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An Evaluation of Federal and State Homebuyer Tax Incentives

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I. Introduction

By early 2008, the U.S. housing market was in critical condition. Existing home sales had fallen nearly 50 percent from their peak in September 2005. Home prices, after having doubled in value between 2000 and 2006 (as measured by CoreLogic's national housing price index), had since dropped 16 percent and showed no signs of bottoming out. Housing starts and building permits were down by more than 50 percent from their highs two years earlier. Meanwhile, the number of new foreclosures was more than double what it had been at the peak of the housing boom.

The state of the broader economy was better than in the housing sector but was also rapidly deteriorating. The National Bureau of Economic Research has determined that the recession began at the end of 2007, with GDP declining at an annual rate of 1.8 percent in the first quarter of 2008. In February 2008, payrolls shrunk by 84,000, the largest monthly decline since 2003 and a harbinger of more trouble to come.

This weak and worsening economic environment led to a number of federal legislative efforts to promote housing demand through homebuyer tax credits—as part of the Housing and Economic Recovery Act of 2008 (HERA), then the American Recovery and Reinvestment Act of 2009 (ARRA), and finally the Worker, Homeownership, and Business Assistance Act of 2009 (WHBAA). According to a Government Accountability Office (2010) study of the tax credits, 3.3 million claims had been made by homeowners as of July 3, 2010 (three months before the final closing data associated with the last federal homebuyer tax credit) and the ultimate cost to the federal government from the subsidies was projected to be $22 billion dollars. A number of states provided complementary incentives to homebuyers, most often in the form of a short-term loan that effectively advanced the credit, but in some cases in the form of an additional credit.

While the homebuyer tax credits garnered much attention, their impact on the recovery of the housing market remains unclear. This paper seeks to address this gap. We analyze the degree to which the federal and state homebuyer subsidies increased home prices, home sales, and housing construction. Since the programs were all time-limited, we also examine whether the effects were temporary, long-lasting, or reverted back to trend after the expiration of the subsidies. Understanding the effects of these programs is important for future federal policymakers contemplating the use of such measures to combat episodes of weakness in the housing market or broader economy.

We begin with a discussion of the effects that one might expect these programs to have on housing demand, housing activity, and the broader economy, drawing off of both theoretical considerations and relevant evidence from the literature. We then examine the programs' effects in graphs of the major relevant time series, focusing on the time around the introduction and expiration (or expected expiration) of the three phases of the credit. The introduction of the ARRA phase of the program roughly coincided with a stabilization of housing activity after several years of rapid deterioration, although interpretation is complicated by the many other important economic and policy developments that occurred at the same time. The shorter-term movements in home sales, home prices, and construction are all consistent with the program providing a modest boost to housing demand, with some of the changes partially reversing after the expiration of the credits.

We use several approaches to try to formally isolate the effect of the homebuyer tax credit. We first use a dynamic forecasting technique to estimate counterfactual paths of these series, reflecting what would have been expected to happen in the absence of the federal tax credit. Comparing the estimated counterfactual

paths with the actual paths suggests a positive effect on housing demand (particularly leading up to the expiration date of the ARRA credit and the initially established deadline for the WHBAA credit), but the counterfactual estimates are sensitive to the specification of the model, inhibiting our ability to assess the quantitative importance of the credit with a high degree of confidence. We also examine the effects of the credit using a difference-in-differences analysis, building on the work of Brogaard and Roshak (2011) and exploiting variation in the value of the credit as a percentage of median housing prices and median household income across states. However, we conclude that this framework is not very useful in this context because the identification assumptions appear to be violated.

Our final approach makes use of variation in the different state level programs and provides the most compelling evidence on the effects of the homebuyer subsidies. We compile a database of information about state-level homebuyer assistance programs and estimate the effect of the presence of such a program on state-level housing market outcomes after controlling for state fixed-effects, a time trend, and state-level labor market conditions. We find evidence that the state-level programs had a small positive effect on home sales, on the order of a several percentage points per program month, with the credit-type programs (which were associated with a larger long-run financial gain) having a stronger effect than the bridge loan programs. The regressions also provide some evidence that the programs provided a modest (less than a percentage point) boost to home prices. As might be expected given the high levels of excess home inventories at the time, the results suggest that any increase in demand did not translate into higher home construction activity (as captured by housing permits and construction employment).

We note that the program had important distributional consequences, and we outline some of these consequences in our discussion of the channels through which a homebuyer tax credit might affect economic activity. However, we do not take a stand on the desirability of these distributional changes because the focus of this paper is the macroeconomic consequences of a homebuyer tax credit. We thus leave the debate over the distributional issues to other authors (see, for example, Baker, 2012).

In section II, we provide background on the federal homebuyer tax credit and the state-level programs designed to complement it, and we present evidence from the Government Accountability Office (GAO) on the take-up rate and cost to taxpayers of the federal credit. In section III, we discuss the key characteristics of the different federal tax credits and state-level programs. Section IV discusses different mechanisms through which the tax credits and loan programs might be expected to affect economic activity. Section V explores what can be learned about the effects of the credit from national data about housing activity. Section VI explores what can be learned about the credit from a difference-in-differences approach that uses state-level variation. Section VII provides evidence based on the state-level programs, and Section VIII concludes.

II. Background on the Homebuyer Tax Credits

Legislative History of the Recent Federal Homebuyer Tax Credit Program

On March 14, 2008, Senator Benjamin Cardin, a Democrat from Maryland, proposed the introduction of a tax credit for the purchase of principal residences by first-time homebuyers. Congress was receptive to the idea and proceeded to draft a tax credit provision as part of the Housing and Economic Recovery Act of 2008 (HERA), which included a variety of measures designed to mitigate the ongoing subprime mortgage crisis and support the housing government-sponsored enterprises, Fannie Mae and Freddie Mac. HERA was passed by Congress on July 26, 2008 and signed into law by President George W. Bush four days later.

The HERA homebuyer tax credit resembled an interest-free loan: Upon filing their taxes, first-time homebuyers received a refundable tax credit equal to 10 percent of the purchase price of a principal residence, up to $7,500, which buyers were then required to repay in 15 annual installments as a surcharge on their income taxes.[1] The credit was available for purchases made after April 8, 2008, and before July 1, 2009. It was awarded in full to joint filers with incomes up to $150,000 and phased out for those with incomes between $150,000 and $170,000. The income limit for individual filers was $75,000, with a phase-out for incomes between $75,000 and $95,000. Table 1 lists key features of the HERA and subsequent phases of the recent homebuyer tax credit program.[2]

In January 2009, amid further deterioration in housing market conditions, Senator Johnny Isakson, a Republican from Georgia, called for an expansion and extension of the homebuyer tax credit, which was eventually incorporated into the American Recovery and Reinvestment Act of 2009 (ARRA) and signed into law by President Barack Obama on February 19, 2009. The most significant difference between the HERA homebuyer tax credit and the ARRA homebuyer tax credit was that repayment was no longer required (as long as purchasers retained the home as their primary residence for three years). The credit's maximum value also increased slightly, from $7,500 to $8,000, but other features of the credit were identical to the previous version. The credit was made available to first-time homebuyers who purchased houses between January 1, 2009, and November 30, 2009.

In May 2009, Isakson called for another expansion and extension of the tax credit, which drew support from Senator Chris Dodd, a Democrat from Connecticut, in October, and was eventually incorporated into the Worker, Homeownership, and Business Assistance Act of 2009 (WHBAA), signed by President Obama on November 6, 2009. This legislation extended the first-time homebuyer credit and expanded the program to include eligible repeat homebuyers for the purchase of a new principal residence. The credit for repeat homebuyers was worth 10 percent of the purchase price of a home up to a maximum of $6,500. To be eligible, repeat homeowners were required to have owned and lived in their current residence for five years or longer. The legislation also established new income limits for eligibility: To be eligible for the full credit, joint filers' incomes could not exceed $225,000, while single filers could earn up to $125,000. The credit was phased out for incomes up to $245,000 and $145,000 for joint and single filers, respectively. The November legislation also added the restriction that the home's purchase price could not exceed $800,000. The credit for repeat homebuyers became available immediately following the passage of the bill, on November 7, 2009, while the new restrictions and income limits for first-time homebuyers did not phase in until the ARRA version of the credit expired on November 30, 2009. Both first-time and repeat homebuyers were required to enter into a binding contract to buy a principal residence by April 30, 2010, and complete the transaction by June 30, 2010, to claim the credit.

In June 2010, reports arose that banks were struggling to process a backlog of home purchase transactions, raising concerns that homeowners who established contracts before April 30 would be unable to close their transactions by the June 30 WHBAA deadline. In response, Senator majority leader Harry Reid, along with Isakson and Dodd, proposed extending the deadline for closing transactions (for homebuyers who had signed a contract by April 30) to September 30, 2010. The proposal became law on July 2, 2010. No further extensions to the federal homebuyer tax credit program were passed thereafter.

[1]For homes sold prior to the credit being paid back in full, homebuyers were required to put any gain on the home toward repayment of the loan (up to the amount of the unpaid balance).
[2] See also Keightley (2009) for a detailed discussion of the different phases of the recent homebuyer tax credit.

Take-up and Taxpayer Cost of the Federal Tax Credits

In September 2010, the Government Accountability Office (GAO) published a report detailing take-up of the homebuyer tax credit through July 3, 2010; the results are summarized in Table 2. Using IRS data, GAO (2010) found that about 1 million taxpayers claimed $7.3 billion in first-time homebuyer credits, to be repaid on future tax returns, during the HERA phase of the program. Then, under ARRA, about 1.7 million taxpayers claimed $12.1 billion in first-time homebuyer credits. Finally, as of July 3, 2010, about 600,000 taxpayers had claimed $4.1 billion in credits under WHBAA. Of these, 400,000 claimed $2.9 billion using the first-time homebuyer credit, while the other 200,000 claimed $1.2 billion using the existing homebuyer credit. The WHBAA data are incomplete since the IRS was still processing submitted homebuyer credit claims at the time of the GAO's analysis, and homebuyers could continue to claim credits on their 2011 tax returns, which were still months away from being submitted. Unfortunately, the GAO has not published an updated analysis with complete data.

The report also included estimates of the ultimate cost to the federal government of the three phases of the homebuyer tax credit program. After taking into account both the funds that would be paid out through all phases of the program and the amount that would be paid back (principally by households that took advantage of the HERA tax credit), the full cost was put at $22 billion. According to Keightley (2009), $4.9 billion of the full cost estimate is associated with the HERA phase, $6.5 billion with the ARRA phase, and $10.8 billion with the WHBAA phase.

Focusing on just the ARRA and WHBAA phases of the program, where the credits essentially provided a grant rather than a loan to homebuyers, a sizable fraction of the claims were made in the largest states (GAO, 2010). Residents of California, Texas, and Florida claimed a combined 27 percent of the total number of credits, and an equal share of the total dollar value of the credits, given out in the ARRA and WHBAA phases of the program. As shown in Figure 1, take-up of the credit *on a per-household basis* varied substantially across states. Nevada, the state with the highest per-household take-up rate, received about $235 per household through the WHBAA and ARRA credits, about 70 percent more than the per-household amount received in the median state. The states that benefited most were concentrated in the Central-Western region, while all but one of the states with the lowest take-up rates were located in the Northeast and Midwest. As we discuss below, take-up of the federal credit appears to have been positively correlated with *ex ante* home sales per household and some related socioeconomic variables (such as income levels and the share of the population represented by young adults) but does not seem to be highly correlated with the existence of a complementary state-level homebuyer assistance program.

