuyers.

Several rationales could justify offering a tax credit to new homebuyers during a housing bust. As house prices decline, more mortgages drop into negative equity which increase the likelihood of delinquency and foreclosure. These foreclosed homes flood the supply of owner-occupied housing relative, pushing home values down further and in turn pushing more mortgages into negative equity. To stop this cycle these vacant homes need to be filled by families not already living in an owner-occupied home. A tax credit subsidizing home purchases encourages renters to do exactly that. Further, the FHTC may persuade those already planning on becoming a homeowner to purchase a larger house and obtain better financing terms by increasing the downpayment amount. The FHTC could be an effective tool to distribute an economic stimulus during a time of weak demand. New homeowners are likely to have little remaining savings, and so may be particularly eager to spend new money.

Tax credits or rebates are a common policy tool to affect consumer behavior. A federal homebuyer tax credit had not previously been implemented. At the local level I am only awaree of a first-time homebuyer tax credit offered in Washington D.C. worth $5,000 between 1997 and 2001. A policy brief on the tax credit reported mostly positive results and cited a greater increase to DC house prices compared to surrounding areas (Tong, 2005). A recent comparable tax credit to the FHTC is the “Cash for Clunkers” program of 2009, which offered households $3,500 or $4,500 to subsidize new car purchases. Mian and Sufi (2010) find the program significantly boosted auto sales, though this boost was largely an inter-temporal shift in when cars were purchased, and had negligible effects on employment, house prices, or home default rates. Examining the 2001 federal tax rebate using survey data, Shapiro and Slemrod (2001) find most households either saved or used the tax rebate to pay down existing debt. However, Agarwal et al. (2007) use credit report data to find that while households saved and paid down debt in the short term, their spending increased shortly after with 40% of the tax rebate being spent within nine months of received it. Ideally, to boost housing demand households would use the FHTC to either buy a home they would have otherwise rented or purchase a larger home. These studies suggest that only a fraction of the tax credit would go towards increased spending, housing or otherwise, and many of those claiming the credit may just be expediting their home purchase by a year or less.

A 2010 GAO report on the FHTC reports 3.3 millionhouseholds claimed the federal first-time

homebuyer tax credit between 2008 and 2010.[2] States with the highest utilization rates are located in the Mountain and Midwest regions. These areas have on average lower home values and higher homeownership rates. However, separating the FHTC effect size from its utilization rate is important as states high homeownership rates naturally would have higher utilization, however may in fact have fewer households induced into homeownership. Utilization is important for account where money from the FHTC was distributed to, similar to an income shock to an area that may affect a wide array of economic variables. The FHTC effect on homeownership is more a direct shock to the housing market and provides new information on household decisions regarding the rental to ownership transition.

Open debate exists as to the effectiveness of the FHTC. In evaluating the FHTC, Baker (2012) states:

> There can be little doubt the the first-time homebuyer tax credit had a large impact on the country's housing market. Sales took off immediately after the credit took effect...The result was that many people were persuaded to buy homes at bubble-inflated prices who would have otherwise purchased them at prices that were more consistent with the longer-term trends in the housing market. This amounted to a substantial transfer of wealth from new homebuyers to home sellers.

The correlation between the timing of the FHTC and home sales can be seen in Figure 1, particularly among existing homes. The spike in sales is especially prevalent in the final months before the expiration of the credit in November 2009 and June 2010. While this indicates homeowners were responding the FHTC, the spike may simply reflect a short-term inter-temporal shift in home purchases rather than a boost to overall home sales.

Existing literature examining the FHTC is scant. Two 2013 reports offer a first look at the topic, Dynan et al. (2013) and Dynan et al. (n.d.). Dynan et al. (2013) evaluates the FHTC in two ways, first by comparing observed housing indicators to realized values and second using state variation in home values within a difference-in-difference strategy. Using forecasting techniques, Dynan et al. (2013) finds a large positive effect of the tax credit, though forecasting during the turbulent 2008-2010 period is difficult, and finds mixed results using the difference-in-difference approach. Dynan et al. (2013) then uses state variation of offered supplemental policies to find states which offered short-term loans or credits to have a positive effect on the housing market. While these papers offer an interesting first look at the effectiveness of the FHTC, the lack of a credible identification strategy limits the strength of its results.

[2]Note these numbers differ somewhat from what the IRS reports, though IRS only reports for 2009 and 2010.

Since the FHTC is a national program, finding an appropriate control group to measure its success is difficult. Housing market indicators shown in Figure 1, display little correlation with the FHTC. Though this time period saw the initial recovery of the housing market, the FHTC was only one of a plethora of housing-market initiatives during this time period, making identification of the effect of the credit by itself difficult. To isolate the effects of the FHTC, I utilize variation in elgibility for the FHTC over time, homebuyer status, and income levels.

3 Data and Empirical Implementation

Key to isolating the FHTC effects are separating the actions of first-time homebuyers relative to previous homeowners. Surprisingly few datasources systematically track US first-time homebuyers. An often cited source comes from the annual Survey Profile of Homebuyers and Sellers published by the National Association of Realtors. Figure 2 compares the AHS first-time homebuyer share of purchases to that reported by the NAR. The two data sources report similar levels and trends of first-time homebuyer shares between 2003 and 2013, beginning near forty percent early and increasing to near fifty percent in 2009 and 2010 before decreasing again.

This study uses multiple of datasources to construct a time-series of first-time homebuyers at national and local levels. At a national level, the American Housing Survey provides the share of movers each month which are first-time homebuyers as well as the monthly distribution of movers with each year. This data is then scaled annually using mortgage data from the Home Mortgage Disclosure Act to complete the time-series. To study state and MSA level effects, a monthly first-time homebuyer time-series is constructed using data from three large government entities: Freddie Mac, Fannie Mae, and the Federal Housing Administration. Following the housing bust, these three entities significantly increased their role in the mortgage market, particularly among first-time homebuyers.

3.1 First-time Homebuyers Nationally

Data for the primary analysis of the FHTC comes from the American Housing Survey. The AHS began in 1973 and biennially surveys roughly 55,000 housing units nationally, focusing on housing related issues. Of particular interest for this study, the AHS asks households which moved within the past two years whether they have ever owned a home before moving, when the move occurred, the downpayment amount, and the current tenure status. Between 2001 through 2013, 23,162 AHS household fall into this “recent mover” sample or about 500 households per quarter. As an important

note, both FHTC eligibility and the other housing agency datasources consider households that have not owned a home in the past three years to be "first-time homebuyers". This is different than my definition based on the AHS, where first-time means "never have owned a home before". Thus a small percentage of previous owners in the AHS are eligible to claim the FHTC.

I construct a quarterly, national estimate of first-time homebuyers and previous owners using a three-step procedure. First, for each quarter I determine the share of movers obtaining a mortgage each quarter that are first-time homebuyers, weighing observations using AHS sample weights to reflect a nationally representative sample. Using first-time homebuyer shares instead of raw counts reduces bias in the estimation because the AHS has an uneven staggering of interviews by quarter. These share of each mover type, first-time homebuyers and previous owners, each quarter are scaled by the total number of mortgage originated each year according to Home Mortgage Disclosure Act data.[3] Lastly, to obtain total home purchases the count of mortgage originations each quarter by buyer type are scaled by the share of movers reporting cash-only purchases by buyer type. I additionally create quarterly home purchase time-series by homebuyer status and income level, splitting the sample into "high" and "low" income at an annual income cutoff of $85,000.[4] First-time homebuyers below this cutoff had greater likelihood eligibility for the FHTC before November 2009 while most households were eligible to claim the FHTC between November 2009 and September 2010.

