

**GSE LOAN PURCHASES, THE FHA, AND HOUSING OUTCOMES
IN TARGETED, LOW-INCOME NEIGHBORHOODS**

by

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Abstract

This study conducts two tests to evaluate the effects of the GSE mortgage purchase goals on homeownership, housing outcomes, and credit access among communities that are the focus of the 1992 GSE Act and the HUD affordable housing goals. The first test exploits differences in the definition of lower-income and underserved neighborhoods under the 1992 GSE Act, which specifies loan purchase goals for the GSEs, and the 1977 Community Reinvestment Act, which governs loan origination activity among the federally-insured depository institutions. Once accounting for the endogeneity of GSE loan purchase activity, we find that (1) the GSEs appear to significantly increase their purchase intensity in neighborhoods targeted by the GSE affordable goals and (2) there are significant GSE-related effects on local housing outcomes. Increases in GSE purchase intensity are associated with declines in neighborhood vacancy rates and increases in median house values, both of which might be interpreted as neighborhood improvements.

The second test focuses on any effects of the 1992 GSE affordable housing goals on the credit quality and performance of government-insured home mortgages. Our analysis derives from two hypotheses. Firstly, we test for elevated FHA prepayment speeds in GSE-targeted areas, owing perhaps to improved borrower access to conventional, conforming loans. Secondly, we evaluate any related deterioration in the credit quality and performance of the residual FHA-insured home mortgage pool. The results show significant deterioration in the average credit quality of FHA-insured borrowers post-1996. Further, Cox partial likelihood estimates of a proportional hazard model indicate elevated prepayment speeds among FHA-insured loans in GSE-targeted tracts. Both findings are consistent with the notion that FHA borrowers in targeted tracts had improved access to less expensive conventional, conforming loans, perhaps owing to enhanced outreach on the part of conventional lenders.

1. Introduction

Recent years have witnessed ongoing research and policy debate as regards the effects of government-sponsored enterprise (GSE) affordable housing goals on lower-income and underserved housing markets. While the GSEs were established to provide liquidity to mortgage markets and to mitigate severe cyclical fluctuations in housing, those entities are intended as well to support the provision of mortgage credit and the attainment of homeownership in lower-income and minority communities. Indeed, federal regulators have devoted much attention of late to the performance of Fannie Mae and Freddie Mac in promoting the flow of funds and hence the widespread availability of mortgage credit among targeted and underserved communities.¹ The 1992 Federal Housing Enterprise Financial Safety and Soundness Act of 1992 (GSE Act of 1992) raised the level of support that the GSEs are required to provide to lower-income and minority communities and authorized the Secretary of the U.S. Department of Housing and Urban Development to establish “affordable housing goals” for the GSEs.² According to those goals, a defined proportion of each GSE’s annual loan purchases must derive from:

- lower-income borrowers (the “low-moderate income” goal);
- borrowers residing in lower-income communities and borrowers in certain “high minority” neighborhoods (jointly, the “geographically targeted” or “underserved areas” goal); and

¹The secondary mortgage market derived largely from a recognized need to reduce the non-price rationing of mortgage credit. Further, federal regulators sought to geographically redistribute loanable funds from areas of excess savings to areas of excess demand for those funds. Accordingly, academic research and policy analysis largely has focused on whether the increased liquidity and implicit Federal guarantee associated with GSE operations have influenced the stability of mortgage market operations and the pricing of mortgages. Ambrose and Warga [3] show that the GSEs have a cost of funds advantage over banking and other financial institutions on the order of 75 basis points. Hendershott and Shilling [21] and Cotterman and Pearce [16] compare the mortgage rates on conforming loans, which the GSEs can purchase, and jumbo loans, which the GSEs can not, and show that the presence of the GSEs is associated with a 25 to 40 basis point reduction in interest rates. Other researchers argue that the GSEs have had at best a limited beneficial impact on mortgage pricing. For example, Passmore, Sherlund, and Burgess [31] estimate that the GSEs reduce interest rates only on the order of 7 basis points. See also Heuson, Passmore and Sparks [22].

²This additional responsibility was added in part because of a belief that returns to GSE shareholders benefited

- very low income borrowers and low-income borrowers living in low-income areas (the “special affordable” goal).

The GSE Act defines lower-income borrowers (for purposes of the low-moderate income goal) as those having incomes less than the metropolitan area median income. Under the geographically targeted goal, lower-income neighborhoods are defined as those having median incomes less than 90 percent of the area median income and high minority neighborhoods are defined as those having a minority population that is at least 30 percent of the total population and a median income of less than 120 percent of the area median. For the special affordable goal, very low income borrowers are those with incomes of less than 60 percent of the area median income. The special affordable goal also includes borrowers living in low-income areas with incomes less than 80 percent of the area median income.

The goals specify a required percentage of GSE loan purchases in each category. The specific percentages are adjusted periodically, as market conditions shift. The most recent HUD rules, set in November 2004 for purchase activity from 2005 through 2008, established the low-moderate income goal at 54 percent of total GSE purchases, the geographically targeted goal at 38.5 percent, and the special affordable goal at 24 percent.³ These categories are not mutually exclusive, so a single loan purchase can count towards multiple goals. Table 1 indicates how the HUD-specified affordable housing goal loan purchase thresholds for the housing GSEs have evolved over time.

In this paper, we seek to determine whether the GSE mortgage purchase goals are associated with improved housing conditions and homeownership attainment among targeted communities that are the focus of the 1992 GSE Act and the HUD affordable housing goals. More generally, we seek

from the federal line of credit available to the GSEs.

to assess the effects of the GSE mortgage purchase goals on the geographic distribution of GSE mortgage purchase activity and to evaluate whether GSE mortgage purchases are associated with improved housing outcomes. This is done using a standard ordinary least squares framework as well as a two-stage least squares framework that accounts for potential endogeneity issues. Finally, the analysis seeks to corroborate whether the credit quality and performance of FHA-insured home mortgages deteriorated subsequent to the enactment of the GSE mortgage purchase goals. Such deterioration in FHA-insured mortgage pool credit composition and performance could result from improved outreach and lending to underserved, lower-income and minority borrowers by conforming lenders, consistent with the objectives of the GSE affordable housing home loan purchase goals.