State Homebuyer Assistance Programs

In the months following the passage of ARRA, many states introduced programs designed to complement the federal homebuyer tax credit. The most common type of complementary program allowed eligible homebuyers to take out a short-term low-cost loan, using the value of their forthcoming credits as collateral. Table 3 provides a comprehensive list of these state bridge loan programs. A key goal of these programs was to help cash-constrained households make a downpayment or paying closing costs. These state programs essentially provided a no- or low-penalty advance of part or all of the value of the federal tax credit so that homebuyers did not have to wait to receive their federal tax credit until after they had

made their purchase and filed their tax returns.[3] The interest rates on these loans generally rose to the rate of interest on the homebuyers' first mortgage, or a slightly higher rate, at some pre-set date shortly after tax time the following year to encourage homebuyers to repay their loans in a timely fashion.

Missouri was the first state to introduce such a program, in mid-January 2009, soon after it became clear that the Recovery Act would feature an expansion of the HERA tax credit. Missouri ran its program through its state housing agency, the Missouri Housing Development Commission (MHDC). It allowed first-time homebuyers to take out a second mortgage through MHDC at the time of closing, worth 6 percent of the home purchase price up to a maximum of $6,750. Borrowers could pay back this second loan without interest before June 1, 2010 after they should have received their tax refund from the IRS. If borrowers failed to fully repay their loan by that deadline, they would have to repay the balance over 10 years at an interest rate that was 50 basis points higher than the interest rate on their first mortgage. To participate in the program, borrowers were also required to obtain their primary mortgage through the MHDC, which were limited to households with incomes below $85,500. The Missouri program served as a model for 18 other states that subsequently introduced similar programs.[4]

Four states opted to introduce more generous homebuyer programs. These programs offered grants or tax credits that buyers could apply against their tax liabilities in subsequent years. As such, they were more like supplements to the ARRA and WHBAA grant programs than the bridge loans offered by other states. These programs are described in Table 4, and included the following details:[5]

- California created three separate homebuyer credits. In March 2009, California introduced a tax credit for first-time and repeat homebuyers who purchased new homes. Purchasers were eligible to claim up to 5 percent of the price of their home against future tax liabilities, up to a maximum of $10,000. The credit was nonrefundable and the claims had to be spread over the three years following the home purchase (with homebuyers able to claim a maximum of $3,333 per year). California budgeted $100 million for the program, allowing homebuyers to reserve credits while funding remained. Reservations arrived so quickly that California stopped accepting them after four months. The state then introduced a second similar credit for new homes purchased between May 2010 and August 2011, and allocated credits to 13,715 buyers, worth a total of $94 million, over that period. Finally, California budgeted $100 million for a third program, aimed exclusively at first-time homebuyers starting in May 2010. Though the program was initially made available for homes purchased between May 2010 and August 2011, the state started refusing applications in mid-August 2010, less than four months after the introduction of the program, after receiving a flood of requests. 18,769 homebuyers received credits through the first-time homebuyer program.
- Georgia offered a tax credit worth 1.2 percent of the purchase price of a home, up to a maximum of $1,800, between June and November 2009. The credit was not limited to first-time

[3] The details varied across programs, but homebuyers generally had to meet certain restrictions such as borrowing from approved lenders. In addition to the specific eligibility requirements of each state-level program, the amount of money to be spent was generally capped such that eligibility was granted on a first-come first-serve basis.
[4] For details about the state-level loan programs that had been put in place as of May 2010, see: http://www.ncsha.org/resource-center/homebuyer-tax-credit-hfa-loan-programs.
[5] The federal government offered first-time homebuyers in the District of Columbia a $5,000 credit between 1997 and 2011. DC homebuyers were not allowed to combine that credit with the federal credits made available to the entire country between 2008 and 2010. Since ARRA and WHBAA versions of the federal credit were more valuable than the DC credit, few homebuyers are likely to have taken advantage of the DC credit while the federal one was available. The DC credit was available through the end of 2011—after the federal credit expired— but was not renewed in 2012. Due to the uniqueness of tax credit availability in DC, it is omitted from our state-level analyses.

homebuyers. Like the California programs, the Georgia homebuyer tax credit was nonrefundable—homebuyers could not claim more than their total tax liability in the following year, but they were allowed to carry any excess over. Georgia's housing association has not published data on the number of credits claimed.

- In June 2009, Maine introduced a "Gift of Green" promotion that offered grants worth 4 percent of the purchase price of a house, up to a maximum of $5,000, for first-time homebuyers. The grants were received in time to be applied to downpayments or closing costs. Maine gave out about 800 of these grants before the program expired at the end of November 2009. Maine created a similar program that ran for an additional year but only offered grants up to $2,500. (Maine Housing has not publicly reported the number of grants it gave out during the second program.)
- Utah offered two rounds of grants for the purchase of new homes in 2009 under its "Home Run" program. Grants were limited to buyers with incomes below $150,000 for couples and $75,000 for singles, but they did not have to be first-time homebuyers. The grants were received in time to be applied towards the downpayment for a home. The first round of the program gave out 1,600 grants worth $6,000 each between March and June 2009. The second round gave out 1,950 grants worth $4,000 each between September and November 2009.

We defer our discussion of how these state-level programs affected economic activity to the empirical section below. However, we note here that the presence of a complementary state program does not appear to have been associated with greater take-up of the federal homebuyer tax credit. Table 5 shows estimated coefficients and standard errors from regressions of measures of take-up (dollars claimed per household, per capita, and per homeowner) against state characteristics and indicator variables for the presence of a complementary state program. As can be seen, take-up appears to have been highly correlated with the *ex ante* pace of home sales (per household, per capita, or per homeowner depending on the specification) in a state. Other state-level characteristics that seem to matter are those that might expected to be related to home sale activity such as the concentration of younger adults (between ages 25 and 34) in the state, the *ex ante* homeownership rate, and median income. However, the estimated coefficient on the indicator variable for the existence of a complementary state-level bridge loan program is negative (i.e., it has the wrong sign) and is very imprecisely estimated. The estimated coefficient on the indicator variable for the existence of a complementary state-level grant program is positive but it is not statistically significant. The regressions speak to correlations not to causality (or lack thereof) but it is interesting to note that the existence of a complementary state-level program has no obvious relationship to the degree of take-up of the federal program.

III. Important Distinctions among the Possible Outcomes

We described many of the specifics of the federal homebuyer tax credit program and the complementary state programs in the sections above. Between the different phases of the federal homebuyer tax credit program and the many state-level programs, a variety of outcomes were possible for eligible households. For the purposes of thinking about the effects on the housing market and the broader economy, it is useful to distinguish among the possible outcomes along several dimensions. These distinctions are summarized in Table 6 and described as follows:

- *Type of buyer*. In addition to the programs' income and home price thresholds (which generally resulted in the benefits being larger for lower-income homebuyers), eligibility was restricted to first-time homebuyers for the HERA and ARRA phases of the federal tax credit program as well as the Maine grant program, the portion of the California program that applied to existing homes, and most of the state bridge loan programs. Focusing a program's benefits on first-time buyers is more likely to increase the number of homeowners and the demand for owner-occupied homes. Note, however, that such an effect likely comes partly at the expense of the market for rental housing, as many first-time homeowners would otherwise have been renters. The programs aimed at first-time homebuyers only represented a net positive for the overall housing market to the degree that they stimulated household formation (in other words they led some people to split off from existing households to become homeowners).[6]
- *Value of the benefit over the long run*. The long-run financial gains to homebuyers varied widely depending on what programs or combinations of programs they participated in. In general, the loan (and loan-like tax credit) programs offered the smallest long-run financial benefits. Most notably, the homebuyers claiming the HERA credit received an immediate benefit of up to $7,500, but they were required to eventually repay this amount. As a result, the long-run gains to homebuyers who took advantage of the HERA tax credit was much smaller—amounting to just the net present value of being able to borrow without paying interest. Under reasonable assumptions about interest rates and the length of time that a homebuyer might be expected to remain in the house, Keightley (2009) calculated the expected long-run benefit of the HERA credit to be just over $2,000.[7] At the high end of long-run benefits received, some homebuyers were able to take advantage of both the ARRA or WHBAA grant-like tax credit and a state grant or grant-like tax credit program. These homebuyers could have received as much as $8,000 through their refundable federal credit and (in the case of those who bought in California) a reduction in their state tax liabilities of up to $10,000 over the three years following purchase.
- *Timing*. If all households could borrow easily, then there is little cost associated with whether a homebuyer receives the tax credit at the time of the purchase or later as part of a tax refund. However, empirical studies and common sense suggest that many households generally face borrowing constraints, and this was particularly true in the tight credit environments that prevailed after the financial crisis. For borrowing constrained households, the time at which any payment associated with the credit was received might be very relevant to their behavior. Some might not be able to purchase a home at all because they lacked the necessary cash for the downpayment and fees. Others might be able to come up with the cash, but only by cutting other spending, which would have been bad for economic conditions more broadly. Some might not be able to purchase a home at all because they lacked the necessary cash for the downpayment and fees. Others might be able to come up with the cash, but only by cutting other spending, which would have been bad for economic conditions more broadly.

[6] Household formation did, in fact, fall during the economic slump, with the fraction of young adults (ages 25-34) living with their parents rising from 1 in 10 in 2000 to a peak of 1 in 7 in 2012. The trend suggests that providing economic support may indeed have been a useful way of encouraging new households to form.

[7] The HERA program also provided some insurance against home price depreciation, as the repayment due if the home was sold within 15 years was limited to only that which could be made out of capital gains on the home.

Generally, homebuyers did not have to wait until tax time the following spring to receive their ARRA, and WHBAA credits as they were allowed to file an amended return for the previous year to claim the credits. However, because of concerns about fraud, many of the claims identified as higher risk by the Internal Revenue Service were selected for audit, which would have greatly slowed down any payment they were to receive.[8] Even in the best case scenario, homebuyers would only receive payment after they had made their purchases, such that they could not apply the cash toward any part of their home purchase.

The state programs bridge loan programs were designed to mitigate this challenge by effectively accelerating receipt of the credit. Indeed, the press releases describing most of the programs explicitly mentioned applying the proceeds to downpayments and closing costs. In addition, on May 29, 2009, Housing and Urban Development Secretary Donovan announced that the Federal Housing Authority (FHA) would allow eligible borrowers to "monetize" their ARRA tax credit.[9] The program was more restrictive than many of the state programs in that the proceeds of the loans could not be applied to the 3.5 percent minimum downpayment required for FHA-insured loans, but participants were able to use the credit to make an additional downpayment or pay closing costs.