Figure 3 displays home purchases by homebuyer status at an annual rate, and the first-time homebuyer quarterly series, with vertical lines marking FHTC implementation dates. The left-hand panel shows that first-time homebuyer purchases peaked in 2004 before declining each year until 2010, though home purchases by previous owners dropped significantly more than first-time buyers. The right-hand panel zooms in on the seasonally-adjusted quarterly rate of first-time homebuyer purchases between 2003 and 2012. While FHTC effects appear subtle in 2008, there is an increase in 2009 and 2010 before expiration is observed. The 2009 increase is not observed among previous owners, implicating the role of the FHTC. Figure 4 shows first-time and previous owner home purchases split by income level. Focusing on first-time homebuyers, the 2009 increase is concentrated among lower-income households, while high income households home purchases increase in 2010 after the income eligibility requirements are relaxed. The timing of this trend among first-time buyers, along with no similar pattern among previous owners, provides supporting evidence that the first-time homebuyers in Figure 3 are responding specifically to the FHTC as opposed to other possible confounding factors.

In addition to a count of first-time and previous owner home purchases, the AHS data provides insight

[3]Home Mortgage Disclosure Act mortgage origination counts are restricted to owner-occupied, first-lien, purchase mortgages. This data do not report first-time homebuyer status, and prior to 2003 do not report lien status.

[4]Home Mortgage Disclosure Act data were similarly cut for scaling AHS data to the national level.

into what type of households the FHTC induced into homeownership, where they came from, and where the money was spent. Figure 5 shows the share of households moving into new rental units or owner-occupied housing, split by whether the household previous owned a home or rented. Here we see that both previous renters and owners had a small increase in the share of movers becoming homeowners during the second and particularly the third iteration of the FHTC. Figure 6 displays the share of new homeowners by previous tenure and buyer status. During the FHTC, first-time homebuyers were more likely to move from rental units or from free rent arrangements relative to the post-FHTC time period. The AHS asks recent mover households what their primary reason for moving was. During the first and second iterations of the FHTC, the percentage of first-time homebuyers cited "Changing Tenure Status" peaked at thirty percent, an increase of nearly fifty percent relative to the two years prior or following the FHTC. Other possible moving reasons such as "Establishing a New Household" or "Moving to a Bigger or Better House" experienced similar spikes during the FHTC eligibility period. Figure 7 displays the average age of first-time homebuyers between 2003 and 2013. Over the decade, the average age of first-time homebuyers has increased steadily by nearly three years to 35.5, reflecting the general US trend of delaying homeownership. However, this average age drops by nearly a full year during the second FHTC iteration, suggesting induced homeowners were younger than typical first-time homebuyers.

To investigate what first-time homebuyers did with their tax credit, Figures 8 and 9 display the log of average home price and downpayment size by homebuyer status over time. On average, first-time homebuyers did not buy more expensive houses during the FHTC eligibility period than the year before or after the tax credit, nor did the difference between previous owners and first-time homebuyers differ from its time trend. Similarly, Figure 9 shows first-time homebuyers were not more likely to put more money down on their home purchase during the tax credit. In fact, putting down five percent or less is more common during the eligibility period than after, likely a result of the increasing influence of the Federal Housing Administration and their less stringent downpayment requirements.

3.2 First-time Homebuyers Locally

Equally as interesting as the national FHTC effects is the variation across local markets in FHTC effect sizes. The tax credit was created in direct response to the housing and financial crisis, but these crisis hit some regions, such as California, Florida, Arizona, and Nevada, much harder than others. To both evaluate the effectiveness of the FHTC as well as consideration of the policy for future housing busts I estimate state- and MSA- level effects and compare these effects to local housing market conditions, measures of housing bust severity, and changes to local economic conditions.

AHS sample size is far too small to create state- or MSA- level first-time homebuyer purchase time-series. Instead I track state- and MSA- level home purchases from mortgage origination purchased or insured by the Federal National Mortgage Association, the Federal Home Loan Corporation, and the Federal Housing Administration (also known as Fannie Mae, Freddie Mac, and the FHA respectively). These agencies account for a majority of owner-occupied, first-lien, purchase mortgage originated since 2008, particularly among first-time homebuyers.

Fannie Mae and Freddie Mac are government-sponsored enterprises which guarantee mortgages made by financial institutions. Both Fannie Mae and Freddie Mac report annual mortgage originations to the Federal Housing Finance Authority which include property location information and a first-time homebuyer indicator. This data is publicly available. To estimate the distribution among quarters from the annual data, I use a publicly-available sample of loan-level data provided by each company which includes the date of first mortgage payment, property location, and an first-time homebuyer indicator. This data also tracks performance of the loan through 2013, including whether the loan has been prepaid or how many months behind payments become.

The FHA insures mortgages meeting criteria geared towards lower-income households. The agency has seen its role in mortgage financing increase dramatically following the housing bust and the collapse of private subprime lending, playing an especially critical role for first-time homebuyers. Data on all FHA mortgages originations and their performance between 2003 and 2013 was obtained from the Department of Housing and Urban Development through a freedom of information act request. The dataset includes thirteen million mortgages insured by the FHA between 2003 through 2013, and includes a flag for first-time homebuyer status, origination date, and property location.

Combining data from Fannie Mae, Freddie Mac, and FHA covers a large share of the US mortgage market. Figure 10 shows the quarterly market share of the Fannie/Freddie, the FHA, and other lenders by homebuyer status between 2004 and 2013.[5] A couple important facts stand out from this figure. One is that the market share of these three enterprises has changed significantly over time, particularly among first-time homebuyers. Since 2008, well over eighty percent of first-time homebuyers purchased a home using mortgage financing backed by the FHA or GSEs. The other important observation is that the Fannie/Freddie/FHA market share rose quickly and significantly during the initial FHTC implementation period. This large shift contaminates using the pre-FHTC period as a control group for measuring FHTC effects. Instead, given the relative stability of Fannie/Freddie/FHA first-time homebuyer market share after the crisis, I focus on the during and post-FHTC eligibility periods to estimate effect sizes.

[5]The Other share is calculated using AHS total quarterly home purchase counts by homebuyer status and subtracting off the FHA and Fannie/Freddie origination counts.

4 Methodology

This section outlines the FHTC effect estimation strategy. I employ both an event study and a difference-in-difference approaches to estimate national and local effect sizes.

I begin with an event study framework to estimate national FHTC effects using the following equation:

$$Y_t = \beta_0 + \delta Treat + \lambda \mathbb{X} + \varepsilon_t \tag{1}$$

Y_t is the outcome of interest, the log of first-time homebuyer purchases at time t, $\mathbb{X}$ contains variables controlling for time trends and ε_t is an error term. The treatment effect, δ, represents the treatment effect from the FHTC. *Treat* and δ are three-dimensional vectors that change depending on whether estimating a single or separate FHTC effects. When estimating a single effect, *Treat* is equal to one during the FHTC eligibility period from the second quarter of 2008 through the third quarter of 2010, and δ has a single value. When estimating separate effects, each dimension in *Treat* is a dummy variable equal to one during each implementation eligibility period and $\delta = \{\delta_1, \delta_2, \delta_3\}$.[6]

To estimate the number of short-term intertemporal home purchase substitutions from the year after the FHTC expired, I use two methods. In the first, I include a substitution effect in Equation (1), *Post-FHTC*, in the year after the FHTC expires. Assuming that substitutions are more costly moving further from the expiration of the tax credit, *Post-FHTC* declines in size linearly across the year essentially allowing for a missing wedge in the home purchase time-series. The other method estimates Equation (1) excluding the time period from the beginning of the FHTC through a year afterwards, allowing for a quadratic time trend. I then predict first-time homebuyer purchases in the absence of the tax credit and take the difference between the predicted and realized values in the year after the FHTC to measure the missing density of first-time homebuyers.