In the first test, we find that, once accounting for the endogeneity of GSE loan purchase activity, (1) the GSEs appear to significantly increase their purchase intensity in neighborhoods targeted by the GSE affordable goals and (2) there are significant GSE-related effects on local housing outcomes. Increases in GSE purchase intensity are associated with declines in neighborhood vacancy rates and increases in median house values, both of which might be interpreted as neighborhood improvements. For the second test, we observe suggests significant deterioration in the average credit quality of FHA-insured borrowers post-1996. Further, Cox partial likelihood estimates of a proportional hazard model indicate elevated prepayment speeds among FHA-insured loans in GSE-targeted tracts. Both findings are consistent with the notion that FHA borrowers in targeted tracts had improved access to less expensive conventional, conforming loans, perhaps owing to enhanced outreach on the part of conventional lenders.

³These figures are averages over the 4-year period. Actual percentages vary from year to year.

The plan of the paper is as follows. The following section provides some basic background on the topic by reviewing the literature. Section 3 provides a brief overview of the empirical analyses. The two tests are described and the results detailed in sections 4 and 5. Section 6 provides concluding remarks.

2. Background

In recent years, a sizable literature has emerged which examines the success of the GSEs in meeting the broad objectives of the 1992 GSE Act. Bunce and Scheessele [10] examine GSE purchase activity using data collected pursuant to the Home Mortgage Disclosure Act (HMDA) and find that the “shares of the GSEs’ business going to lower income borrowers and underserved neighborhoods typically fall short of the corresponding shares of other market participants” (p. 3). Other researchers, including, Manchester, Neal, and Bunce [28], Bunce [11], and Case, Gillen, and Wachter [15], have reached similar conclusions. Of these, Case, Gillen, and Wachter [15] use a different approach. They augment the HMDA data with HUD public use data base (PUDB) information on GSE purchases and compare the distribution of purchases to the distribution of mortgage originations. Looking at 44 metropolitan areas between 1993 and 1996, they find that the GSEs are less likely to purchase loans extended to lower-income borrowers, minority borrowers, borrowers in lower-income neighborhoods, and borrowers in central cities.

Taking a different approach, Canner, Passmore and Surette [14] examine loans eligible for insurance under the Federal Housing Administration (FHA) rules and evaluate how the risk associated with those loans is distributed among four classes of institutions: government mortgage institutions, private mortgage insurers, the GSEs, and banking institutions that hold loans in their portfolio. The results indicate that the FHA bears the largest share of risk associated with FHA-

eligible lending to lower-income and minority populations, with the GSEs lagging far behind. These findings are consistent with the above discussed studies and further motivate our assessment (below) of the effects of the GSE housing affordability goals on credit quality, composition, and performance of the FHA-insured loan pool.

However, other research (see, for example, Listokin and Wyly [25] and Temkin, et al. [33]) has shown that the GSEs responded to the affordable housing goals by enhancing their product offerings so as to facilitate more purchases of loans from targeted communities. These new products often feature underwriting criteria that depart from industry norms and allow for higher risks. Moreover, Bunce and Scheessele [12], Bunce [11], and others have shown that in the years following the enactment of the 1992 GSE Act, the GSEs have increased the proportion of loan purchases from targeted populations. For example, between 1992 and 1995, Fannie Mae doubled the share of loan purchases from lower-income borrowers and Freddie Mac increased its share by about 50 percent. Manchester [27] documents considerable GSE improvement in loan purchases among lower-income and targeted communities; in 1995, Fannie Mae and Freddie Mac both surpassed the affordable housing goals established by HUD. Overall, the emergent literature suggests that the GSEs have been one of a number of players important to enhancing lower-income and minority access to mortgage credit. By some measures, the GSEs have been relatively smaller players. Nonetheless, since the passage of the 1992 GSE Act, GSE performance appears to have improved significantly.

The GSEs, however, may have enhanced mortgage market functions and support of lower-income and minority communities independent of their direct loan purchase activity. For example, Harrison, Archer, Ling, and Smith [20] focus on whether the GSEs reduce the prevalence of adverse informational externalities in mortgage lending markets. Information externalities are potentially an

important factor in the provision of mortgages to lower-income and minority communities because these areas often have low transaction volumes (i.e., “thin markets”), a characteristic that has been shown to be negatively associated with the probability of mortgage loan approval.⁴ If the GSEs help to elevate the number of transactions in thin markets, then they can enhance the prospects for homeownership among individuals in lower-income and minority communities, regardless of whether the mortgage is subsequently purchased by a GSE or not. The authors find that the GSEs in general, and Fannie Mae in particular, do indeed help to increase the number of transactions in thin markets in Florida and thus help to mitigate the effects of adverse informational externalities.

In a related study, Myers [29] examines the effects of GSE activity on loan origination. He argues that lenders have a greater incentive to approve those loans most likely to be purchased by the GSEs, because increased liquidity is realized only if the GSEs purchase the originated loans. Myers specifically tests whether primary market lenders favor higher income borrowers, white borrowers, borrowers in higher-income neighborhoods, and borrowers in the suburbs, since these are the populations that have been shown to receive considerable GSE support. While Myers does find that loans with a lower probability of being sold to the GSEs do have a lower likelihood of being approved overall, he does not find support for this incentive-based explanation in analyses of racial disparities in mortgage approvals. Findings from Ambrose and Thibodeau [2] suggest that the affordable housing goals had a limited effect on the overall supply of mortgage credit to targeted groups in the largest 308 metropolitan statistical areas during 1995 and 1999. Finally, Freeman and Galster [18] similarly focuses on housing market effects by looking at underserved neighborhoods in Cleveland between 1993 and 1999. They find no links between secondary market activities, by the

⁴Lang and Nakamura [23] develop a model of mortgage lending that shows that, because of higher uncertainty, mortgage applications for properties located in neighborhoods with thin markets will be deemed riskier than applications from neighborhoods with high transaction volumes (“thick markets”). Many studies have since found empirical evidence in support of the theory, including Harrison [19], Calomiris [13], and Ling and Wachter [24].

GSEs or others, and sales prices in these neighborhoods and only a limited relationship between secondary market activities and sales volumes.