Participants in the California tax credit programs received their benefits over the longest period of time because the credits (which were not refundable) had to be spread out over the three years following purchase. Thus, while the California programs provided a sizable incentive for households to purchase homes in terms of the long-run financial gain, they did little to facilitate purchases by households who had insufficient financial assets to make downpayments or fund closing costs.

IV. How Might a Homebuyer Tax Credit Affect Economic Activity?

As background for our analysis, we review how one might have expected the homebuyer tax credit to affect the housing market and economic activity. We begin with a discussion of the "direct" effects of homebuyer tax credits that likely arose from the transfer from taxpayers to homebuyers—higher demand for housing (both via the incentive provided by the long-run financial gain and via the greater immediate funding for downpayments and closing costs) and higher homebuyer disposable income. We then turn to "indirect" effects—those arising from the higher home prices and higher home sales that should have resulted from any increase in housing demand. The discussion is summarized in Table 7 and described as follows:

- *Direct effect of transfer: long-run financial gain raises the demand for housing.* The homebuyer tax credit effectively made it less costly to purchase a home and, should have, in turn, increased the demand for owner-occupied housing.[10] However, the resulting effect on housing market conditions was likely tempered by several factors.[11] First, households that wanted to participate not only had to meet the program's eligibility requirements but also had to be able to purchase a home. They had to be able to fund a downpayment and closing costs and they had to have

[8] According to Internal Revenue Service (2009), as of the early fall of 2009 the IRS had processed first-time homebuyer claims on more than 1.5 million returns and had selected more than 100,000 returns for audits.
[9] See http://portal.hud.gov/hudportal/HUD?src=/press/press_releases_media_advisories/2009/HUDNo.09-072.
[10] Keightley (2009) applies a range of price elasticities to his estimates of the effective decrease in the purchase price associated with the credit and concludes that the ARRA and WHBAA tax credits may have raised home purchases by between 90,000 and 280,000. He points out that his estimates are lower than those of private analysts at the National Association of Homebuilders, the National Association of Realtors, and Moody's. Note that all of these estimates are of additional purchases rather than additional housing demand because they do not take account of the factors tempering the permanent net effect on overall housing demand discussed above.
[11] See Gayer (2009a) and Gayer (2009b) for a more detailed discussion of these factors.

sufficiently solid incomes and credit histories to qualify for mortgages during a period in which lenders had sharply tightened standards on mortgage loans. Second, because the different phases of the program were temporary, they likely only shifted the timing of some households' purchases, inducing those that would have purchased a home at some point anyway to do so earlier rather than later. This should have resulted in a period of "payback" after the expiration of the credit such that the net effect of the program on housing activity when viewed over a longer period of time would be limited. Third, repeat homebuyers participating in the WHBAA phase likely had little net effect on housing demand as most presumably were selling a house in addition to purchasing one. In addition, first-time homebuyers may have been previously residing in rental units such that their purchase reduced the demand for rental housing, mitigating the effect of the credits on *overall* housing activity. As discussed earlier, the credits only produced new net overall demand for housing to the extent that they led new households to split off of existing households.[12]

- *Direct effect: funding for downpayments and closing costs raises the demand for housing*. As noted above, some households might be constrained from purchasing homes even if they desired to do so because they had few financial assets that could be put toward the downpayment and upfront costs associated with buying a house.[13] By themselves, the federal homebuyer tax credits could not address this problem because the funds were not available until after homebuyers made their purchases and filed tax returns. However, the state level bridge loans allowed qualified homebuyers to get around this constraint, effectively accelerating the credit so that it was available for use as part of closing on a home purchase. The HUD program that allowed monetization of the credit also helped in this regard although it was limited to first-time borrowers obtaining FHA-insured loans and these borrowers still had to come up with a 3½ percent downpayment out of their own funds.

  All told, when used in combination with a bridge loan program, the homebuyer tax credit should have provided an additional boost to housing demand by allowing more households with low financial assets to purchase homes. However, as with the stimulus associated with the effective reduction in the purchase price of a house, the long-run effect on overall housing demand was likely considerably tempered by sales being pulled forward, repeat buyers also selling homes, and first time buyers reducing their demand for rental housing.

- *Direct effect: higher disposable income of homebuyers raises consumer demand*. One would also expect participating homebuyers to respond to the transfer more broadly because it represents an increase in their lifetime resources. For those that did not put their gain entirely into increased housing services, one would expect some increase in the demand for nonhousing goods and services. Both the size and timing of the response would likely depend on whether a household was consuming at a lower-than-optimal level because of liquidity constraints; if so, one would expect a larger response but one that was delayed until the household actually received some cash

[12] Fraud likely also reduced the impact of the credits on housing activity. However, the amount of fraud appears to have been small relative to the total size of the program. See U.S. Treasury Inspector General for Tax Administration (2010).

[13] Dynan (2013) points out that even among households in their peak saving years (between the ages of 45 and 54) accumulated financial assets are very low for much of population. In 2010, the typical household in the lowest quintile of the net worth distribution had financial assets that amounted to less than one week of income and the typical household in the next highest quintile had seven weeks' of income in financial assets. Furthermore, holdings of liquid financial assets were much lower.

associated with the credit.

- *Indirect effect: higher home prices induce a "wealth effect" and raise consumer demand.* Any increase in home prices arising from higher demand for owner-occupied housing may have created "wealth effects" that induced homeowners broadly (i.e. not just participating households) to increase their spending. As discussed by Dynan and Cooper (2013), economists disagree about the exact channels underlying housing wealth effects. Moreover, non-homeowners that are planning to purchase a home in the future are made worse off and so likely to reduce their spending.[14] That said, conventional empirical estimates from macroeconomic models suggest that the net effect of higher home prices on aggregate consumption in fact positive and economically significant, with every additional dollar of household wealth leads to an increase in consumer spending of between 3 and 6 cents (Davis and Palumbo, 2001).
- *Indirect effect: higher home prices reduce foreclosures and bank losses.* The large number of homeowners that owed more than their homes were worth in the wake of the home price bust contributed importantly to the recent wave of foreclosures. In an environment of rising home prices, homeowners having difficulty making their mortgage payments can often avoid foreclosure because they typically have positive equity and are able to sell their home and pay off their loans in full.[15] However, during the recent slump, "underwater" homeowners who found themselves with too little income to make their mortgage payments because of job losses or other factors often ended up defaulting because they did not have the alternative option to pay off their loan by selling their home.[16] Any increase in home prices arising from the homebuyer tax credit should have reduced the number of underwater borrowers such that those that could not meet their mortgage obligations could sell instead of going into foreclosure. Such an outcome does not avoid some of the hardships associated with foreclosure such as dislocation and other consequences of losing a home, but it does allow distressed homeowners to avoid damage to their credit histories and potentially is less disruptive for the housing market. In addition, banks should take fewer losses, which would leave the financial system stronger and make credit more widely available.
- *Indirect effect: higher home prices facilitate refinancing.* The rate on 30-year fixed-rate mortgages fell from an average of 6.3 percent in 2007 to 5 percent in 2009 and then dropped further to 4.7 percent in 2010. The lower rates created an opportunity for mortgage borrowers to refinance their loans and substantially reduce their required mortgage payments, freeing up cash for other uses. Traditionally, because of lender restrictions, mortgage borrowers that have little equity in their homes or who are underwater altogether will find it very difficult if not impossible to refinance their loans and benefit from a reduction in mortgage rates. The President's Home Affordable Refinancing Program (HARP) relaxed the refinancing restrictions for low-equity and

[14] Baker (2012) emphasized the point that future buyers were made worse off if the credit delayed but did not prevent deflation of the home price bubble. Similarly, an e21 (2013) editorial argued that households that purchased homes when the credit was in place ended up paying almost $18,000 more than if they had waited to buy until January 2012.
[15] Figure 1 of Gerardi, Shapiro, and Willen (2009) provides an illustration of this point. Delinquencies soared in Massachusetts during the 2001-02 recession because of job loss but (in contrast to the experiences during the early 1990s and the recent recession) there was no increase in foreclosures because home prices exceeded the previous peak so most homeowners had positive equity.
[16] Presumably these homeowners would have pursued other options such as attempting to have their mortgage reduced through a loan modification and (possibly) pursuing a short sale, whereby the lender agrees to release the lien in exchange for the proceeds of the sale even if they are less than the outstanding loan balance.

underwater borrowers with GSE-backed loans, but many borrowers, particularly those with mortgages in private-label mortgage backed securities, were not covered by the program.[17] Thus, another benefit of any increase in home prices resulting from the homebuyer tax credit is that more homeowners should have been able to realize savings from the substantial decline in mortgage rates by refinancing their mortgages.

- *Indirect effect: higher home purchases absorb excess housing inventory.* The slump in home sales that occurred during the housing bust left a substantial excess inventory in the market for owner-occupied housing. At its peak in early 2009, the ratio of inventories to sales stood at 12, up from less than 5 in the early and mid-2000s. Higher home purchases have the potential to absorb excess inventory, but only to the degree that they are not also associated with sales (as would be the case for most repeat homebuyers who would be selling the home they previously owned). Thus, the effect of the homebuyer tax credit on inventories of owner-occupied housing is much smaller than the effect on purchases because it depends on the *net* increase in demand, which is determined mainly by how many new buyers are drawn into the market. Furthermore, as noted above, a large share of new buyers in the owner-occupied market presumably give up rental housing, and the shift has the potential to create excessive supply in that latter market.
- *Indirect effect: higher home purchases stimulate construction.* If the homebuyer tax credit generated enough increase in net demand for owner-occupied housing to absorb much of the excess inventory, it could, in principle, stimulate new construction. However, in practice, it seems unlikely to have generated a meaningful increase in construction at the national level given the very high level of inventories that prevailed when it went into effect. That said, the homebuyer tax credit might have been able to spur housing construction in particular areas where excess inventories were not as high as they were on average across the country.
- *Indirect effect: higher home purchases generate income for those involved in home purchase transactions*. One final channel through which higher home purchases arising from the homebuyer tax credit had the potential to affect the macroeconomy is by raising the income of third parties involved in real estate transactions, such as people in the real estate industries and the employees and shareholders of financial institutions that saw higher fee income. Presumably much of this income would be spent on consumer goods and services, which would improve general economic conditions and potentially lead to more hiring. Unlike most of the potential effects of the homebuyer tax credit on the housing market, this magnitude of this effect would not depend only on the incremental demand but rather on the absolute number of total purchases.

In sum, there are many ways in which the homebuyer tax credit might have been expected to affect the housing market and economic activity. However, there are also significant caveats regarding just how much promise the program held. Among the most important, as emphasized repeatedly above, the credit had to generate new *net* housing demand to have any meaningful effect on housing market conditions even in the short run. Of course, like any transfer of income, the program was likely to spur spending by its beneficiaries. But, for the credit to affect the overall housing activity (sales, purchases, excess housing inventories, and construction both in the owner-occupied and rental markets), it had to lead to *incremental* purchases. Note that one implication of this consideration is that analyses of the likely effects

[17] For more details about HARP, see http://www.makinghomeaffordable.gov/programs/lower-rates/Pages/harp.aspx.

of the program that simply apply a elasticity of demand to the change in the effective price are of limited value when it comes to gauging the macroeconomic consequences because such they do not typically net out the sales by repeat buyers and the effects on the rental market. Accordingly, we believe that the best approach to analyze the effects of the program on the housing market and economic activity is to look at the actual pattern of what happened to key housing market indicators, as we do below.