FHTC effects are also estimated using the following difference-in-difference equation:

$$Y_{i,t} = \beta_0 + \beta_1\ Group + \beta_2\ Treat + \delta(\ Treatx\ Group) + \lambda \mathbb{X} + \varepsilon_{i,t} \tag{2}$$

where *Group* is a dummy equal to one the treated group and *Treat* is as defined above. *Group* is defined either by income levels, high or low, or by homebuyer status, first-time or previous owner. As in Equation (1), $\mathbb{X}$ contains time trend control variables and $\varepsilon_{i,t}$ is an error term for each group i in time t. δ is the outcome of interest, the treatment effect of the FHTC on the effected group.

[6] I specify implementation one from 2008q2-2008q4, implementation two from 2009q1-2009q4, and implementation three from 2010q1-2010q3.

5 Results

In this section I present event study and difference-in-difference results of FHTC effects on first-time homebuyer purchases between April 2008 and September 2010. I begin by discussing national level estimates overall and by iteration, and calculating the price paid per new homeowner. I then present state- and MSA- level FHTC estimates and investigate causes for differential effectiveness across areas. These local effects are lastly correlated with changes in macro variables to look for broader effects of the FHTC.

5.1 National FHTC Effects and the Price of Homeowners

Table 2 reports both the single and by iteration FHTC effect estimates using event study framework from Equation (1) with the AHS first-time homebuyer times-series. The main specification in Column (1) finds that the FHTC increased first-time homebuyers by 8.5 percent during its eligibility period, equating to 301,900 new homeowners. The main specification allows for a quadratic time trend to allow for a gradual level shift in first-time homebuyers before and after the housing crash, and Columns (2) and (3) differ from (1) by removing the post-FHTC control and removing time periods to the FHTC respectively. Columns (4) and (5) consider only the during- and post-FHTC time periods and allow for only a linear time trend. While the national FHTC effect varies from 4.3 to 15.4 percent, all specifications find positive effect of similar magnitude. As the bottom level of Table 2 shows, the FHTC effect is only seen after the tax credit became non-repayable in the second and third FHTC iterations, with statistically significant effects of 14.1 and 14.5 percent. The main specification finds a relatively small post-FHTC effect which translates in an estimated 41,000 homeowners or 14 percent of the total effect resulting from first-time homeowners speeding up their home purchase by a year or less.

Table 3 reports both the single and by iteration FHTC effect estimates using the difference-in-difference framework across income levels from Equation (2). As expected, these estimates find the FHTC effects to be concentrated among lower income households more likely eligible for the tax credit, with effects sizes ranging from 18.5 to 24.6 . As the lower panel shows, these effects are again consistently estimated higher in the second iteration of the FHTC relative to the first. After high income households become eligible for the tax credit in the third iteration, the differential between high/low income household in fact reverses to become slightly negative, though statistically insignificant. One difference between Table 3 and Table 2 is the much higher effects of the first FHTC iteration. This may be attributed to a shifting underlying distribution of households across

these income levels, as income were falling during 2008. That potential shift may distort the difference-in-difference estimates, however the basic facts that the boost in first-time homebuyers was concentrated among lower-income households, with a higher response in the second iteration, and the presence of a higher-income effect in the third iteration all lend supporting evidence that effects found in Table 2 are the direct result of the FHTC.

Policymakers considering responses to housing busts must consider the cost effectiveness of their choices. While the FHTC may have had a number of effects on the market, considering the number of new households it induced into homeownership must be a first-order priority. A present two calculations of the "price of homeowners" paid by the FHTC. Nationally, I estimate the program induced 301,900 new first-time homebuyers. With around 3.3 millionfirst-time homebuyers eligible to claim the credit, direct expenditures are roughly $21.1 billion.[7] This translates into paying $69,890 per new homeowner, though most of this is a direct transfer of wealth to first-time homebuyers.

When considering social welfare implications of the tax credit, the FHTC cost is better represented by the deadweight loss associated with the program. To estimate FHTC deadweight loss I combine literature estimates of the marginal cost of raising revenue and the expected deadweight loss of altering the decisions of previous renters. Ballard et al. (1985) find the deadweight loss of raising tax revenue to be between seventeen and fifty-six cents on the dollar, which I approximate as thirty cents. A rough estimate of the deadweight loss from altering renters decisions is half the value of the claimed tax credit. The logic is as follows: assume all renters begin some $X distance from preferring to be homeowners. The tax credit induces those with $X less than $8,000 to switch to homeownership. The deadweight loss is then the sum of $X across induced homeowners. If we assume a uniform distribution across $X between $0 and $8,000 among induced homeowners, the deadweight loss is half the value of the claimed credit. Combining these two sources of deadweight loss totals $7.4 billionand translates to a price per homeowner of $24,180 .

Considering whether $24,180 is a reasonable price to pay for homeowners is a difficult quesiton to answer. This paper only begins to answer welfare benefits from the FHTC by measuring the extensive and intensive margin responses of households to the credit. Quantifying the benefits of damnpening the drop in home values or restoring consumer confidence is logical, though difficult, next step. However, one reason homeownership has long been a federal policy goal is the expected positive externalities stemming from homeownership, such as better citizenship and home upkeep. A recent paper, Coulson and Li (2013) measures the annual positive externality from homeownership,

[7]Note that the first iteration of the tax credit is repayable over fifteen years. I discount claims during this iteration at a discount rate of 0.95. Consistent with the rest of the study, I exclude any effects or costs of the tax credit expansion to previous owners in the FHTC third iteration.

capitalized into neighborhood home values, to be $1327 annually. If each induced FHTC induced homeowner is expected to be a homeowner ten more years than without it, and discounting by a 0.95 rate, then they add $10,650 of value to the area. This benefit alone is nearly half the price of buying a homeowner. Additionally, we should consider what would happen to the vacant homes if they are occupied by new homeownerships. An evaulation of the recent Neighborhood Stabilization Program lues in declining areas may have been to demolish vacant or foreclosed homes. A recent evaluation of the Neighborhood Stabilization Program, Spader et al. (2015), find that on average it costs local governments around $11,000 to demolish vacant homes.

5.2 Outcomes of First-time Homebuyers

Aside from measuring the extensive margin effects of the FHTC on inducing households into homeownership, policymakers may care about outcomes of these new homeowners. For instance, if households on the margin between renting and owning are less financially prepared to handle costs associated with homeownership or simply have a lower preference for homeownership they may more likely to default on their mortgage. Foreclosures are costly to local governments, banks, and residential neighbors and likely to negate any positive benefit that increasing homeownership rates may have provided. Similarly, these new homeowners may limit FHTC benefits on increased homeownership if they quickly transition back to renting.

To examine the outcomes of first-time homebuyers, I use the loan-level mortgage pereformance data from Fannie Mae, Freddie Mac, and the Federal Housing Administration. Figure 11 shows the difference between first-time homebuyers and previous owners in delinquency and prepayment rates after two, three, and four years after origination. Previous owners are used to control both for changes in house prices and credit availability across cohorts. Overall, delinquency rates of first-time homebuyers are lower than that of previous owners during the FHTC eligibility period, reversing the trend prior to 2008. Transitions across FHTC implementation dates are mostly smooth, suggesting limited effects of the FHTC on delinquency. However two possibly troubling observations should be noting. One is the increase in increase in first-time homebuyer delinquency relative to previous owners beginning in January 2009 and the other is the jump in first-time homebuyer delinquency beginning in the fourth year after origination in 2009. More time needs to pass before these effects could be more accurately measured, but may raise some concerns if they persist. While neither effect is large in magnitude, even small changes in delinquency rates can impose significant costs to banks and governments. Prepayment rate differences in Figure 11 are both too noisy and too short since origination to draw strong conclusions about FHTC effects. These initial outcomes do show large

differences between the two year and the three and four year prepayment rates during the FHTC eligibility time period, with the first-time homebuyers difference on prepayment being much higher rate during the first two years after origination. The cause of this difference needs to be explored further, as the data do not track whether prepayment is the result of refinancing or moving to a new home and most interestingly, if that new home is owner-occupied or a rental. The two year prepayment difference is particularly puzzling since households receiving the FHTC must repay the tax credit if they move within three years after buying the home.