A portion of the current research focuses on whether and how GSE mortgage loan purchase activity changes housing conditions and homeownership attainment among communities that are the focus of the 1992 GSE Act and the affordable housing goals set by HUD. In this regard, this part of the study builds on a recent paper by Bostic and Gabriel [10], which focuses on such trends in California. In that work, the authors found little evidence of a GSE effect associated with the affordable housing goal incentives. An and Bostic [4] argues that such a finding need not imply that the affordable housing goals have lacked efficacy. Rather, they posit that any observed effects are likely to involve compositional changes between conventional conforming and higher risk loan portfolios, with high quality, higher risk borrowers benefiting by shifting from higher cost loans to less expensive conventional conforming loans. An and Bostic [4] then presents evidence for the FHA suggesting such substitution has taken place. Given the range of findings on this issue, further research is warranted.

3. Empirical overview

The remainder of the paper describes the results of two new tests of whether and how GSE mortgage loan purchases significantly influence housing markets. Both tests seek to establish if GSE purchases exert a positive force on the marketplace that results in welfare gains. The first test focuses on their relationship to outcomes in targeted, lower-income neighborhoods. This test and its results are presented in section 4. The second test examines their influence on the performance of the portfolio of loans originated with insurance from the Federal Housing Administration (FHA). This research is described and summarized in section 5.

4. Test 1: The affordable housing goals and housing market outcomes

4.1 Introduction and setup

We evaluate the issue of affordable housing goal impacts on housing market outcomes by exploiting variation in the rules governing the GSE Act of 1992 and those governing the banking-oriented Community Reinvestment Act of 1977 (CRA). The CRA directs the federal banking regulatory agencies to encourage federally-insured banking institutions to assist in meeting the credit needs of all communities in their service areas, including lower-income areas, while maintaining safe and sound operations.⁵ In the context of federal bank examinations, regulators are directed to assess the institution's record of meeting the credit needs of all communities in their service area and to consider the institution's CRA performance when assessing an application for merger, acquisition, or other structural change.

CRA examinations of banking institutions scrutinize the geographic distribution of lending activities. Among other tests, these examinations compare (1) the proportion of loans extended within the institution's CRA assessment area as compared to the proportion of loans extended outside of its assessment area, and (2) the distribution of loans within the institution's CRA assessment area across neighborhoods with differing incomes, with lending in lower-income neighborhoods receiving particular weight.⁶ Here, lower-income neighborhoods are defined as those

⁵The Community Reinvestment Act (CRA) derived in part from concerns that banking institutions were engaged in "redlining," a practice by which lenders would fail to seek out credit-granting opportunities in minority or lower-income neighborhoods. The resultant lack of available capital, it was argued, held back the economic development of those communities. The federal regulatory agencies that are the CRA's focus are the Board of Governors of the Federal Reserve System, the Office of the Comptroller of the Currency, the Federal Deposit Insurance Corporation, and the Office of Thrift Supervision.

⁶Banking institutions specify their CRA assessment area, a geographic area that roughly corresponds to the areas where the institution operates branches and where it does considerable lending, in order to facilitate CRA performance evaluations. CRA assessment areas must be approved by the federal regulatory agencies. The CRA regulations also require that examiners evaluate the distribution of loans within its assessment area across borrowers of different economic standing. For more information on the regulations implementing the CRA, see Board of Governors [7].

(census tracts) that have a median family income of less than 80 percent of the median family income of the metropolitan area in which the census tract is located.⁷

Thus, the CRA's regulatory threshold for defining lower-income neighborhoods (80 percent) differs from the 90 percent threshold used for the GSE geographically targeted loan purchase goal under the GSE Act of 1992. It is clear then that a subset of neighborhoods – those with median incomes between 80 and 90 percent of the area median income – is the focus of GSE but not banking institution regulation. We thus can use changes in measures of neighborhood and housing market activity in this latter set of census tracts, compared to changes in similar census tracts not covered by GSE regulation, as an indication of the impact of GSE loan purchase activities driven by the affordable housing goals. This is a direct and relatively powerful test of the effects of GSE loan purchase goals on local housing markets.

The form of the empirical test follows Avery, Calem, and Canner [5] and Bostic and Gabriel [10], who conduct similar analyses of the impact of the CRA and the GSE affordable housing goals on local communities. As in those studies, the challenge is to establish the counterfactual of local housing market activity in the absence of GSE loan purchase activity. While it is relatively straightforward to identify the treatment group (census tracts with median incomes between 80 and 90 percent of the area median), there are no census tracts in the same median income range that do not receive regulatory treatment by either the banking institutions or the GSEs. As in the Avery,

⁷There is considerable evidence indicating that banking institutions have responded to the CRA by increasing the resources and lending directed to lower-income areas within their assessment areas. Avery, Bostic, and Canner [6], for example, show a limited increase in the percentage of institutions engaged in community lending activities because of the CRA. As another example, Schwartz [32] and Bostic and Robinson [8, 9] examine the effects of CRA agreements, which are pledges lenders make to extend specified volumes of lending to targeted communities, and find evidence suggesting increased levels of lending on the part of banks.

Calem, and Canner [5] and Bostic and Gabriel [10] studies, we address this challenge by identifying a control group as close as possible to the treatment group.⁸

The analysis here uses the lower-income threshold as defined by the 1992 GSE Act as the key cutoff. Accordingly, our study focuses on the 90 percent threshold that defines the marginal impact of the GSE regulations alone. We compare outcomes among tracts distributed about the GSE Act threshold and use a range of 10 percentage points (80-90 percent versus 90-100 percent of area median income). The key outcomes of interest are changes in three local housing market indicators, the homeownership rate, the vacancy rate, and the median house value.

A key advantage of our approach is its simplicity. Because the tracts in the control and treatment groups are located in the same metropolitan areas and often are in close proximity to each other, they face many of the same economic and demographic forces that influence metropolitan housing markets. This obviates the need to control for many factors, including technology, metropolitan area economic performance, and new mortgage and other lending practices, since the influence is likely to be near identical within the treatment and control groups. That noted, demographic, economic, and housing-related controls are still needed because trends in the homeownership rate, vacancy rate, and median house values are influenced by factors beyond GSE activity and because the relationship between GSE activity and changes in housing market conditions might also be affected by these factors.

These controls include youth, elderly, and minority population shares, average household size, percentage of all units in the tract that are single-family units and that are owner-occupied, unemployment rate, central city location, and the like. Further, as appropriate, we control for

⁸ In the Avery et al [5] study, the control group is the set of census tracts just above the lower-income neighborhood threshold as defined by the CRA regulations, under the reasoning that these tracts could be CRA-eligible with only a slight change in their populace.

variations across tracts in nominal housing affordability and in house price growth rates, with the latter being a proxy for expected homeownership capital gains, a primary component of homeownership user costs.⁹ Finally, we control for variability across MSAs in housing supply elasticities.