A second, oft-discussed, caveat arises from the time-limited nature of the program. For the most part, the credit is likely to have simply "pulled forward" home purchases that would have ultimately been made at some later date. This consideration underscores the importance of any analysis looking not just at the period during which the credit was in effect but also at the months that followed in order to gauge the degree of "payback." We note that payback does not necessarily imply that the program was not useful because there are benefits to accelerating economic activity when there are unused resources in an economy. In particular, the costs of an economic slump likely increase disproportionately with its size. For example, firms may decide not to lay off workers if a downturn in demand is perceived as likely to be short-lived, reducing the hardships suffered by the workers and making it easier for the economy to rebound. In this case, even merely pulling demand forward can lead to a less severe downturn.

V. The Federal Homebuyer Tax Credit: Evidence from Macroeconomic Data

Graphical Evidence

Figure 2 plots single-family home prices, sales, construction permits, and construction starts at the national level over the last decade. The solid vertical lines demarcate the periods over which the HERA, ARRA, and WHBAA phases of the homebuyer tax credit were active while the dotted vertical line demarcates the original deadline for closing under WHBAA. The home price series is a version of the CoreLogic National House Price Index that has been seasonally adjusted by the Haver Analytics, an economic data firm. The sales data are also from CoreLogic, which we seasonally adjust using X12-ARIMA, a seasonal adjustment program developed by the U.S. Census Bureau. Our housing starts and permits data come pre-seasonally adjusted from the Census Bureau.

During the HERA phase, when the program essentially provided an interest-free loan to homebuyers, the different indicators of housing activity appear to have continued to decline at the same rapid rate as before the program was introduced. However, almost immediately after ARRA was passed, these indicators stabilized or increased. Between January and November 2009, the period during which the ARRA credit was only available to first-time homebuyers, seasonally-adjusted monthly sales rose 32 percent. Home prices were about flat, compared with a decline of 14 percent over the previous 11 months, and housing starts increased 39 percent.

Home sales surged toward the scheduled end of the ARRA homebuyer tax credit phase amid fears that there would be no extension of the program. Such unevenness is not surprising given that one might expect many households to wait as long as possible before taking up the tax credit. This surge was followed by a lull at the beginning of the WHBAA program, but sales picked up again before the expiration of the WHBAA credit such that they averaged about the same as during the ARRA period.

In contrast to the pattern of home sales, the series on home prices, starts, and permits all showed a downdrift over the WHBAA period, although starts and permits remained above their earlier lows. Recall

that one would expect to see the WHBAA phase have a stronger effect on sales than on prices and construction because that phase offered the credit not only to first-time homebuyers but also to repeat homebuyers, and the purchases of the latter group did not generally represent additional housing demand.

The graphs also suggest that at least some of these gains were reversed with the expiration the tax credits. Immediately following the original closing deadline to take advantage of the WHBAA credit in June 2010, sales dropped by 25 percent. Several months of steady increases followed, before sales stabilized around levels roughly equal to the post-bubble low preceding the introduction of ARRA. Prices continued to move down, and starts and permits were about flat.

Time Series Analysis

At face value, the national housing market data would seem to indicate that the ARRA and WHBAA phases of the federal homebuyer tax credit stimulated home sales in the short-term and had some impact on home prices, permits, and starts. The introduction of the ARRA credit also roughly coincided with a discrete shift in housing market activity—from a housing market where conditions were rapidly deteriorating to one where conditions were much more stable (albeit at a very low level of activity). However, a number of factors caution against drawing a strong tie between the credit and the shift. To begin, the tax credit was part of a much larger ARRA stimulus package, which included unprecedented measures aimed at supporting the economy, many of which continued during the WHBAA phase of the credit. The beginning of ARRA also roughly coincided with a major expansion of the Fed's first quantitative easing program, the first commercial bank "stress tests," and a sharp turnaround in the stock market. In addition, throughout the period when the credits were on offer, the federal government was involved in other efforts to aid the ailing housing market, including measures to help prevent foreclosures, mitigate the consequences of unavoidable foreclosures, and facilitate mortgage refinancing among high-debt households.

To try to isolate the impact of the homebuyer tax credit in stimulating housing market activity, we estimate simple time-series models relating the various national housing market indicators to fundamentals. We estimate the models using data from before the ARRA homebuyer tax credit went into effect and then combine the estimated coefficients with the actual data on the fundamentals to forecast the behavior of these indicators over the period when the ARRA and WHBAA programs were active. We use these forecasts, in turn, as counterfactuals with which to compare actual changes in the indicators; the differences should reflect the impact of factors that are not captured by the fundamentals on these indicators, including the homebuyer tax credit.

We examine monthly data for home prices, but quarterly data for home sales, starts, and purchases. The different choice of frequency reflects the different properties of the different series. Home prices appear not to be very noisy on a monthly basis, so we use monthly data because the higher frequency information allows us to align the series more closely with the timing of the tax credit. The other series appear to have much more measurement error at the monthly frequency, so we opt to use quarterly averages that will smooth out some of the noise.

Table 8 shows the results from estimation of the home price model for different time periods. The specific model we estimate is an autoregression of monthly percent changes in home prices on four lags of the dependent variable and several other variables that are exogenous to the model: the percent change in disposable personal income, the first difference of the 30-year fixed-rate mortgage interest rate, percent change in non-farm payrolls, percent change in the Wilshire 5,000 stock price index, percent change in the University of Michigan consumer sentiment index, and two lags of each of those variables, as well as the unemployment rate and the 30-year fixed-rate mortgage interest rate.

Perhaps unsurprisingly, the lags of home prices, and especially the first two lags, are by far the most important and statistically significant predictors of current house prices in the model. Other variables are not statistically significant by themselves, although one might expect this given the presumably high degree of collinearity between some of them (such as income and unemployment or confidence and sentiment).

Our forecasting technique is a dynamic forecast. To predict the February 2009 percent change in housing prices, the first month in the forecast period, we simply plug in the actual values for each of the exogenous variables and for the four lags of percent-change in housing prices into the estimated model from the autoregression. For the following month, March 2009, so as not to rely on actual price data from within the forecast period, we use the February 2009 predicted percent change in home price value as the first lag of home prices, along with actual price data for the other three home price lags and the exogenous variables. For April 2009, we use the March 2009 and February 2009 predicted percent change home price values for the first and second lags, respectively, along with actual data for the remaining variables. We repeat the process of predicting percent-changes in home prices, using previous-period predictions as lags of the outcome variable, iteratively for 36 periods.

Figure 3 depicts the results of the dynamic forecast using the three estimated models of monthly percent-changes in house prices. The two vertical lines indicate the introduction of the passage of ARRA, in January 2009, and the deadline to close purchases to take advantage of the WHBAA credit at the end of June 2010. The blue line shows actual monthly changes in house prices, while the red, green, and orange lines show the forecasts derived from the models estimated starting in 1995, 2000, and 2004, respectively. During the period when the ARRA and WHBAA tax credit programs were in place, the three predicted home price series are between 2 and 5 percentage points lower than the actual monthly changes in home prices. However, we caution that these results need to be interpreted with caution given that the forecasts appear to be extremely sensitive to the estimation period. In particular, the forecast based on the longest estimation period (1995-2009) diverges significantly from the other series after a few quarters.

Table 9 shows the results from the estimated models of quarterly home sales, starts, and permits. Because using quarterly as opposed to monthly data reduces the total number of observations included in the regressions by a factor of four, we reduce the number of regressors in our model to avoid overfitting. Specifically, we regress the quarter-to-quarter percent change in each outcome variable on four lags of itself, in addition to contemporaneous consumer confidence, the 30-year fixed-rate mortgage interest rate, the year-on-year change in the Wilshire 5,000 stock price index, the year-on-year change in non-farm payroll employment, the year-on-year change in disposable personal income, and the quarter-to-quarter change in the 30-year fixed-rate mortgage interest rate. We estimate the model for starts and permits over two separate ranges: 1995:Q1 to 2008:Q4 and 2000:Q1 to 2008:Q4. Because CoreLogic

housing sales data are not available before the year 2000, we are only able to estimate the sales model using the time range, 2001:Q2 to 2008:Q4 once we allow for lags of the dependent variable on the right hand side.

Compared with the results of the monthly housing price model estimates, the coefficients on the exogenous variables in the sales, starts, and permits models are more highly statistically significant. The estimated signs of the coefficients sometimes correspond to the expected relationship but other times do not. Moreover, some appear to be quite sensitive to the estimation period, leading us to be again cautious about interpretation.

The results of the dynamic forecasting exercise are depicted in Figure 4. As before, the two vertical lines indicate the introduction of the passage of ARRA, in January 2009, and the initial deadline to close purchases to take advantage of the WHBAA credit at the end of June 2010. The blue line shows actual quarterly changes in the outcome variables, while the red and green lines show the forecasts derived from the models estimated starting in 1995 and 2000 (or 2001, in the case of sales), respectively. For both starts and permits, the actual quarterly percent changes exceed the forecasted percent changes by a considerable margin for several periods in the middle of the treatment period, while in other periods the forecast is fairly close to the actual. Despite the fact that the naïve inspection of the sales data seemed to show the clearest evidence of a treatment effect from the tax credit program, there is no obvious treatment effect from comparing the forecast quarterly data series with the actual one.

All told, there is some evidence that the models were surprised by the strength of prices and construction (starts and permits) following the passage of ARRA. This result is consistent with what the much simpler approach of visually inspecting the time series shows—that the sharp deterioration in the housing market stopped around this time. Given that we can see clear effects of the homebuyer tax credits on the pattern of sales, it seems plausible that the program contributed to this stabilization. However, we are reluctant to use the dynamic forecasting results to quantify the precise effects of the program for two reasons. First, it seems very unlikely that the independent variables in the models are capturing all of the other changes that occurred in the economy at the time (including both the general support for the financial system as well as the various initiatives aimed directly at the housing market like the government's foreclosure mitigation programs). Second, the models themselves do not appear to be highly robust, with both the coefficient estimates and the forecasts fairly sensitive to the time period examined..

VI. Using State-Level Variation to Analyze the Federal Homebuyer Tax Credit Program

We next estimate the impact of the federal homebuyer tax credit using state-level data, building on a method used by Brogaard and Roshak (2011). These authors used city-level data and exploited the fact that differences in housing market and socioeconomic conditions across cities implied that, all else equal, the credit should have provided a stronger incentive to purchase housing in some cities than in others. We assembled a state-level data set with monthly observations and attempted to use variation along three dimensions to isolate the impact of the credit. First, the credit represented a greater effective percent reduction in home prices in states where housing was generally cheaper. Second, the credit should have been proportionally more valuable in states that had more low-income households because these households were more likely to be eligible to get the credit and because they were more likely to need the credit to overcome liquidity constraints. Third, because credit was initially limited to first-time

homebuyers, the credit should have been relatively more valuable in states with lower homeownership rates because of their large pool of "potential homeowners." In the analysis that follows, we refer to the states with below-median housing prices, below-median personal income, and below-median homeownership as part of effective "treatment" groups relative to other states.