5.3 State and MSA FHTC Effects

While I find the FHTC increased first-time homebuyers by around 8.5 percent overall, we are also interested in its distributional impacts across the US. For example, did areas hit harder by the housing crisis have larger responses to the tax credit? What aspects of local housing markets predict a higher response and what can we infer from it? Do larger FHTC effects correlate positively with changes in employment or house prices during the tax credit? Or negatively after the credit expired? To answer these questions I use the Fannie/Freddie/FHA state- and MSA-level first-time homebuyer data to estimate Equation (2) using previous owners as a control group. I focus my analysis on the average FHTC effect size during the second and third iterations of the FHTC, since national results indicate only minor to zero response during the first iteration.

Figure 12 displays state level results, with darker colors representing larger FHTC effects. Overall, Midwestern and Southern states experienced the largest impacts while Western and Northeastern states displayed milder effects. Figures 13 and 14 plots both state- and MSA-level effects against the peak-to-trough house price drop during the housing crisis, as reported by the FHFA Purchase-Only House Price Index, and the 2009 mortgage delinquency rate.[8] These graphs display a negative correlation between FHTC effect size and housing bust magnitude, and alternative estimation specifications yield a similar trend. Among the four states hit the most hardest by the crisis, only Arizona displays an above median FHTC effect, and overall the expected FHTC effect among states with the most mild housing busts was double the expected affect among states with the most severe housing busts.

Next, I compare FHTC effects to housing market characteristics. The FHTC provided the lesser of $8,000 or 10% of the home purchase price. Average home values in the US are near $250,000

[8]This delinquency rate is calculated among a sample of 2 million mortgages managed by the Wells Fargo Trustee, originated in 2005 or 2006, often referred to as the Corporate Trust Services data. While this delinquency rate is taken from a group of subprime borrowers, a similar ordering of states is found among prime borrowers as well.

meaning a large majority of households claiming the credit received the full $8,000. Since home values differ greatly across local housing markets, this means that lower home value areas such as Nebraska and Iowa effectively received a higher treatment effect than higher value areas such as California and Hawaii. Figure 15 plots FHTC effects against the log of average 2009 state and MSA home values.[9] As expected, there is a strong negative correlation between FHTC effect and land value. Regressing average land value on effect size yields a statistically significant coefficient of -0.197 at the state level and -0.178 at the MSA level.[10] This implies that moving from an area fifty percent more expensive, such as from Tennessee to Massachusetts, reduces the expected FHTC effect by almost ten percentage points.

Figure 15 also provides an estimate of what results counterfactual FHTC policies would have yielded. The current design of offering $8,000 on average US home values of $250,000, Figure 15 predicts around a fourteen percent effect, the same as the effect found for the second and third iterations of the FHTC. These results suggest that altering the tax credit to be a percentage of home value rather than a fixed amount and offering 5% of the home value would have increased the FHTC effect to 23.3% or 494,000 total induced new homeowners. Offering a percentage of the home value would have additionally eliminated the tilt of FHTC effects towards lower home value areas and in turn better targeted the housing bust states.

Since variation in average home values alters the treatment effect of the FHTC across areas, other housing market characteristics will be considered using the residual after regressing FHTC effect size on average home value. Figure 16 plots the FHTC effect residual against the percentage of households which were renters according to the 2009 American Community Survey. Ex ante, one could argue the group of renters changes as a higher fraction of household rent in a way that would correlate with a higher expected response to the FHTC. However, I observe mixed and weak evidence that areas with a higher fraction of renters responded any differently than areas with a lower fraction of renters.

I also consider the role housing supply elasticity and land use regulation might have played in the FHTC response. Figure 17 plots the FHTC effect residual against a measure of housing supply elasticity reported by Saiz (2008) and the Wharton Land Use Regulation index as detailed in Gyourko et al. (2008). While only a slight positive correlation is found between higher regulation and effect size, a stronger positive correlation is observed with housing supply elasticity. Metro areas with the least elastic housing supply such as Miami and Los Angeles experienced a ten percentage point

[9] Home value data provided by the Lincoln Land Institute, and can be obtained at `http://www.lincolninst.edu/subcenters/land-values/`. Effect size is the average from the second and third FHTC implementations only.

[10] MSA level correlation reported if looking at areas with populations greater than 1,000,000 (n=51). Restricting to population greater than 500,000 (n=102) estimate is -0.122.

smaller effect on average than areas with the most elastic housing supply such as Kansas City and Charlotte, even after accounting for differences in average home value. This indicates that potential first-time homebuyers were more responsive in areas they could build new homes as opposed to moving into existing or vacant homes.

Lastly, I consider FHTC effects on house prices, employment, housing starts and owner-occupied vacancy rates. Figures 18 and 19 plot the average monthly percentage change to these four variables against the FHTC effect size and FHTC utilization rate by state respectively.[11] The FHTC effect size is the same as calculated above and represents the extensive margin impacts of the additional new homeowners induced by the FHTC, while the GAO utilization rate represents the intensive margin or stiumulus FHTC effects by counting the number of households claiming the tax credit according to a September 2010 GAO report as a percentage of the total population.[12] Both Figures 18 and 19 show a small and statistically insignificant correlation between changes in house prices and FHTC effect or utilization and implies that increasing the utilization rate by a standard deviation would increase house prices by 0.67% each month during the credit. Similarly weak and insignificant correlations are found between the FHTC effects and changes to housing starts, employment, and owner-occupied housing vacancy rates. While is should be noted that on average state had a 1.1% increase in house prices and an average decrease in vacancy rates during the FHTC, since the variation of these state-level effects are not significantly correlated with either the increase or level of first-time homebuyers it is difficult to attribute these changes to the FHTC.

6 Conclusions

This paper studies the effects of the First-time Homebuyer Tax Credit. At a national level, I find the tax credit increased first-time homebuyers by 8.5 percent for a total of 301,900 households induced into homeownership between April 2008 and September 2010. This effect was concentrated between January 2009 and September 2010 after the tax credit was no longer repayable, and splitting the sample based on income verifies only eligible households responded to the tax credit. Given total program expenditures are roughly $21.1 billion, I approximate the deadweight loss of raising that revenue combined with altering households decisions to be $7.4 billion. This translates into paying

[11] House price data comes from the FHFA Purchase-Only house price index, while state employment and housing starts data are provided by the Bureau of Labor Statistics and the Census Bureau respectively. Annual housing vacancy rates are taken from the Census Bureau. The shock to each variable is calculated as the average monthly residual during the second and third FHTC iterations from predicting the time-series using a quadratic time-trend.

[12] The GAO report can be found at:`http://www.gao.gov/new.items/d101025r.pdf`

$24,180 per induced homeowner.

Survey data provide no evidence that first-time homebuyers receiving the tax credit bought bigger houses or put more money in the downpayment relatie to before or after the tax credit, but did cite "Changing Tenure Status" more frequently as the primary reason for moving. State- and MSA-level analysis find the tax credit was more effective in areas with lower housing values and more elastic housing supply, while land use regulation and a higher rental percentage were not predictors of effect size after accounting for home value.

These findings highlight several important issues regrading the federal response to the US housing crisis, in particular the importance of targeting and the high cost of homeowners. Households clearly responded to the credit, however given that for every induced first-time homebuyer the tax credit was paid to six always-movers, considering more efficient ways to targeted households on the margin between buying and renting or in housing bust areas would improve program performance. That induced homeowners were not more likely to prepay or default on their mortgage suggests that many current renters could handle the financial challenges of homeownership.