The analysis further seeks to establish whether GSE attention to the low-moderate income and special affordable goals is associated with improved housing market outcomes. Our interest is to test whether changes in neighborhood housing conditions are sensitive to the incentive structure established by the HUD affordable housing goals, from which we draw conclusions as to whether GSE activity has had a significant positive effect on neighborhood housing markets. Further, we evaluate the robustness of estimated findings across disparate local housing markets.

For purposes of our analyses, a key variable is the intensity of GSE activity in a particular Census tract, defined as the proportion of mortgage loans in a tract purchased by the GSEs. This metric reflects the relative penetration of GSE activity in a neighborhood, which is one measure of the importance of GSE activity for mortgage capital flows to a neighborhood. This measure comports with the objective of the affordable housing goals, which is to increase the GSE presence and influence in the mortgage markets of underserved neighborhoods and populations.¹⁰

One concern regarding the use of GSE purchase intensity is that it might be endogenous. That is, GSE loan purchase intensity might be a function of housing market trends rather than the other way around. For example, it is entirely plausible that the GSEs might shift their purchase activity to those neighborhoods showing the largest increases in homeownership or house price. To

⁹ See Appendix Table 1 for variable definitions.

¹⁰ GSE intensity is preferred to variables such as the number of purchased loans in a tract because it is a better comparative measure of relative influence. Some tracts might have large objective numbers of GSE purchases, yet relatively small GSE intensities because of very large numbers of non-purchased loans as well.

address the potential endogeneity of GSE intensity, we also estimate the relationships of interest using a two-stage least squares approach.

In the first stage equation, we estimate models of GSE purchase intensity using the tract-level characteristics and housing market conditions at the beginning of the sample period. That equation also controls for the effects of the GSE affordable housing goals. We then use this model to generate fitted values of predicted GSE intensity that are then used as regressors in the second stage estimates of the relationships associated with changes in three housing market conditions – the homeownership rate, the vacancy rate, and the median house value. We include both the predicted level of GSE intensity as well as the predicted change in GSE intensity as regressors in this second stage estimation.

4.2 Summary information on GSE loan purchase activity

Table 2 contains annual information on GSE home loan purchase activity drawn from data collected via HMDA. The unit of observation is the census tract; our sample here includes all MSA tracts in the United States. For all sampled tracts, GSE purchase intensity fluctuates modestly between 1995 and 2000 in the range of 24 to 29 percent. However, little trend is indicated, as the 2000 ratio at 27 percent is close to that of 1995. As would be expected, GSE purchase intensity varies markedly across tracts stratified by income and minority status. Indeed, loan purchase intensity declines monotonically with tract median income from about 35 percent for tracts with median income at 120 percent or greater than the MSA average to about 18 percent among tracts at less than 80 percent of MSA median income. Similarly, little trend is indicated over time in those purchase ratios; indeed, for each tract income category, year 2000 purchase intensity is close to that of 1995. Finally, purchase intensities among tracts with minority populations of less than 30

percent, at about 30 percent, are significantly elevated relative to the approximate 20 percent purchase ratio evidenced among tracts with more elevated minority populations.

4.3 Data and the sample

The study uses data from the 1990s to assess the effects GSE home loan purchase activity on local housing market outcomes.¹¹ Annual GSE home loan purchase activity from 1995 to 2000 is measured using HMDA. Housing market conditions as well as control variables within a census tract are compiled using the 1990 and 2000 Censuses. With these data, we are able to establish initial conditions in a neighborhood and to measure how those conditions changed over the decade. These data also allow us to identify those tracts that rank highly as regards low-moderate income borrower and “special affordable” housing goals. Definitions of all variables are contained in appendix table 1.

In accordance with the identification strategy described above, the analysis is restricted to U.S. metropolitan area census tracts with median family incomes between 80 and 100 percent of the area median family income. The final sample includes 7602 census tracts.¹² Table 3 presents summary information on the estimation sample as a whole as well as regards the subgroups of tracts on either side of the 90 percent GSE eligibility threshold. Also included is summary information on

¹¹ While changes in census tract housing market conditions are measured for the period between the decennial censuses of 1990 and 2000, note that the GSE Act of 1992 was not passed until 1992. However, federal legislation rarely occurs without broad debate and in that regard it is plausible to assume that the GSEs were aware of likely GSE Act provisions in advance of the passage of the legislation. If true, then prior to the Act’s passage, the GSEs might have internalized a number of its incentives, which would suggest a behavioral response earlier in the decade. Note further that California experienced a deep recession in the early 1990s with house prices tumbling by upwards of 15 percent. The state’s economy started to regain its footing only in 1993, had virtually returned to its 1990 position by 1995. In this view, much of the benefit that GSEs afford would have been evidenced primarily during the post-recession years of the 1990s.

¹² For the comparisons we examine to be meaningful, it is necessary that the 1990 and 2000 data pertain to the same geographic space. Because tract boundaries sometimes change between each decennial Census, we restrict our sample to those tracts that did not record a boundary change over the decade of the 1990s.

the universe of all MSA tracts in the U.S. Tract level data are included from both the 1990 and 2000 Censuses.

The first column in Table 3 includes tracts from all income ranges. The second to fourth columns contain tracts with a minority population share of less than 30% and a median family income of 80-100%, 90-100% and 80-90% of MSA median, respectively.¹³ The GSE affordable housing goals geographic goal target is defined as census tracts with median family income of less than 90% of MSA median. Accordingly, column 4 includes GSE targeted tracts and column 3 includes non-targeted tracts. In column 4, an asterisk (*) indicates a value that is statistically different from the above margin sample (column 3).

The table shows that sample tracts generally witnessed improvements in housing market conditions between 1990 and 2000, in that homeownership rates and median house values increased while vacancy rates declined (column 2). However, sampled tracts had far lower shares of minority populations, relative to the national norms. Further, sampled tracts trailed metropolitan areas as a whole as regards median house values and median family incomes. In marked contrast, sampled tracts exhibited somewhat higher levels of homeownership – at about 61 percent in 2000 – relative to the 57 percent recorded for all tracts in U.S. metropolitan areas.