We begin by estimating a difference-in-differences model of homebuyer tax credit effects on a data set of monthly state-level observations:

$$\ln(sales)_{s,t} = \alpha + \beta_1 program_t + \beta_2 post_t + \beta_3 lowHPI_s + \beta_4 program_t * lowHPI_s + \beta_5 post_t * lowHPI_s + \beta_6 unemp_{s,t} + \beta_7 \ln(\Delta payroll)_{s,t} + state_s + \varepsilon_{s,t}$$

Where $program_t$ equals 1 for the 18-month duration of the ARRA and WHBAA phases of the program (April 2009 through September 2010) and 0 otherwise. $post_t$ equals 1 for our presumed "payback period," the 15 months following the end of WHBAA (October 2010 through December 2011, the end of the dataset) and 0 otherwise.[18] We interact these time variables with an indicator of whether the state falls in the first treatment group: $lowHPI_s$, which equals 1 for states with a below-median HPI. (Each state's HPI is calculated as a monthly average from January 2004 through July 2008, before the homebuyer tax credit was introduced, to avoid conflating pre-program conditions with treatment effects.) The state-level unemployment rate, the three-month average of the monthly change in payroll employment, and a full set of state fixed-effects are also included in the regression to help control for differences in economic conditions across states that might influence the effects of the tax credit program.

If treatment group status is uncorrelated with unobservable determinants of home sales, then the coefficient on the interaction of the "treatment" and the indicator for months when the program was in effect, β_4, should provide an unbiased estimate of the effect of the homebuyer tax credit. The coefficient β_5 should capture the persistence of the effect of the credit after it expires. If the credit primarily served to accelerate purchases that households would have made even without the program, the coefficient would be expected to be negative.[19]

We also estimate the specification above replacing the treatment group indicator based on below-median HPI with treatment group indicators based on a state having below-median personal income per capita or a below-median homeownership rate.[20] As with HPI, inclusion in the treatment group is based on the ex ante monthly average of either personal income per capita or and homeownership (calculated between January 2004 and July 2008). We then repeat these three specifications using ln(HPI) as the outcome variable instead of *ln(sales)*. For all specifications, the interpretation of β_4 and β_5 is similar.

The estimates are presented in Table 10. The key results are in the rows marked "Program*treat"

[18] We experimented with payback periods of different lengths, and it did not change our basic conclusions.
[19] We cannot directly compare the relative sizes of β_4 and β_5 since the number of months covered by each are not quite the same. Roughly speaking, though, complete persistence or complete payback would imply a coefficients that are of roughly the same absolute magnitude (though β_5 would be positive in the former case and negative in the latter case.
[20] We only observe state-level homeownership at a quarterly frequency and therefore interpolate monthly data between each quarterly observation.

(corresponding to β_4 in the equation above) and "Post*treat" (corresponding to β_5. Although most of the estimated coefficients are highly significant, they do not tell a particularly coherent story. The estimates are very different depending on the choice of treatment group. For half of the specifications, the coefficient on Program*treat takes a negative value, implying that the credits actually reduced sales and prices. Furthermore, the coefficients on Program*treat and Post*treat have the same sign as each other in all of the specifications. This combination of results is suggestive that the coefficients are reflecting forces in addition to the effects of the tax credit on the levels of home sales and prices. In other words, it would appear that the assumption that being in the various treatment groups has no independent relationship with the outcome variables (i.e. above and beyond the predicted relationship because of the tax credit) is violated.

Indeed, we find evidence that treatment group status is correlated with the observable determinants of housing prices and sales, suggesting that it is also correlated with unobservable determinants, thus violating the identification assumption. Table 11 provides an example—a state's unemployment rate during the sample period that we looked at had a significant relationship with whether it is in the various treatment groups. States with low home prices tended to have lower unemployment rates, those with low personal income and homeownership rates tended to have higher unemployment rates.

Thus, while use of more geographically granular data is appealing because it offers so much more variation than the macro data, the difference-in-differences framework does not appear to be well-suited to analyzing the homebuyer tax credit.

VII. Analysis of State-Level Homebuyer Assistance Programs

A final way in which we explore the effects of the homebuyer tax credit is through analysis of the state homebuyer assistance programs. As discussed above, the state-level programs essentially took on two forms. Nineteen states created programs that provided bridge loans such that homebuyers claiming the credit could effectively apply the proceeds to downpayments and purchase costs. Meanwhile, four other states created programs that provided credits or grants to homebuyers meeting certain qualifications.

Analysis of the latter set of programs can shed light on the effects of the federal homebuyer tax credit program. Although the state-level programs had different eligibility criteria and time frames than the federal homebuyer tax credit, the basic concept—a subsidy for home purchases—was the same. A given amount of subsidy should have the same influence on eligible homebuyers regardless of whether it was made available by the state or federal government.

A closer examination of the bridge loan programs is useful because they were designed as a way to increase the impact of the federal homebuyer tax credit program. In particular, by facilitating home purchases by cash-constrained households, they should have increased the number of households that were able to take advantage of the federal homebuyer tax credit program and, in turn, produce a larger effect on a state's housing markets. More generally, the bridge loan programs should have allowed the federal homebuyer tax credit to have had a more immediate effect on a state's economy by accelerating the effective transfer.

We begin by simply looking at whether housing activity was stronger in states that had any kind of

homebuyer assistance program. We estimate the following specification for four outcome variables—single-family home sales, HPI, the number of new private housing units authorized by building permits, and the level of construction employment:

$$\ln(outcome)_{s,t} = \alpha + \beta_1 activeProgram_{s,t} + \beta_2 unemp_{s,t} + \beta_3 \ln(\Delta payroll)_{s,t} + state_s + month_t + \varepsilon_{s,t}$$

where *active program*$_{s,t}$ is a dummy variable equal to 1 when a grant, credit, or loan for the purchase of a home is available in state *s* during month *t*; *unemp*$_{s,t}$ is the unemployment rate; *ln(Δpayroll)* is the smoothed[21] log of the month-to-month change in level of payroll employment; and *state*$_s$ and *month*$_t$ are full sets of state and month fixed-effects, respectively. We repeat the specification adding an indicator variable, *post*$_{s,t}$, equal to 1 in a given state for six months following the end of a credit, grant, or loan program in that state, and 0 otherwise. We interpret the coefficient on *active program*$_{s,t}$ as an estimate of the effect of the presence of a state program on a particular housing market outcome, while *post*$_{s,t}$ is meant to capture any lasting effects (or reversion of effects) of the program on housing market activity. A positive coefficient would suggest that the programs had a lasting stimulative effect, while a negative one suggests that they may have worked, in part, by shifting the timing of purchases that would have occurred even in the programs' absence.

The results of this analysis appear in Table 12. The results in columns (1) and (2) suggest that home sales in states that had some type of program were, on average, about 2 percentage points higher during the months for which the program was in place. The coefficient on the indicator variable for the post-program period is positive though imprecisely estimated, suggesting that the programs had no permanent effect on sales but also did not induce a pronounced period of "payback." The results in columns (3) and (4) suggest that the programs also may have boosted home prices. At face value, the effect appears to be small—less than 1 percent—but the higher home prices appeared to prevail even after the expiration of the programs. However, there is no evidence that the programs had any economically meaningful effects on home construction, with the coefficients on the indicator variables in the regressions for permits and construction employment imprecisely estimated and of the wrong sign. This latter result is perhaps not too surprising given the high levels of excess inventories at the time and the lack of any evident effect of the program on construction in the macro data.

Table 13 shows the results when indicator variables for bridge loan and grant programs are included separately in the regressions for home sales and prices. For home sales, the grant programs appear to have made the most differences, with states having those programs seeing sales that were about 5 percent higher over the period during which the programs were in effect. For home prices, the point estimates imply that the effects for both types of programs are similar (and similar to those seen when the two types of programs were grouped together). These coefficients are not statistically significant, although the relatively high standard errors may reflect a lack of relevant variation once the groups are split apart.

[21] Each smoothed value of ln(Δ*payroll*)equals the raw value for that month averaged with the raw value for each of the previous two months.

VIII. Conclusion

All told, our different analyses suggest that the various homebuyer tax credit programs had, at best, small and mostly temporary effects on housing activity. However, like any type of tax credit, the homebuyer tax credits probably did provide a general stimulus to the economy at a time when unused resources were very high. The real question would be, then, whether this particular form of tax relief was the most cost-effective way to provide such stimulus. Comparing the outcomes of the homebuyer tax credit programs to the very wide range of ways in which the government could have used the funds is outside of the scope of this paper, but we flag the issue as imperative for future policymakers contemplating the use of such a program. Future policymakers also need to consider whether the distributional consequences of this particular form of tax relief are socially desirable, a point emphasized by Baker (2012).

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Table 1
Major Phases of the Homebuyer Tax Credit

	Housing and Economic Recovery Act of 2008	American Recovery and Reinvestment Act of 2009	Worker, Homeownership, and Business Assistance Act of 2009
Eligible purchase dates	April 8, 2008 - Dec. 31, 2008[a]	Jan. 1, 2009 - Nov. 30, 2009	Nov. 7, 2009- April 30, 2010 (deadline for contract); Closing required by June 30, 2010, extended to Sep. 30, 2010[b]
Buyer type	First-time	First-time	First-time and repeat (if they had owned and lived in their homes for 5 years)
Maximum amount	$7,500	$8,000	$8,000 for first-time buyers $6,500 for repeat buyers
Income phase-out ($ 000s)	Single: $75-95 Joint: $150-170	Single: $75-95 Joint: $150-170	Single: $125-145 Joint: $225-245
Repayment required	Yes	No[c]	No[c]
Maximum purchase price	None	None	$800,000

a. The HERA credit was available through July 1, 2009, but since the ARRA credit was strictly more generous, we assume that taxpayers would have chosen to take advantage of that credit instead.
b. Members of the armed services were subject to an extended deadline.
c. Provided the homebuyer owned and lived in the home for 36 months following purchase (rule waived for members of the armed services).