A future FHTC improvement would be better to target housing bust areas by altering the tax credit payout structure. The 2008 housing busts states were in relatively high-cost areas and so could have been better targeted by raising the maximum award dollar amount but lowering the highest percentage of the purchased home value it could be. Changing the tax credit to pay up to %5 of the home value, uncapped, would have shifted a greater percentage of new homeowners to California and Florida and away from the Midwest and the Southern states. Housing busts are typically accompanied by high foreclosure and vacancy rates, so targeting could be improved by additionally requiring or incentivizing moving into a foreclosed or vacant home.

The FHTC has also lent insight into the decision homeowners face between purchasing or renting their home. The own or rent housing decision is a research area in need of further exploration as the US homeownership rate has receded to its lowest rate since 1995. The differential cost between owning and renting housing is not well defined and certainly heterogeneous. A deeper look at the FHTC considering credit history, expected tenure duration, and income trajectory and uncertainty could feasibly provide a better understanding and estimation of this cost. For policy relevance, the mortgage interest deduction remains a hot political issue and one of the largest US tax breaks costing $70 billion each year. Those believing $69,890 price for homeowners is high should remember that it cuts both ways and means the federal government could receive a similarly high price for selling homeowners by reducing or eliminating the mortgage interest deduction or other homeownership benefits.

The focus of this paper has been to quantify the housing response of first-time homebuyers to the

FHTC. I find a moderate impact of the tax credit on the extensive margin of inducing new homeowers, while finding no evidence on the intensive margins of these new homeowners buying bigger houses, putting more money down, or having worse mortgage outcomes. The paper did not other possible motivations for tax credit other than inducing homeownership or raising home values, such as providing economic stimulus or a redistribution of income. A full welfare analysis of the program, which is beyond the scope of this paper, would need to incorporate these aspects.

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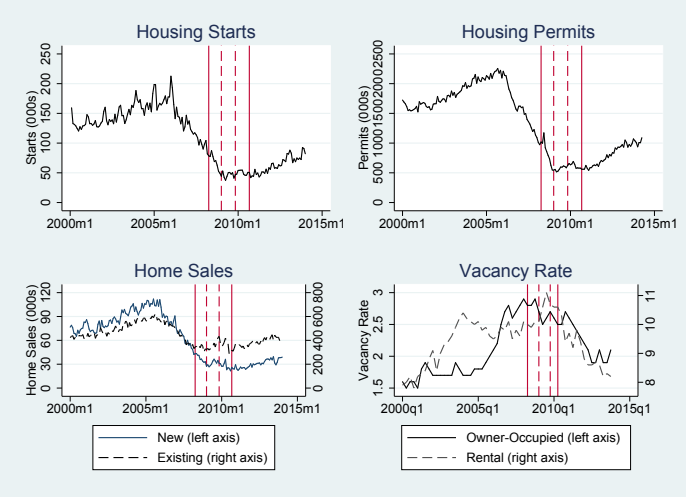
Figure 1: US Housing Market Indicators 2000-2014

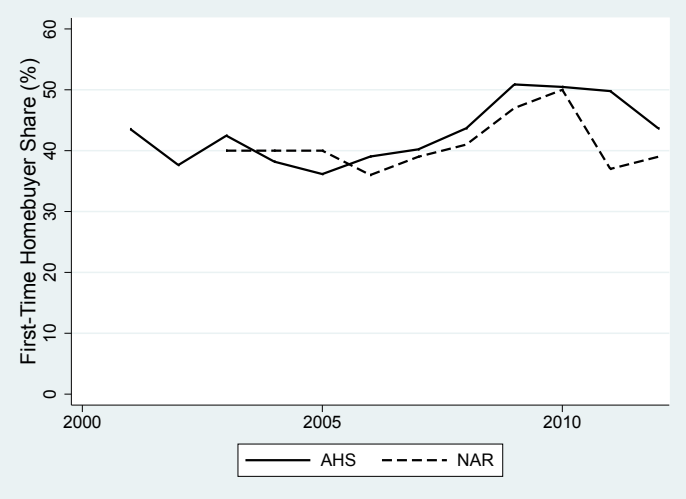


Notes: This figure displays US housing market indicators between 2000 and 2014. The top left and right panels display seasonally-adjusted US housing starts and permits respectively. The bottom left panel displays seasonally-adjusted US home sales of new and existing sales, and the bottom right panel displays owner-occupied and rental housing vacancy rates. Solid vertical lines reflect FHTC start and end dates and dashed lines represent iteration start dates.
Source: Census Bureau, National Association of Realtors.

Figure 5: New Housing Tenure Shares, by Previous Tenure

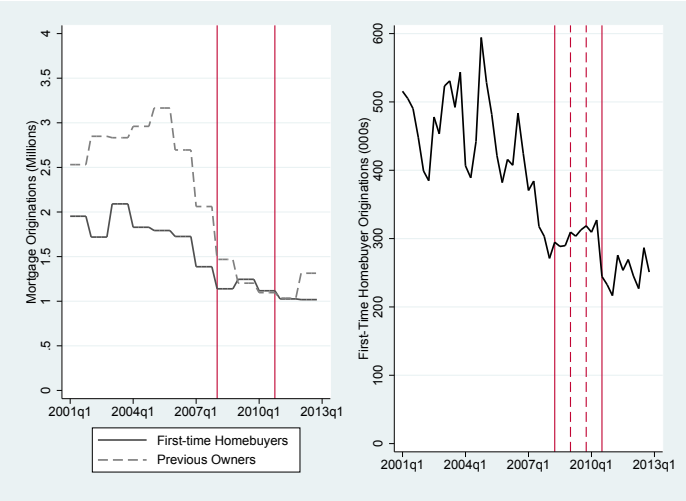
Notes: This figure displays new housing tenure shares among movers, by year and previous tenure status. Based on AHS data using sample weights and smoothed with a local polynomial. Solid vertical lines represent FHTC start and end dates and dashed lines represent each iteration date.
Source: American Housing Survey

Figure 2: First-Time Homebuyer Share, NAR vs. AHS



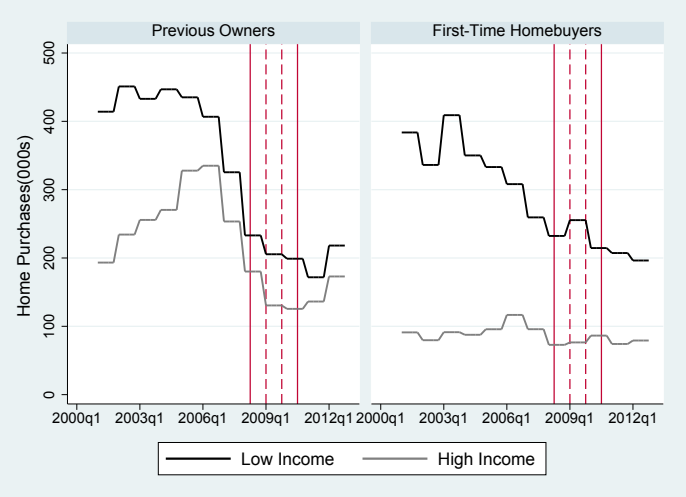
Note: This figure compares the percent of recent homebuyers reporting to be first-time buyers in the AHS survey data and NAR Profile of Homebuyers and Sellers. AHS first-time homebuyer share based on year of moving date.
Source: American Housing Survey, National Association of Realtors Profile of Homebuyers and Sellers.