In comparing tracts just above and below the GSE income eligibility threshold, the data show that the tracts are similar along certain dimensions. For example, tracts with family incomes of 80-90 percent of metropolitan the area median income (column 4) and tracts with family incomes of 90-100 percent of metropolitan area median income (column 3) had statistically similar population age distributions and Asian population shares as well as statistically similar central city locations. However, they did differ in some important respects, as GSE-eligible tracts had statistically elevated

¹³ We use the minority threshold to account for the fact that the GSE geographic goal target also includes census

percentages of minorities. Tracts just below the GSE threshold with 80-90 percent of area median income had about 20 percent minority population share, compared with a 17 percent minority share for those tracts with 90-100 percent of area median income. Further, the GSE-eligible tracts were further characterized by statistically depressed income levels as well as statistically elevated rates of poverty and unemployment, relative to tracts above the GSE margin.

Finally, in terms of housing market indicators, tracts just below the GSE threshold began the decade with an average homeownership rate and an average median house value significantly lower than tracts just above the GSEs 90 percent threshold. In both cases, the average values for tracts below the GSE threshold were about 10 percent lower than those for tracts just above the threshold. GSE-eligible tracts also had statistically-elevated vacancy rates of approximately 8-1/4 percent.

Despite these initial differences, tracts with median family incomes just above and below the GSE threshold did not evidence substantial differences in housing market performance during the 1990s. These groups of tracts recorded comparable and modest increases in homeownership rates of about 1 percentage point. Average vacancy rate declines were of statistically similar magnitude across the two sample groups, as was the percentage increase in the median house value. These small differences in the average housing market experiences of tracts that fall just below and beyond the GSE threshold suggests that GSE activity might not have had a significant impact on local housing market outcomes. However, the univariate statistics in table 2 do not take into account the correlations between housing outcomes and other important determinants thereof and thus leave open the possibility that these correlations mask the effects of GSE activity.

4.4 Estimation Results

tracts with median family income less than 120% of MSA median and minority population in excess of 30%.

The regressions estimate the effects of levels and changes in census tract socio-demographic, local housing market, economic, and other characteristics on the percent change in tract housing market conditions (homeownership rate, vacancy rate, and median house values). The presented ordinary least squares estimates (table 4) report the results of estimates that include proxies for each of the three HUD-specified GSE loan purchase goals (GEOG, LOW-MOD, AFFORD). None of the GSE housing affordability loan purchase goal controls enters the analysis with an appropriate degree of statistical significance. Accordingly, estimation results suggest little impact of the GSE targeting of underserved and low income populations and neighborhoods in the determination of tract-level housing market evolutions.¹⁴

While these results suggest that the GSE affordable housing goals have had minimal effect on housing market outcomes, there are reasons one might be skeptical of them. One issue is that tracts with median incomes above the 90 percent threshold used to identify the geographically-targeted tracts, which we use as controls, are likely to themselves be affected by the targeting through the other goals. This fact is one motivation for including metrics indicating the likely salience of all the goals in the specification presented in table 4, although there are certainly other approaches to incorporating them into the specification. We also repeated the analysis using successively narrow bands around the 90 percent threshold (i.e., 81-90 percent vs. 91-99 percent through to 89-90 percent vs. 90-91 percent), speculating that the likelihood of significant variation in

¹⁴ Numerous other robustness checks were run. Regression estimates were obtained for specifications including state-level fixed effects and including each GSE loan purchase goal individually as the sole goal factor. In addition, regression estimates using the baseline specification were obtained for stratified subsamples. Estimates were obtained to test for robustness of results across central city and non-central city areas, markets experiencing elevated versus damped rates of house price increase (top and bottom quartiles in 1995-2000 home price appreciation), markets that are highly affordable relative to those that are highly unaffordable (top and bottom quartiles in price-to-income ratio), and markets characterized by few housing supply constraints. Appendix table 2 provides summary information for these stratifications of the sample. The results (available upon request) are largely robust to specification or sample stratification, with the estimated GSE housing goal coefficients generally failing to achieve an acceptable level of statistical significance.

these ancillary influences across treatment and control tracts is minimized. The results of these analyses (not shown) are virtually identical to those reported.

As noted earlier, a key variable to consider is GSE purchase intensity, as the affordable housing goals are designed to affect the level and rate of increase of this intensity in targeted tracts. Because intensity is potentially endogenous, as noted above, we employ a two-stage technique to account for this. In the first stage, we develop models of intensity and change in intensity based on tract attractiveness across the three HUD-specified affordable housing goals and other census tract characteristics thought to influence purchase decisions. We use this model to estimate fitted values of levels and changes in GSE purchase intensities for each tract. These “exogenous” fitted values are then used in a second stage regression similar to those presented in table 4, except that the variables obtained via the fitted values replace the GSE incentive controls. The premise underlying this approach is that one can model GSE home loan purchase activity and that GSE impacts will be most visible in those locations where this activity (or changes in this activity) is greatest.

Tables 5 and 6 report the results of this process. The first stage estimates reported in Table 5 indicate that the *level* of GSE purchase intensity is lower in areas qualifying as geographically underserved and in areas rating high for the low-moderate income goal (column 1). GSE purchase intensity is similarly significantly depressed in tracts with higher levels of minority populations as well as in urban tracts and tracts with high unemployment rates. The GSE loan purchase intensity ratio does appear to vary positively with the scale of the conforming mortgage market, as evidenced in the number of originated conforming loans in the tract. Column 2 of the table shows that GSE purchase intensity increased significantly in tracts targeted under the geographically targeted goal (GEOG), which is consistent with previously noted finding suggesting that the GSEs responded affirmatively to the incentives established via the affordable housing goals. GSE intensity also

increased significantly in areas with high initial unemployment rates and a growing elderly presence. GSE intensity grew slower in Asian neighborhoods and urban tracts. Surprisingly, GSE intensities also increase less in areas where there are higher proportion of low- and moderate-income households, and in areas where more conforming conventional loans are originated.

One caveat regarding these first stage estimates is that the model fits are relatively low. This is particularly true in the case of the estimates of the percent change in GSE intensity, where only three variables show a significant relationship with change in GSE purchase intensity. This suggests that the fitted values might not have as much power as one might prefer. Readers are cautioned to consider the ensuing results of the second stage estimates with this caveat in mind.