Table 2
Homebuyer Tax Credit Take-up
by Major Program Phase through July 3, 2010

Program phase	Time range	Number of credits	Amount claimed (millions of dollars)
HERA	April 8, 2008 – Dec. 31, 2008	1,069,150	$7,300
ARRA	Jan. 1, 2009 – Nov. 30, 2009	1,669,081	$12,119
WHBAA			
First-time	Nov. 30, 2009 – Sep. 30, 2010	398,545	$2,947
Repeat	Nov. 9, 2009 – Sep. 30, 2010	185,014	$1,155
Total		583,559	$4,101

Table 3
State Programs Complementing the Federal Homebuyers Tax Credit
Bridge Loan Programs[a]

State	Loan amount[b] % purchase price	Loan amount[b] Max.	Interest rate[c]	Program start[d]	Program end[e]	Loan due
Colorado	3.5	6000	0	Jan-09	Jun-10	Dec-10
Florida		8000	0	May-09	Jun-10	Jun-10
Idaho	5	7000	3	Mar-09	Jun-10	Jul-10
Illinois	3.5	6000	0	Jul-09	Nov-09	Jun-10
Kentucky		4500	0	May-09	Nov-09	Jul-10
Massachusetts		8000	0	Jul-09	Nov-09	Jun-10
Missouri	6	6750	0	Jan-09	Nov-09	Jun-10
Nebraska	8.5	6800	5	Dec-09	Jun-10	Dec-10
New Jersey	10	5000	0	Apr-09	Dec-09	Jun-10
New Mexico	8	6500	0	Apr-09	Dec-09	Jun-10
New York	10	8000	0	Jan-10	Jun-10	Jun-11
Ohio	3		0	Jan-09	Nov-09	Aug-10
Oklahoma	6	6000	2	Aug-09	Nov-09	Dec-09
Pennsylvania	10	5500	0	Jan-09	Nov-09	Jun-10
South Dakota	6	6000	0	Jun-09	Nov-09	Jul-10
Tennessee	3.5		0	Apr-09	Nov-09	Jun-10
Texas	5	7000	0	Jul-09	Dec-09	Mar-10
Virginia	5		0	Jun-09	Jun-10	Jun-11

a. The parameters in the table only summarize the loan programs. Additional restrictions applied to most programs.
b. Loan amounts are equal to the listed percent of the home purchase price up to the listed maximum.
c. Loan "due date" is date at which the interest rate rises if the loan has not yet been paid back.
d. We could not find specific information about the start dates for FL, TN, and VA, so we estimated these dates using related information such as when press releases were issued.
e. We could not find specific information about the end dates for CO and SD, so we estimated these dates using related information such as when loans were due.

Table 4
State Programs Complementing the Federal Homebuyers Tax Credit
Home Purchase Grants (via Tax Credit)

State	Eligibility	Grant amount	Program period	Total budget	Grants awarded
California	New homes	5%, up to $10,000	3/1/2009-7/2/2009	$100 million	Unknown, likely ~14,000
California	New homes	5%, up to $10,000	5/1/2010-8/1/2011	$94 million	13,715
California	First-time	5%, up to $10,000	5/1/2010-8/15/2010	$100 million	18,769
Georgia	Not limited to first-time	1.2%, up to $1,800	6/1/2009-11/30/2009	Unknown	Unknown
Maine	First-time	4%, up to $5,000	6/2009-11/30/2009	~$5 million	~800
Maine	First-time	4%, up to $2,500	12/1/2009-?	Unknown	Unknown
Utah	New homes	$6,000	3/19/2009-6/2009	$9.6 million	1,600
Utah	New homes	$4,000	9/4/2009-11/2009	$7.8 million	1,950

Table 5
Take-up of Federal Tax Credit Program: Regression Results[a]

	(1) $ per household	(2) $ per capita	(3) $ per homeowner
% population 25-34, 1/09	1183*** (385.9)	3734.5** (156.0)	1717*** (552.7)
Unemployment rate, 1/09	-3.732 (2.367)	-2.095** (0.984)	-5.403 (3.403)
% ΔHPI during "boom"[b]	17.01 (21.58)	3.871 (8.808)	24.30 (31.29)
Homeownership rate, 1/09	1.730** (0.713)	0.433 (0.295)	0.423 (1.031)
Median household income, 1/09	0.00122** (0.000543)	0.000391* (0.000223)	0.00181** (0.000782)
Median home price, 1/09	-0.000249** (0.000114)	-9.46e-05* (4.74e-05)	-0.000371** (0.000166)
Median normalized sales, 1/09[c]	24,451*** (5,515)	22,014*** (6,345)	23,932*** (5,543)
State had credit or grant program	11.47 (10.42)	2.199 (4.357)	17.96 (14.97)
State had bridge loan program	-4.821 (5.991)	-2.648 (2.485)	-7.996 (8.599)
Constant	-177.0* (89.49)	-31.51 (36.28)	-114.7 (124.9)
Observations	51	51	51
R^2	0.699	0.606	0.713

a. Analysis reflects only take-up during the ARRA and WHBAA phases of the homebuyer tax credit program.
b. Percent change in home prices between February 2003 and April 2006.
c. Per household for column (1), per capita for column (2), and per homeowner for column (3).
Standard errors in parentheses.
*** p<0.01, ** p<0.05, * p<0.1.

Table 6

Different Dimensions of Homebuyer Incentive Programs that

Are Relevant to Macroeconomic Effects

Type of buyer:	
First-time	HERA, ARRA, Maine, California (for existing homes), most state bridge loan programs
First-time and repeat	WHBAA, California (for new homes), Utah, Georgia
Value of benefit over the long run:	
Smallest	Federal loan-like tax credits (HERA) and state bridge loans
↓	Federal grant-like tax credits (ARRA and WHBAA)
Largest	Federal grant-like tax credits combined with state grant (Utah, Maine) or grant-like tax credits (California, Georgia)
Timing:	
Money received before closing	ARRA and WHBAA combined with a bridge loan from state finance agency or qualified lender (generally first-time FHA borrowers only), Utah, Maine
↓	HERA, ARRA and WHBAA if purchaser elected to file amended tax return for prior year (and no audit)
↓	HERA, ARRA and WHBAA if purchaser elected to wait until following year to claim credit, Georgia (unless credit exceed tax liabilities in which case excess carried over)
Money/benefits received over a period of years	California

Table 7
Potential Macroeconomic Effects of Homebuyer Tax Credit

	Channel	Effect	Notes
Direct Effects	Transfer to homebuyers	Long-run financial gain that raises demand for owner-occupied housing	Rental demand reduced; overall housing demand only increases if new households formed. Likely followed by "payback" since new purchases mostly just accelerated
		Funding for downpayments and closing costs that raises the demand for owner-occupied housing	May induce purchases by households with little savings, but only for buyers that are able to "monetize" the credit in advance
		Increases disposable income	May raise the spending of homebuyers on consumer goods and services
Indirect Effects	Higher home prices	"Wealth" effects	Should raise spending of all homeowners, though a negative for non-homeowners that are planning to purchase a home in the future
		Reduce foreclosures and bank losses	Households who cannot make their mortgage payments may be able to avoid foreclosure by selling and paying off their mortgages
		Allow more households to refinance by reducing the number of "underwater" homeowners	The Administration's HARP program facilitated refinancing for underwater homeowners with GSE-backed mortgages, but underwater homeowners with mortgages in private-label MBS pools were excluded
	Higher home purchases	Absorb excess inventory	Only to the degree that net demand for housing is higher
		Stimulate construction	If excess inventory in area has been completely absorbed
		Increase income for those involved in home purchase transactions	Should raise demand more broadly

Table 8
Estimates from Monthly Home Price Model

	Estimation period		
Variable[a]	1/1995-1/2009	1/2000-1/2009	1/2004-1/2009
HPI, 1st lag	1.750***	1.744***	1.830***
	(0.0940)	(0.124)	(0.176)
HPI, 2nd lag	-1.153***	-1.132***	-1.155***
	(0.185)	(0.243)	(0.340)
HPI, 3rd lag	0.440**	0.436*	0.272
	(0.185)	(0.243)	(0.334)
HPI, 4th lag	-0.0220	-0.0397	0.0355
	(0.0959)	(0.125)	(0.165)
Personal income (PI)	0.00916	0.00966	0.0225
	(0.0114)	(0.0137)	(0.0197)
PI, 1st lag	0.0143	0.00922	0.0170
	(0.0116)	(0.0139)	(0.0197)
PI, 2nd lag	0.000985	-0.00185	-0.00785
	(0.0113)	(0.0134)	(0.0185)
Mortgage rate (%)	0.000169	0.000333	-1.62e-06
	(0.000106)	(0.000267)	(0.00101)
Δ Mortgage rate (pp)	-0.000163	-0.000650	-0.00108
	(0.000423)	(0.000707)	(0.00138)
Δ Mort. rate, 1st lag	0.000267	0.000969	0.00248**
	(0.000419)	(0.000595)	(0.00120)
Δ Mort. rate, 2nd lag	9.06e-05	-5.65e-05	0.000131
	(0.000419)	(0.000643)	(0.00125)
Unemp. rate (%)	4.78e-05	0.000234	9.40e-05
	(0.000136)	(0.000325)	(0.000746)
Employment	0.0227	0.0973	0.259
	(0.0864)	(0.131)	(0.228)
Employment, 1st lag	0.0887	0.0698	0.0559
	(0.0855)	(0.135)	(0.252)
Employment, 2nd lag	-0.0886	-0.140	-0.101
	(0.0866)	(0.138)	(0.274)
Wilshire 5,000 Index	0.00273	0.00446	0.00560
	(0.00215)	(0.00301)	(0.00551)
Wilshire, 1st lag	-0.00278	-0.00187	-0.0131**
	(0.00231)	(0.00332)	(0.00571)
Wilshire, 2nd lag	0.00391	0.00656*	0.00934
	(0.00238)	(0.00366)	(0.00691)
Consumer confidence	-0.000620	-0.00203	-0.00156
	(0.00185)	(0.00231)	(0.00326)
Cons. conf., 1st lag	-0.00153	-0.00192	0.00145
	(0.00181)	(0.00226)	(0.00311)
Cons. conf., 2nd lag	-0.00145	-0.00226	-0.00278
	(0.00186)	(0.00235)	(0.00354)
Constant	-0.00166	-0.00361	-0.000958
	(0.00114)	(0.00325)	(0.00897)
Observations	169	109	61
R^2	0.984	0.987	0.989

a. variables represent monthly percent changes unless otherwise noted

Standard errors in parentheses.
*** p<0.01, ** p<0.05, * p<0.1.