Figure 3: US Homebuyers: Total and by Homebuyer Status, Annual and Quarterly Rates



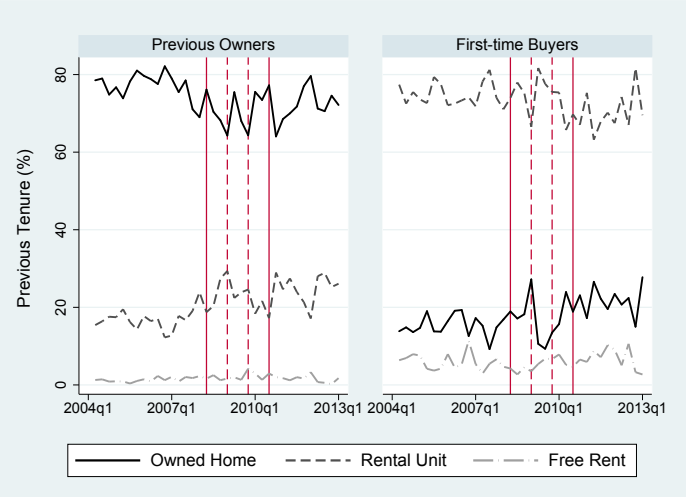
Notes: This figure displays total, and split by homeowner status, purchase mortgage originations. Annual estimates in thick lines (left axis), monthly estimates in thin lines (right axis, levels not reported).
Source: American Housing Survey and HMDA data.

Figure 4: Number of Homebuyers, by Homeowners Status and Income Level



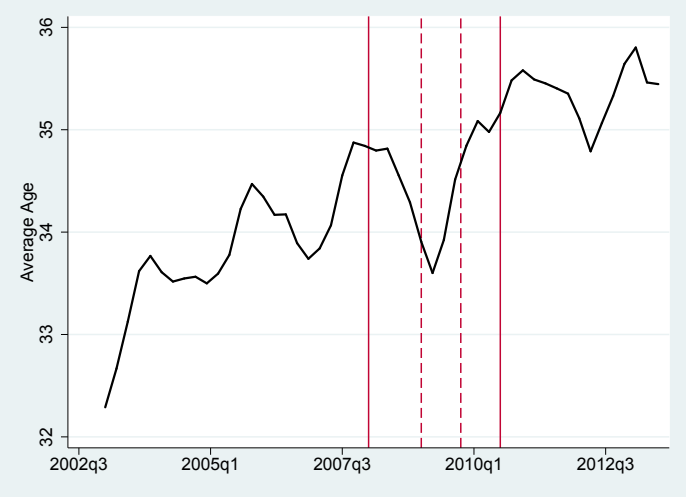
Notes: This figure displays estimates of the number of homebuyers each month by income level and homebuyer status. Mortgage originations use log scale. High income defined as households reporting above $85,000 annual income, low income below this threshold. AHS data extrapolated using HMDA annual counts of total first-lien, owner-occupied, purchase mortgages, by income categories. Solid vertical lines represent FHTC start and end dates and dashed lines represent each iteration date.
Source: American Housing Survey

Figure 6: Previous Housing Tenure of New Homebuyers, by Buyer Type



Notes: This figure displays the previous housing tenure share of new homebuyers, by buyer status. Based on AHS data using sample weights and smoothed with a local polynomial. Solid vertical lines represent FHTC start and end dates and dashed lines represent each iteration date.
Source: American Housing Survey

Figure 7: Average Age of First-time Homebuyers

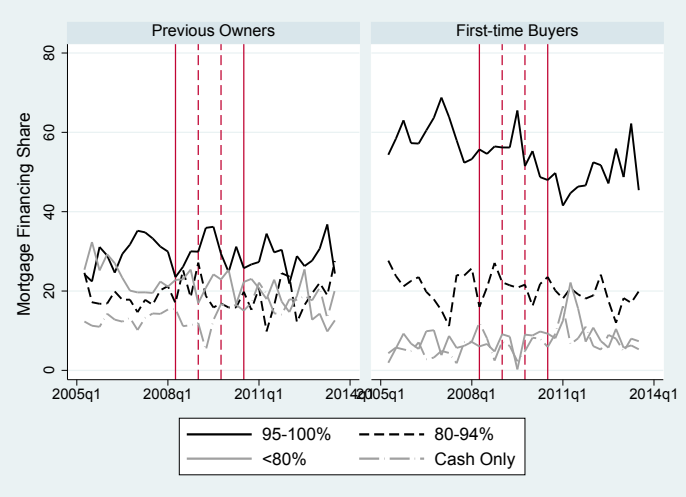


Notes: This figure displays the average household head age among first-time homebuyers, by quarter of move. Based on AHS data and smoothed with a local polynomial. Solid vertical lines represent FHTC start and end dates and dashed lines represent each iteration date.
Source: American Housing Survey

Figure 8: New Home Price, by Buyer Status

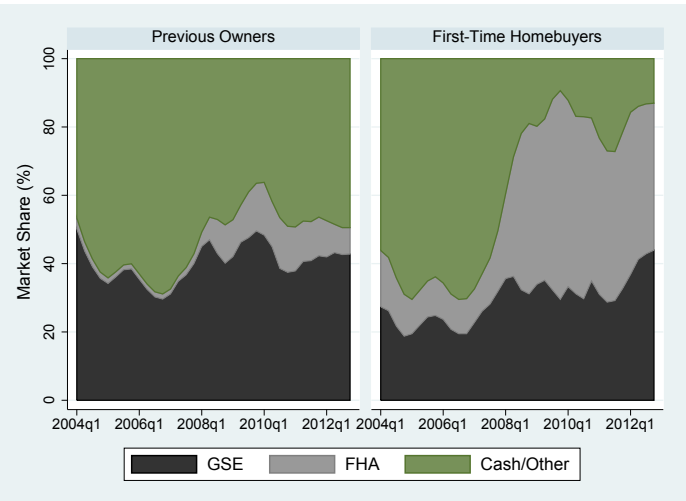
Notes: This figure displays the log average new house price of recent movers, by buyer status and log difference between previous owners and first-time homebuyers house price. House prices are winsorized at the five percent level. Solid vertical lines represent FHTC start and end dates and dashed lines represent each iteration date.
Source: American Housing Survey

Figure 9: Size of Mortgage Downpayment by Buyer Status



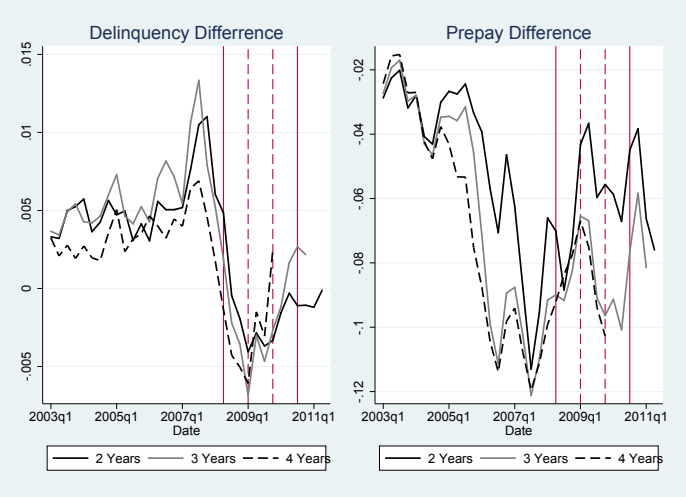
Notes: This figure displays new homebuyer mortgage downpayment size share, by homebuyer status and moving date. Based on American Housing Survey data using sample weights. Solid vertical lines represent FHTC start and end dates and dashed lines represent each iteration date.
Source: American Housing Survey

Figure 10: Home Purchase Financing Shares of GSE, FHA, and Other Sources, by Buyer Status



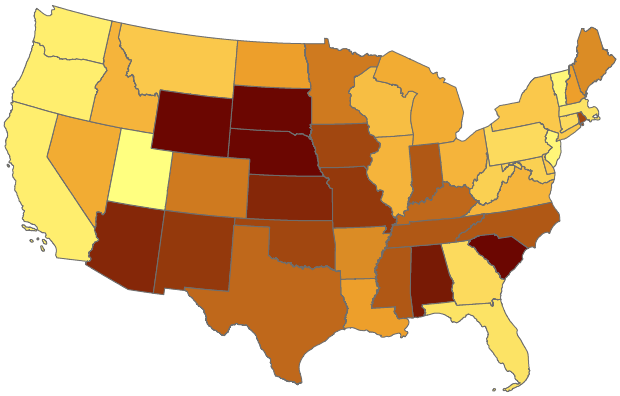
Notes: This figure displays the home purchase financing share of the GSEs, FHA, and other sources such as private label or cash-only purchases. Other share is calculated as the difference between the estimated total quarterly home purchases in the AHS and the sum of GSE and FHA origination.
Source: Authors calculations using American Housing Survey data, Fannie Mae, Freddie Mac, and FHA loan-level mortgage origination data.