The second stage estimates, reported in table 6, show that predicted levels of GSE purchase intensity are associated with significantly higher changes in tract homeownership rates. Regarding *changes* in GSE intensity, the results show benefits of the GSE activities: changes in GSE intensity are associated with significant reductions in vacancy rates and increases in median house values. The results of the two-stage analysis are noteworthy, in that they indicate that the endogeneity of GSE activity is an important consideration for those seeking to accurately assess the effects of GSE-related incentives on housing markets. While analyses not explicitly accounting for this endogeneity found little efficacy of the affordable housing goals (table 5 and robustness), an empirical approach using instrumental variable methods indicates significant GSE effects, beneficial ones as regards vacancy and house values.

Other results of Table 6 conform to expectations. For example, central cities show smaller changes in homeownership rates, and minority communities show lower increases in median house values. Other variables, however, yielded some surprises. Supply constraints were found to be associated with declines in median house values. This runs counter to theoretical predictions, and

may reflect some interaction with other regressors such as variables involving changes in the number of units in a tract. More investigation of these ancillary relationships is warranted.

5. Test 2: GSE activity and the FHA

In this section, we seek to corroborate and assess any decline in the credit quality or performance of the FHA-insured home mortgage borrower pool subsequent to the enactment of the GSE affordable housing goals. The analysis derives from the hypothesis that enhanced outreach and purchase by the GSEs of conforming loans originated among lower-income, minority, and other underserved borrowers could measurably affect underserved borrower choice among FHA-insured and conforming mortgages. Changes at the margin in borrower choice among FHA-insured and conforming conventional instruments, subsequent to and as a result of the implementation of the GSE goals, could result in deterioration in the quality and performance of the FHA pool, as better qualified underserved and minority borrowers seek to obtain lower-cost conventional, conforming loans (An and Bostic [4]). As shown by Deng and Gabriel [17], lower credit quality borrowers are less likely to ruthlessly exercise the call option, suggesting diminished prepayment speeds among residual borrowers in the FHA-insured loan pool. In that regard, we first compare credit quality of FHA-insured mortgage loans originated before and after the implementation of the affordable housing goals. Further, the analysis employs a hazard model to assess FHA-insured mortgage default and prepayment risks.

The principal dataset utilized in this study consists of a large random sample of FHA-insured home purchase loans originated during 1992 - 1996.¹⁵ All loans are fully amortizing, most with

¹⁵ The final sample consists of 12,021 loans randomly drawn from the 120,342 endorsed loans applications from 1992 to 1996. The loan database was provided by Unicon Research and is a stratified choice-based sample with weights that account for choice-based sampling from strata based on differential loan losses by race and loan status. The individual loan files are observed on a monthly basis from month of origination through that of termination,

thirty-year terms. The individual loan records contain information on a large number of loan, borrower, and property-related characteristics and also indicate termination date of each loan and reason for termination. Attached to the loan record files are borrower credit scores at time of loan application as well as measures of local housing market performance including house price appreciation and variance. In accordance to methods utilized in Deng and Gabriel [17], contemporaneous mortgage default and prepayment option values are computed for each month subsequent to loan origination. The data also include census tract level neighborhood socioeconomic and housing market indicators and metropolitan area level economic variables from the 1990 Census and FHA data on the race of the borrower. The FHA data set encompasses nearly 300 different metropolitan areas, allowing for substantial variability in the structure of local lending markets. For additional information on the dataset, see Deng and Gabriel [17].

For purposes of our first task, the data first was stratified by year of origination, so as to enable characterization of average FHA-insured loan pool characteristics prior and subsequent to the implementation of the GSE affordable housing goals. Because the GSE affordable housing goals were implemented in 1995, we treat loans originated in 1992 as pre-treatment observations and loans originated in 1996 as treatment observations. Loans in those pools were followed through termination or until the end of 2000. Our hypothesis suggests that, comparing the 1992 and 1996 loan pools, we should observe deterioration of FHA-insured mortgage pool quality and performance in the loans originated in 1996.

Table 7 provides a comparison of mean values of variables from the 1992 and 1996 FHA-insured home purchase loan samples. Those results suggest some decline in average credit quality of FHA-insured borrowers in the 1996 sample. For example, a comparison of means suggests

maturity, or through the end of 2000 for active loans.

statistically depressed credit score distributions among 1996 borrowers relative to their counterparts in 1992. Similarly, the 1996 sample contains evidence of significant deterioration in borrower debt-to-income ratios relative to levels recorded among 1992 sampled borrowers. The 1996 sample contains a statistically elevated share of first-time homebuyers; further the 1996 sample showed significant deterioration in the distribution of borrower liquid assets. Findings here then support the hypothesis of significant decline in the credit quality of FHA-insured borrowers over the decade of the 1990s, owing perhaps to changes in the origination of conforming versus FHA-insured loans in the wake of the enactment of the GSE affordable housing loan purchase goals.

Table 8 provides information on summary performance characteristics of the 1992 and 1996 vintage FHA-insured loan pools. Here we tabulate cumulative default and prepayment rates by 1, 3, and 5 years post-origination and report the data across neighborhoods grouped by relative income. We observe few differences between the 1992 and 1996 vintage pools regarding default propensities. Given the fact that 1996 vintage loans faced higher housing price appreciation and better overall economic environment in years after origination, one might have expected better default performance for the 1996 portfolio of loans. One would expect any significant deterioration in credit quality among FHA-insured borrowers to be evidenced in depressed – rather than elevated – prepayment speeds (Deng and Gabriel [17]). However, in many instances, 1996 borrowers show statistically elevated prepayment speeds.

In order to disentangle multiple possible impacts of the GSE affordable housing goals on the FHA-insured market, we adopt an option-based empirical hazard model. In estimation of that model, we seek to analyze prepayment and default behaviors among FHA borrowers in periods prior and subsequent to the implementation of the GSE affordable housing goals. The empirical hazard model allows us to control for over 40 contemporaneous and time-invariant covariates, including

well-specified contemporaneous proxies for the intrinsic values of mortgage put and call option exercise, borrower credit worthiness (credit scores), and a large number of common underwriting variables measuring borrower, loan, and locational risks. Further, the model includes a regime shift indicator (to distinguish prepayment or default behavior before and after January 1996) as well as a GSE-targeted tract indicator.¹⁶ The indicators are also interacted with one another and with the contemporaneous values of the put (default) and call (prepayment) option variables. We hypothesize that FHA-insured borrowers in GSE-targeted tracts will have elevated prepayment propensities, given their enhanced access to conventional conforming loans. However, following Deng and Gabriel [17], we further hypothesize that loans originated among less credit worthy FHA-insured borrowers will have substantially depressed prepayment speeds. Our sample includes loans originated during the 1992 - 1996, in contrast to our previous analysis of credit characteristics, which only compares 1992 and 1996 vintage loans.