Table 9
Estimates from Quarterly Sales, Starts, and Permits Models

Outcome	(1) Sales	(2) Starts	(3) Starts	(4) Permits	(5) Permits
Estimation Period	2001Q2-2008Q4	1995Q1-2008Q4	2000Q1-2008Q4	1995Q1-2008Q4	2000Q1-2008Q4
1st lag of dep. var.	-0.112	0.176	0.00117	0.436***	0.342*
	(0.165)	(0.138)	(0.162)	(0.138)	(0.189)
2nd lag	-0.152	0.0181	-0.0148	-0.223	-0.158
	(0.142)	(0.138)	(0.159)	(0.150)	(0.189)
3rd lag	0.158	0.238*	0.174	0.426***	0.238
	(0.156)	(0.141)	(0.149)	(0.154)	(0.199)
4th lag	0.108	0.214	0.231	0.0429	0.0272
	(0.172)	(0.142)	(0.174)	(0.145)	(0.197)
Consumer confidence	0.00426***	0.00231**	0.00568***	0.00231**	0.00490***
	(0.00103)	(0.00117)	(0.00160)	(0.00102)	(0.00156)
30 yr. mortgage rate	-0.0756***	-0.000448	-0.0405*	-0.00418	-0.0390**
	(0.0170)	(0.0109)	(0.0213)	(0.00926)	(0.0194)
YoY Δ, Wilshire 5,000	-0.182***	0.0590	-0.189*	0.0828	-0.118
	(0.0572)	(0.0656)	(0.0985)	(0.0565)	(0.0943)
YoY Δ, Employment	-1.661**	-1.360	-1.004	-1.411*	-1.051
	(0.670)	(0.923)	(0.980)	(0.798)	(0.922)
YoY Δ, personal income	0.853*	-0.675	-0.412	-0.496	0.323
	(0.476)	(0.597)	(0.917)	(0.529)	(0.817)
Qtr.-to-qtr. Δ, mort. rate	0.122***	-0.000391	0.0819***	-0.0363*	0.0444
	(0.0273)	(0.0220)	(0.0314)	(0.0200)	(0.0326)
Constant	0.0849	-0.185**	-0.236**	-0.168**	-0.198**
	(0.0832)	(0.0941)	(0.101)	(0.0829)	(0.0951)
Observations	31	56	36	56	36
R^2	0.742	0.434	0.641	0.579	0.696

Standard errors in parentheses .
*** p<0.01, ** p<0.05, * p<0.1.

Table 10
Results from Difference-in-Differences Analysis of Federal Homebuyer Tax Credit

	(1)	(2)	(3)	(4)	(5)	(6)
Outcome	lnsales	lnsales	lnsales	lnhpi	lnhpi	lnhpi
Treatment	lowHP	lowPI	lowHO	lowHP	lowPI	lowHO
Program	0.0351**	0.00681	-0.0465***	-0.0125***	0.0105**	0.0269***
	(0.0159)	(0.0161)	(0.0168)	(0.00429)	(0.00452)	(0.00465)
Post	-0.0815***	-0.124***	-0.229***	-0.0732***	-0.0403***	-0.0339***
	(0.0158)	(0.0158)	(0.0159)	(0.00425)	(0.00445)	(0.00438)
Program * treat	-0.121***	-0.0810***	0.0438***	0.0631***	0.0193***	-0.0161***
	(0.0144)	(0.0148)	(0.0150)	(0.00388)	(0.00416)	(0.00415)
Post * treat	-0.235***	-0.168***	0.0658***	0.0727***	0.00880**	-0.00573
	(0.0154)	(0.0157)	(0.0161)	(0.00413)	(0.00443)	(0.00444)
Unemp rate	-0.0183***	-0.0156***	-0.0176***	-0.0318***	-0.0324***	-0.0322***
	(0.00378)	(0.00387)	(0.00396)	(0.00102)	(0.00109)	(0.00109)
Δ ln(payroll)	16.33***	17.30***	16.83***	0.0324	-0.188	-0.156
	(1.271)	(1.302)	(1.327)	(0.342)	(0.366)	(0.366)
Constant	8.494***	8.480***	8.490***	5.202***	5.205***	5.204***
	(0.0213)	(0.0218)	(0.0223)	(0.00572)	(0.00613)	(0.00616)
Observations	2,450	2,450	2,450	2,450	2,450	2,450
R-squared	0.985	0.984	0.983	0.963	0.957	0.957
State FE	X	X	X	X	X	X

Standard errors in parentheses.
*** p<0.01, ** p<0.05, * p<0.1.

Table 11
Regressions of the Unemployment Rate on "Treatment" Indicators

	(1)	(2)	(3)
low HP	-0.156*		
	(0.0934)		
low HO		0.432***	
		(0.0931)	
low PI per cap			0.352***
			(0.0932)
Constant	7.766***	7.484***	7.522***
	(0.0647)	(0.0645)	(0.0646)
Observations	2,450	2,450	2,450
R-squared	0.001	0.009	0.006

Standard errors in parentheses.
*** p<0.01, ** p<0.05, * p<0.1.

Table 12
Analysis of State Programs
Designed to Complement or Augment the Homebuyer Tax Credit

VARIABLES	(1) lnsales	(2) lnsales	(3) lnhpi	(4) lnhpi	(5) lnpermits	(6) lnpermits	(7) lnconstemp	(8) lnconstemp
Active program	0.0207*	0.0263**	0.00486	0.00688*	-0.0189	-0.0270	-0.00117	-0.000666
	(0.0122)	(0.0127)	(0.00338)	(0.00353)	(0.0204)	(0.0212)	(0.00413)	(0.00432)
Post program		0.0222		0.00796**		-0.0322		0.00194
		(0.0142)		(0.00394)		(0.0238)		(0.00487)
UR	0.00669	0.00641	-0.0371***	-0.0372***	-0.0677***	-0.0673***	-0.0540***	-0.0540***
	(0.00479)	(0.00479)	(0.00133)	(0.00133)	(0.00802)	(0.00803)	(0.00162)	(0.00163)
Δ Ln(payroll)	12.72***	12.81***	-6.596***	-6.563***	2.615	2.482	-6.882***	-6.875***
	(2.258)	(2.258)	(0.628)	(0.628)	(3.784)	(3.785)	(0.784)	(0.784)
State FE	X	X	X	X	X	X	X	X
Month FE	X	X	X	X	X	X	X	X
Constant	6.760***	6.762***	5.358***	5.359***	4.758***	4.755***	3.190***	3.190***
	(0.0402)	(0.0402)	(0.0112)	(0.0112)	(0.0674)	(0.0674)	(0.0135)	(0.0135)
Observations	2,401	2,401	2,401	2,401	2,401	2,401	2,107	2,107
R-squared	0.987	0.987	0.962	0.962	0.955	0.955	0.998	0.998

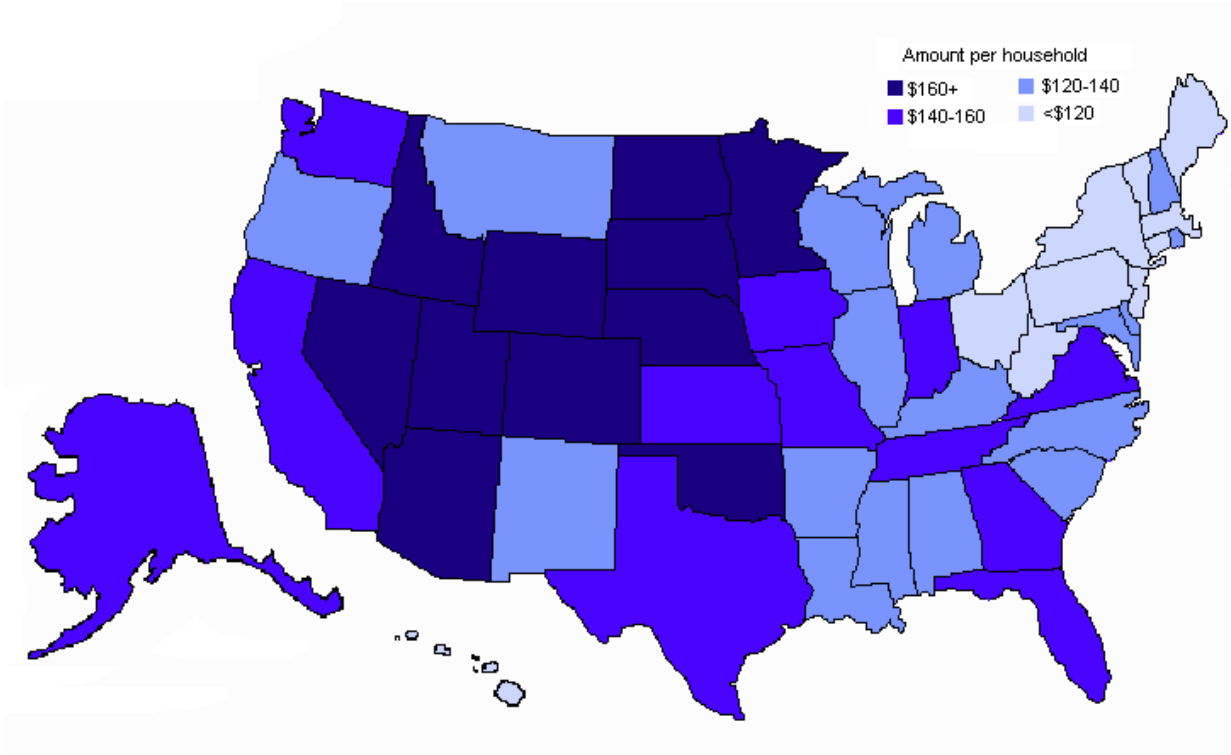
Standard errors in parentheses.
*** p<0.01, ** p<0.05, * p<0.1.

Table 13
Further Analysis of State Programs
Designed to Complement or Augment the Homebuyer Tax Credit

	(1)	(2)	(3)	(4)
VARIABLES	lnsales	lnsales	lnhpi	lnhpi
Active grant	0.0549**	0.0551**	0.00466	0.00636
	(0.0238)	(0.0249)	(0.00663)	(0.00695)
Post grant		-0.00531		0.00477
		(0.0283)		(0.00788)
Active loan	0.0103	0.0168	0.00492	0.00691*
	(0.0137)	(0.0141)	(0.00380)	(0.00392)
Post loan		0.0313**		0.00888**
		(0.0158)		(0.00440)
UR	0.00631	0.00629	-0.0371***	-0.0372***
	(0.00479)	(0.00480)	(0.00133)	(0.00134)
Δ Ln(payroll)	12.79***	12.84***	-6.597***	-6.568***
	(2.258)	(2.258)	(0.629)	(0.629)
Constant	6.763***	6.763***	5.358***	5.359***
	(0.0402)	(0.0403)	(0.0112)	(0.0112)
Observations	2,401	2,401	2,401	2,401
R-squared	0.987	0.987	0.962	0.962
State FE	X	X	X	X
Month FE	X	X	X	X

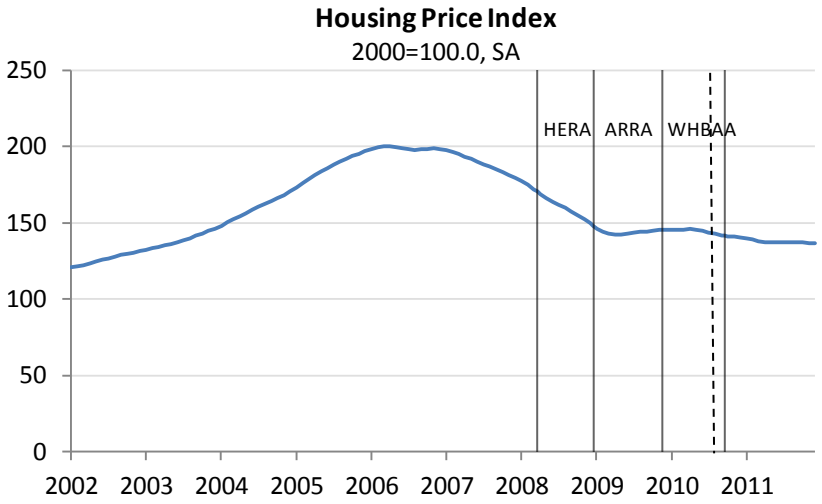
Standard errors in parentheses.
*** p<0.01, ** p<0.05, * p<0.1.