Figure 11: Mortgage Outcome Differences:
First-time Homebuyers vs. Previous Owners



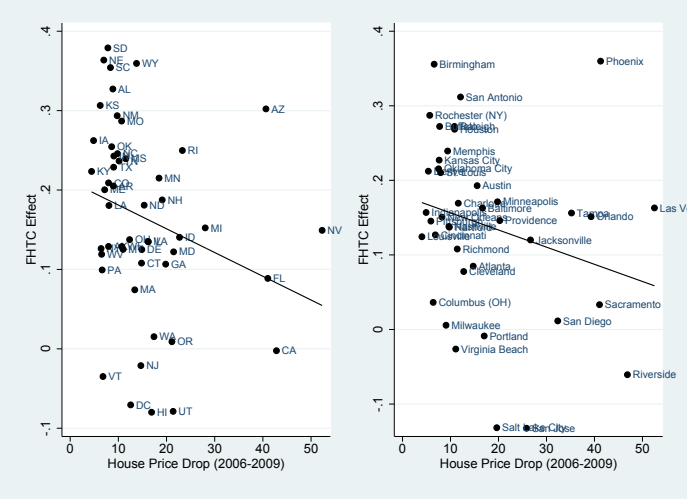
Notes: This figure displays the difference of first-time homebuyer less previous owners rates of delinquency and prepayment for each mortgage vintage quarter after various lengths in time. Solid vertical lines represent FHTC start and end dates and dashed lines represent each iteration date.

Figure 12: FHTC Effect Size by State



Notes: This map shows the estimated effect size of the second iteration of the FHTC. Darker colors represent a larger effect.
Source: Authors calculations based on Fannie Mae, Freddie Mac, and FHA loan-level mortgage origination data.

Figure 13: FHTC Effect Size and House Price Drop 2006-2009

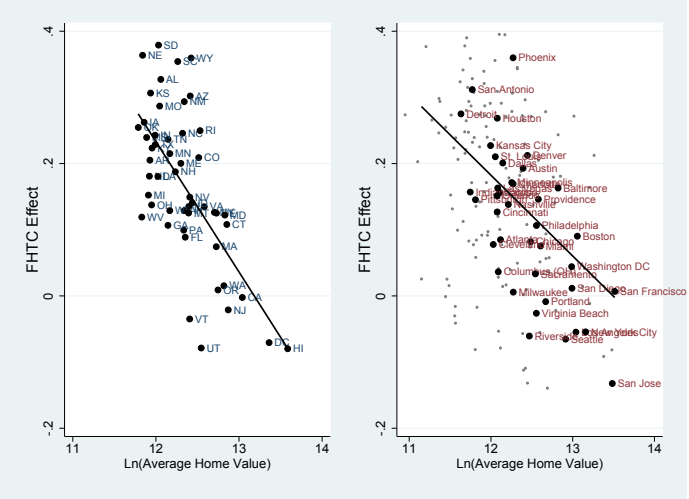


Notes: This figure displays the estimated FHTC effect size against the peak-to-trough house price drop between 2006 and 2010 for each area. Effect size of the second iteration of the FHTC only. House price data comes from FHFA purchase-only house price index. Dark line is a linear fit of the data.

Figure 14: FHTC Effect Size and House Price Drop 2006-2009

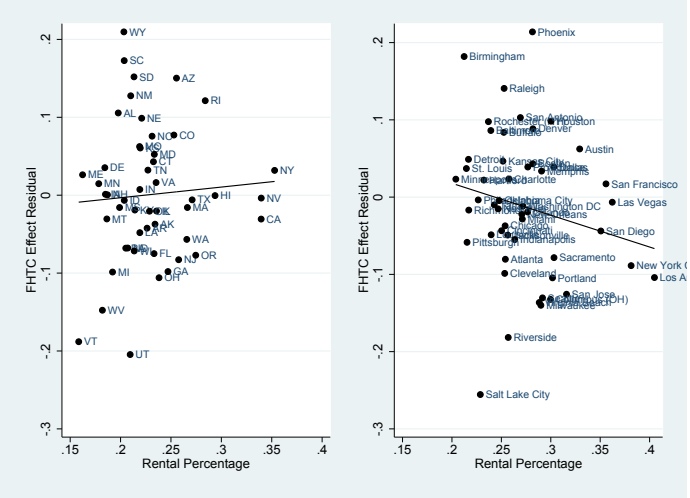
Notes: This figure displays the estimated FHTC effect size against the 2009 mortgage delinquency rate of each area. Effect size of the second iteration of the FHTC only. Mortgage delinquency rates come from 2009 Freddie Mac loan-level data, with delinquency defined as loans sixty days or more behind on payments. Dark line is a linear fit of the data.

Figure 15: FHTC Effect Size and Average Home Values



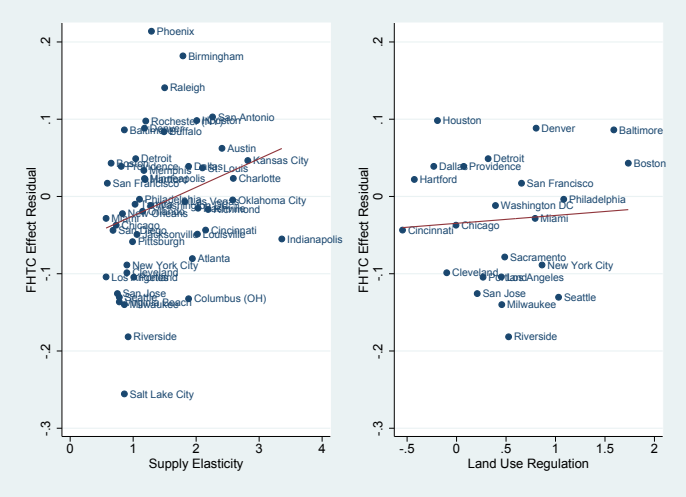
Notes: This figure displays the estimated FHTC effect size against the log of the average home value by state and MSA. Effect size of the second iteration of the FHTC only. Average home values come from data provided by the Lincoln Land Institute as of 2009:`http://www.lincolninst.edu/subcenters/land-values/`. Dark line is a linear fit of the data.

Figure 16: FHTC Effect Size Residual and Rental Percentage



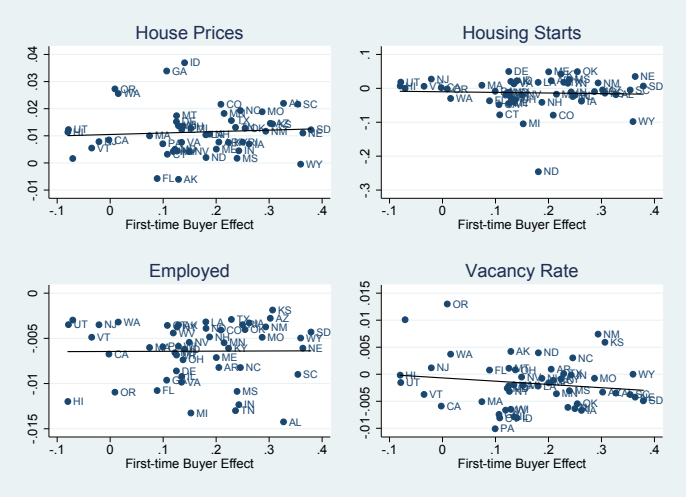
Notes: This figure displays the renter percentage in each area against the residual after regressing the FHTC effect on average home value of the area. Effect size of the second iteration of the FHTC only. Rental percentage as of 2008, authors calculations from American Community Survey data. Dark line is a linear fit of the data.