Table 9 displays results of the Cox partial likelihood estimates of prepayment and default equations. Overall, results of the analysis strongly support the predictions of option theory in explaining the exercise of default and prepayment options among FHA-insured borrowers. The estimates confirm that the intrinsic values of the call and put option variables are positive and highly significant in the exercise of the prepayment and default options, respectively. Note, however, that the coefficients associated with the value of the call option among loans outstanding post-January 1996 as well as the value of the call option among loans outstanding post-January 1996 in GSE-targeted tracks are negative and significant. (This can be seen by comparing the estimated coefficients for the call option before 1996 (7.74) with the coefficient after 1996 ($7.74 - 1.05 = 6.69$),

¹⁶ We also experimented with an origination year dummy to distinguish loans of different vintages. The estimated coefficient associated with that control was not significant in explaining prepayment and default behaviors, which is not surprising given the fact that we had already controlled many underwriting related factors.

row 3 and 6 of column 1). Those results suggest that post-1996, FHA borrowers, especially those in GSE-targeted tracts, are less ruthless in the exercise of prepayment opportunities. Those findings are consistent with evidenced declines in the credit quality of FHA-insured borrowers in the post-January 1996 sample (Table 9), as could be associated with increasing selection of better qualified FHA-insured borrowers into the conventional, conforming market in the wake of the 1992 enactment of the GSE affordable housing loan purchase goals. Indeed, as shown by Deng and Gabriel [17], lower credit quality borrowers are less responsive to “in the money” call option exercise. Estimation findings also show a significant positive coefficient associated with FHA-insured loans outstanding post-January 1996 in GSE-targeted tracts (row 5, column 1). This result is consistent with our hypothesis of enhanced ease of refinance of FHA-insured loans in GSE-targeted areas, owing perhaps to the improved access to conventional mortgage finance. Overall, FHA-insured mortgages in GSE-targeted tracts evidence damped responsiveness to call-option driven prepayment after the 1996 regime shift. This can be seen by comparing the estimated coefficient post-1996, (i.e., $7.74 + 1.02 - 2.33 = 6.43$) with that prior to 1996 (i.e., $7.74 + 1.02 = 8.75$). Other results generally conform to expectations. For example, higher credit scores are associated with higher prepayment speeds, all other things equal; further research findings indicate damped prepayment propensities among minority households. In sum, findings from the estimation of the Cox proportional hazard model provide support for the notion that, all things equal, prepayment speeds in GSE-targeted tracts increase, while at the same time FHA-insured mortgage borrowers evidence less responsiveness to “in the money” prepayment as consistent with deterioration in the credit quality of outstanding FHA-insured loans in GSE targeted tracts post-1996.

6. Conclusion

This paper assesses the effects of the GSE loan purchase goals on local housing outcomes and on the characteristics and performance of FHA-insured loans. In so doing, the study seeks to infer whether GSE mortgage purchase activity among targeted tracts is associated with improvements in homeownership, housing conditions and credit access. The test framework exploits differences in the regulatory definition of lower-income neighborhoods under the 1992 GSE Act, which establishes regulation for the GSEs, and the 1977 Community Reinvestment Act (CRA), which lays out regulation for Federally-insured depository institutions. In defining lower-income neighborhoods, the GSE Act establishes a neighborhood median family income threshold of 90 percent of area median family income, whereas the CRA establishes a neighborhood regulatory threshold at 80 percent of the area median family income. These definitions leave census tracts with median incomes between 80 and 90 percent of the area median family income as the clear GSE treatment group. In this context, we also test for robustness of results across local housing market stratifications. We use changes in measures of housing market outcomes, including house prices, vacancy rates, and homeownership, among these GSE-targeted communities compared to a control group of census tracts, to indicate the impact of GSE activities.

Initial research findings suggest limited direct effects of the GSE affordable housing goals on local housing outcomes. While GSE targeted tracts tended to lag non-targeted tracts in terms of initial housing market conditions, suggesting the appropriateness of the policy focus on these neighborhoods, the results do not indicate much efficacy of the GSE affordable housing loan purchase targets in improving designated tract housing market conditions. For the most part, upon controlling for changes in tract and metropolitan area characteristics, tracts targeted under the GSE affordable goals were little different from non-targeted tracts with respect to housing market outcomes during the 1990s.

Once accounting for the endogeneity of GSE loan purchase activity via the use of a two-stage least squares framework, however, we find that (1) the GSEs appear to significantly increase their purchase intensity in neighborhoods targeted by the GSE affordable goals and (2) there are significant GSE-related effects on local housing outcomes. Increases in GSE purchase intensity are associated with declines in neighborhood vacancy rates and increases in median house values, both of which might be interpreted as neighborhood improvements. As expected, GSE purchase intensities are sensitive to local economic conditions; also, GSE purchase intensity varies positively with the scale of the conforming loan market.

We note one key issue associated with this first test. It could be that the true observable margin by which GSE activity influences household consumption might not be in housing consumption. By this argument, households may now be choosing to make sacrifices to consume an optimal bundle of housing. If so, then household monetary benefits resulting from GSE activity relieve these constraints and allow for consumption of other, non-housing goods. Our current methodology cannot address this potentiality, and we note this as a shortcoming.

Finally, the analysis investigates whether a decline in the credit quality and performance of FHA-insured home mortgages was observed subsequent to the enactment of the 1992 GSE affordable housing goals. As suggested by An and Bostic [4], such deterioration in FHA pool composition and performance could have resulted from enhanced outreach by conforming loan originators to underserved, lower-income, and minority borrowers in the wake of the 1992 GSE Act. Summary information on credit characteristics and unadjusted prepayment and default performances from a large random sample of FHA-insured home purchase loans suggests significant deterioration in the average credit quality of FHA-insured borrowers post-1996. Further, Cox partial likelihood estimates of a proportional hazard model indicate elevated prepayment speeds among

FHA-insured loans in GSE-targeted tracts. This finding is consistent with the notion that FHA borrowers in targeted tracts had improved access to less expensive conventional, conforming loans, perhaps owing to enhanced outreach on the part of conventional lenders.