Figure 1
Amount of Homebuyer Credit Claimed per Household by State
ARRA and WHBAA, through July 3, 2010

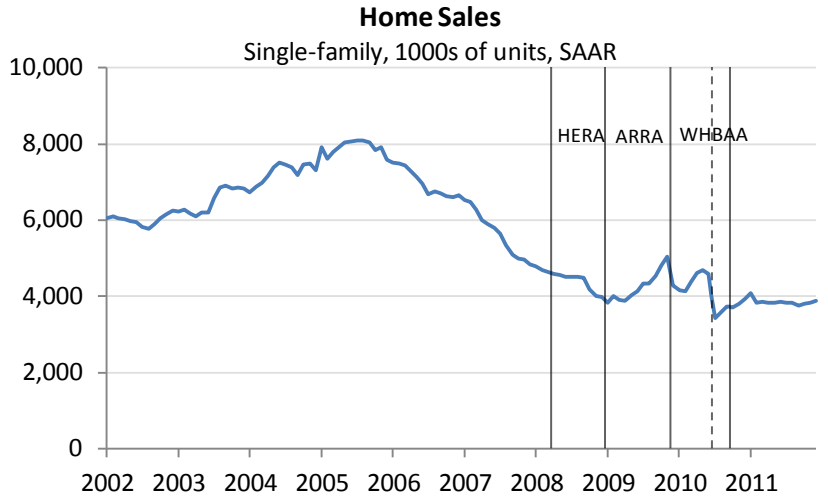


Note: Amount for each state calculated by dividing GAO's (2010) estimate of the total amount of the credit claimed by tax filers in a state by the total number of households in that state.

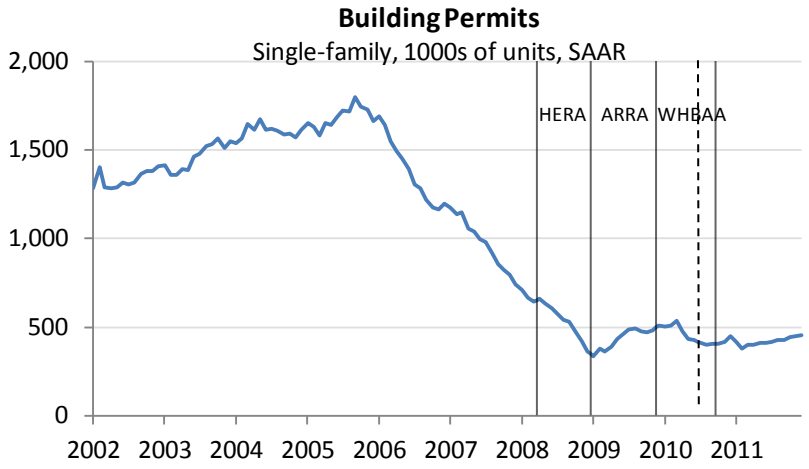
Figure 2
Housing Market Indicators, 2002-2011



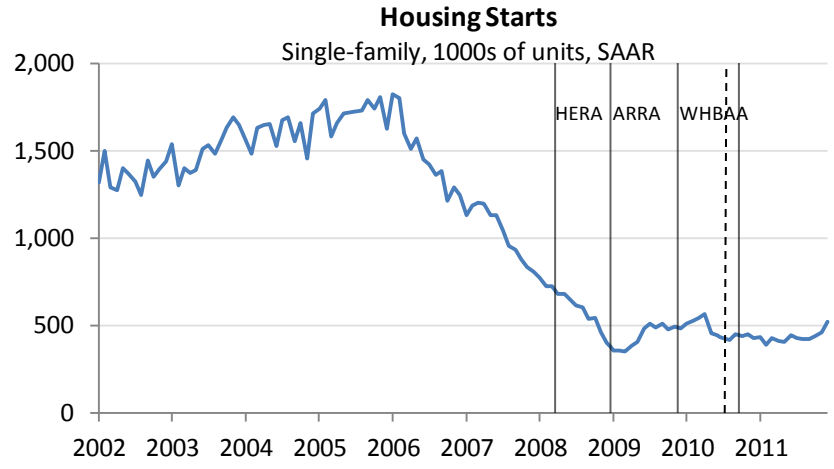
Source: CoreLogic, Haver Analytics



Source: CoreLogic, author's calculations



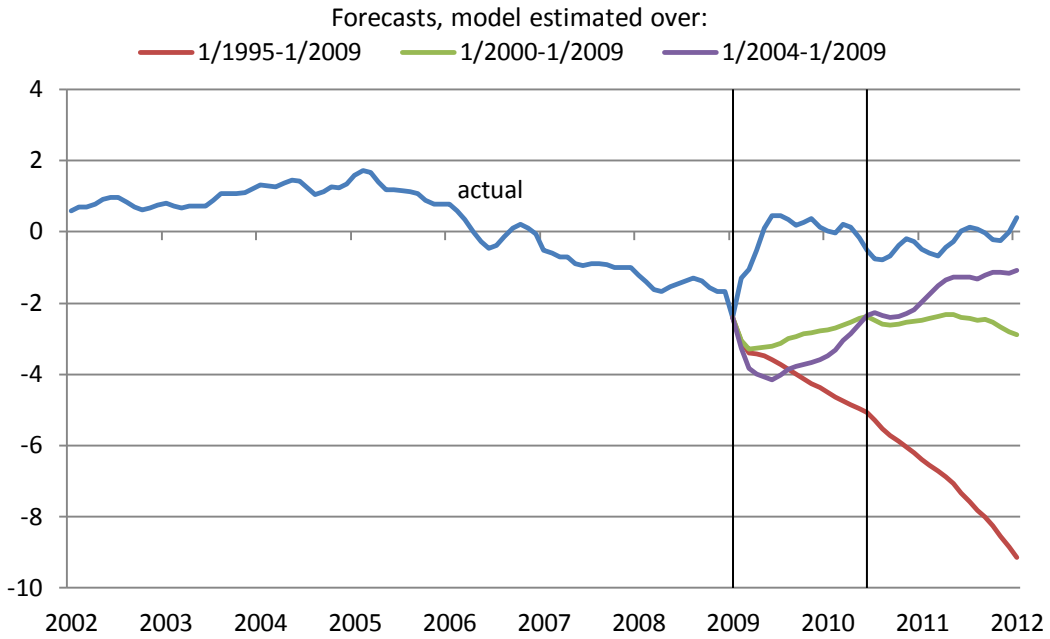
Source: Census Bureau



Source: Census Bureau

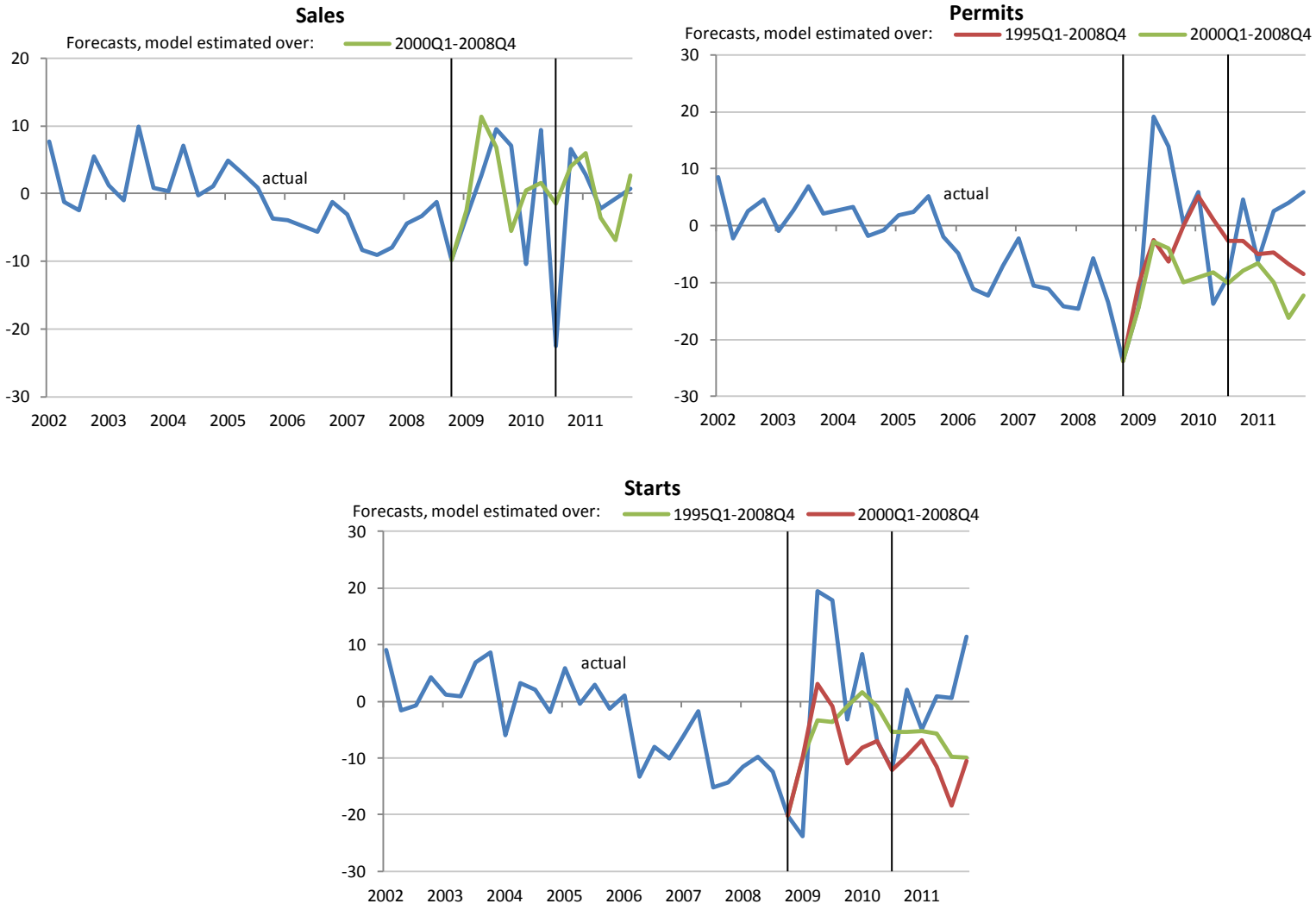
Note: The solid vertical lines demarcate the periods over which the HERA, ARRA, and WHBAA phases of the homebuyer tax credit were active. The dashed lines show the original deadline for the WHBAA phase.

Figure 3
Percent Changes in Monthly Home Prices
Actual versus Forecast



Note: The two vertical lines indicate the passage of ARRA in February 2009 and the initial deadline to close purchases under the WHBAA credit at the end of June 2010.

Figure 4:
Percent changes in Quarterly Sales, Starts, and Permits
Actual versus Forecast



Note: The two vertical lines indicate the passage of ARRA in February 2009 and the initial deadline to close purchases under the WHBAA credit at the end of June 2010.