Figure 17: FHTC Effect Size versus Housing Supply Elasticity and Land Use Regulation



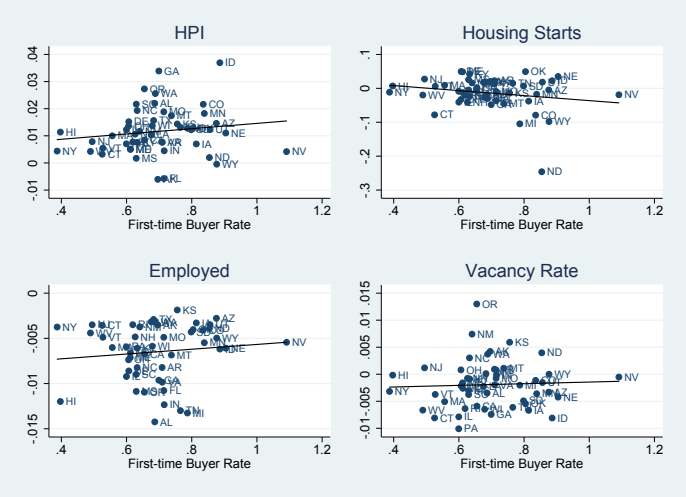
Notes: This figure displays the housing supply elasticity and a land use regulation index against the residual after regressing the FHTC effect on average home value of the MSA. Effect size of the second iteration of the FHTC only. Housing supply elasticity estimates are taken from Saiz (2008). Land use regulation index taken from Gyourko et al. (2008). Dark line is a linear fit of the data.

Figure 18: FHTC Effect Size and Changes to Local Economic Variables between January 2009-September 2010



Note: These panels display the FHTC effect size against shocks to local economic variables. Effect size of the second iteration of the FHTC only. The shock is measured as the average monthly residual between January 2009 and September 2010 from predicting each series using a quadratic time trend by state. Vacancy rate from owner-occupied housing, available only at annual rate. Dark line is a linear fit of the data.
Source: Census Bureau, FHFA, Bureau of Labor Statistics.

Figure 19: FHTC Utilization Rate and Changes to Local Economic Variables between January 2009-September 2010



Note: These panels display the FHTC utilization rate against shocks to local economic variables. FHTC utilization rate calculated as percentage of households in each state claiming tax credit according to claims according to a September 2010 GAO report. The shock is measured as the average monthly residual between January 2009 and September 2010 from predicting each series using a quadratic time trend by state. Vacancy rate from owner-occupied housing, available only at annual rate. Dark line is a linear fit of the data.
Sources: Census Bureau, FHFA, Bureau of Labor Statistics.

Table 1: First-time Homebuyer Tax Credit Details

	Housing and Economic Recovery Act of 2008 (Housing Act)	**American Recovery and Reinvestment Act of 2009 (Recovery Act)**	**Worker, Homeownership, and Business Assistance Act of 2009 (Assistance Act)[a]**
Applicable dates	April 9, 2008 – July 1, 2009	January 1, 2009 – November 30, 2009	November 7, 2009 – June 30, 2010 (buy, or enter into a binding contract to buy, by April 30, 2010, close by June 30, 2010)[b]
First-time homebuyer only?	Yes	Yes	No (includes long-term owners)
Maximum amount	$7,500	$8,000	$8,000
Income phase out[c]	Single: $75,000 - $95,000 Joint: $150,000 - $170,000	Single: $75,000 - $95,000 Joint: $150,000 - $170,000	Single: $125,000 - $145,000 Joint: $225,000 - $245,000
Repayable	Yes	No (unless resold within 3 years at a gain)	No (unless resold within 3 years at a gain)
Documentation of purchase required?	No	No	Yes[d]
Maximum purchase price	No	No	$800,000

Source: GAO analysis of IRS data.

[a]Members of the Armed Forces and certain federal employees serving outside the U.S. have an additional year to buy a principal residence in the U.S. and qualify using the Assistance Act. An eligible taxpayer must buy or enter into a binding contract to buy a home by April 30, 2011, and settle on the purchase by June 30, 2011.

[b]The Homebuyers Assistance and Improvement Act of 2010 extended the closing date for the credit through September 30, 2010.

[c]Income phase out amounts refer to modified adjusted gross income.

[d]Under the Assistance Act, claimants must attach a copy of the settlement statement to the tax return.

Note: This table is taken from the Government Accountability Office report on the FHTC: `http://www.gao.gov/new.items/d101025r.pdf`.

Table 2: Event Study Estimates of FHTC Effect, National

	(1)	(2)	(3)	(4)	(5)
FHTC Effect	0.085	0.110*	0.043	0.154***	0.138***
	(0.069)	(0.055)	(0.077)	(0.037)	(0.041)
Post-FHTC Control	-0.015				
	(0.025)				
No Adjacent Periods			x		x
First Iteration	-0.006	0.008	-0.046	0.120**	0.104*
	(0.075)	(0.066)	(0.078)	(0.054)	(0.056)
Second Iteration	0.141*	0.159**	0.100	0.187***	0.171***
	(0.076)	(0.064)	(0.080)	(0.049)	(0.052)
Third Iteration	0.145*	0.162**	0.110	0.143**	0.127**
	(0.078)	(0.066)	(0.081)	(0.054)	(0.056)

* p< 0.10, ** p< 0.05, *** p < 0.010

Note: Each specification includes a quadratic time trend. Column (2) omits the four months prior to and six months following the FHTC eligibility period. Column (3) specifies the Post-FHTC Effect beginning in July 2010 and diminishing linearly over the following year. Columns (4) and (5) begin the Post-FHTC effect in September 2010. Other control variables include house prices, unemployment rate, mortgage rate and mortgage spread.

Source: Author's calculations based on American Housing Survey and HMDA data.

Table 3: Difference-in-Differnce Estimates of FHTC Effect, National

	(1)	(2)	(3)	(4)	(5)
FHTC Effect	0.221***	0.211***	0.246***	0.185**	0.220***
	(0.079)	(0.077)	(0.075)	(0.077)	(0.077)
Post-FTHC Effect	-0.034				
	(0.034)				
Post-FHTC EffectXLow-Income	0.033				
	(0.042)				
No Adjacent Periods			x		x
First Iteration Effect	0.179	0.161	0.217*	0.188	0.289**
	(0.135)	(0.131)	(0.128)	(0.135)	(0.137)
Second Iteration Effect	0.261**	0.243**	0.299**	0.270**	0.371***
	(0.120)	(0.116)	(0.114)	(0.122)	(0.126)
Third Iteration Effect	-0.026	-0.044	0.012	-0.017	0.084
	(0.135)	(0.131)	(0.128)	(0.135)	(0.137)

* p<0.10, ** p<0.05, *** p<0.010

Note: Each specification includes a quadratic time trend. Column (2) omits the four months prior to and six months following the FHTC eligibility period. Column (3) specifies the Post-FHTC Effect beginning in July 2010 and diminishing linearly over the following year. Columns (4) and (5) begin the Post-FHTC effect in September 2010. Other control variables include house prices, unemployment rate, mortgage rate and mortgage spread.

Source: Author's calculations based on American Housing Survey and HMDA data.