For this second test, there is also an important outstanding issue. In 1995, the FHA redefined long term debt and effective income and the increased lender flexibility in evaluating borrowers' credit history. Both of these actions eased underwriting standards and could be responsible for the observed declines in borrower credit quality.¹⁷ Because the changes occurred in 1995, however, the effects of this easing may not have been most pronounced in the 1996 FHA loan portfolio. By this argument, GSE activity would still be a significant driving factor. Future research might focus on disentangling these two effects.

Taken together, research findings suggest that the GSE affordable goals have impacted the housing market in significant ways. At the same time, results serve to emphasize the importance of ongoing efforts to facilitate the flow of mortgage credit to targeted underserved communities. The findings here argue for further investigation as to whether expanding the scope of GSE purchase activity might enhance the efficacy of the affordable housing goals.

¹⁷ We thank Bill Shear from GAO for pointing this out. For more information, please see the 2002 GAO report titled "Mortgage financing: Changes in the performance of FHA-insured loans."

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Table 1. HUD-Specified Affordable Housing Loan Purchase Goals

Period	Goal		
	Low- and Moderate- Income	Underserved Neighborhoods	Special Affordable
1994-1995	30	30*	In dollar amount
1996	40	21	12
1997-2000	42	24	14
2001-2004	50	31	20
2005-2008	52-56	37-39	22-27

NOTE: All figures are percentages of the total number of units associated with the mortgages purchased by each GSE. During 1994 and 1995, underserved neighborhoods were defined differently from the current definition. The percentage thresholds for 1996-2000 were published on December 1, 1995, those for 2001-2003 were published on October 31, 2000, and those for 2005-2008 were published on November 2, 2004. According to HUD, the increase in the underserved neighborhoods goal from 31% in 2001-2004 to 37% in 2005-2008 largely reflects adjustments in the 2000 census data, whereby the 2001-2004 goal of 31% would have been equivalent to 36% under the current definition. HUD used the 1990 census data to create housing goals prior to 2005, and used the 2000 census data to create goals for 2005-2008.

Table 2. GSE Purchase Intensity of Home Purchase Loans by Tract Characteristics

	1995	1996	1997	1998	1999	2000	1995-2000 Average
<i>All tracts</i>	0.276	0.248	0.240	0.287	0.252	0.272	0.264
<i>Tract relative income</i>							
120 percent or more	0.360	0.329	0.329	0.389	0.331	0.348	0.348
100-120 percent	0.304	0.278	0.276	0.332	0.290	0.306	0.298
90-100 percent	0.270	0.243	0.240	0.289	0.255	0.271	0.262
80-90 percent	0.244	0.217	0.207	0.246	0.227	0.247	0.232
Less than 80 percent	0.203	0.174	0.152	0.185	0.167	0.196	0.181
<i>Tract minority</i>							
minority less than 30	0.295	0.270	0.269	0.324	0.283	0.298	0.291
minority over 30 percent	0.230	0.195	0.168	0.196	0.175	0.209	0.197
Total number of tracts			37,545				37,545

NOTE: These are means of GSE purchase intensities by specific tract characteristics. Tract relative income is defined as census tract median family income divided by MSA median. GSE purchase intensity is defined as the number of conforming loans purchased by either of the two housing GSEs (Fannie Mae and Freddie Mac) divided by the total number of conforming loans originated in each census tract.

Table 3. Selected Sample Average for MSA Census Tracts in US

	All tracts (1)	Selected Sample (2)	Tracts above GSE margin (3)	Tracts below GSE margin (4)
<i>Housing Market Indicators</i>				
Homeownership rate, 1990	56.83	60.47	62.82	57.67***
Vacancy rate, 1990	7.78	7.62	7.10	8.25***
Median house value, 1990 (000s)	110.46	84.40	88.83	79.11***
Homeownership rate, 2000	57.22	60.88	63.37	57.91***
Vacancy rate, 2000	7.17	7.07	6.50	7.75***
Median house value, 2000 (000s)	142.57	113.27	119.20	106.17***
Percentage of single family house, 1990	67.22	68.82	72.23	66.77***
Number of units, 1990	1,664	1,777	1,974	1,937
Number of owner-occupied units, 1990	953	1,065	1,255	1,133***
Change in homeownership rate, 1990s	2.28	1.35	1.62	1.02*
Change in vacancy rate, 1990s	6.93	7.34	6.89	7.89
Change in median house value, 1990s	41.72	45.31	44.41	46.39
Change in percentage of single family, 1990s	8.87	4.56	3.50	5.83**
Change in number of units, 1990s	10.60	11.01	11.79	10.09**
Change in owner-occupied units, 1990s	13.96	13.16	14.26	11.83***
<i>Demographic Characteristics</i>				
Percentage aged 17 or less, 1990	24.75	23.62	23.75	23.81
Percentage aged 65 or older, 1990	13.16	14.84	14.20	14.31
Percentage minority, 1990	26.30	8.93	17.28	19.94***
Percentage Asian, 1990	3.51	1.47	2.63	2.77
Household size, 1990	2.74	2.59	2.55	2.52***
Central City, 1990	0.51	0.37	0.35	0.40
Urban Tract, 1990	0.89	0.80	0.80	0.82**
Change in percentage aged 17 or less, 1990s	3.04	2.70	1.96	3.60**
Change in percentage aged 65 or older, 1990s	8.57	1.06	4.12	-2.60***
Change in percentage minority, 1990s	99.19	148.83	148.17	149.62
Change in percentage Asian, 1990s	102.47	122.29	125.85	117.84
Change in household size, 1990s	-1.26	-1.91	-2.31	-1.42***
<i>Economic Characteristics</i>				
Median family income, 1990 (000s)	37.83	34.08	50.64	45.20***
Unemployment rate, 1990	4.72	4.10	3.40	3.94***

Poverty rate, 1990	13.93	10.66	9.49	12.25***
House price to income, 1990	2.85	2.39	2.32	2.36
House price to rent, 1990	209.39	181.47	193.21	181.96***
Change in median family income, 1990s	41.34	42.02	41.67	42.44*
Change in unemployment rate, 1990s	6.48	1.03	0.57	1.58
Change in poverty rate, 1990s	23.98	15.34	18.63	11.41***
Change in house price to income, 1990s	-0.09	-0.05	-0.05	-0.06
Change in house price to rent, 1990s	6.26	7.69	7.78	7.58
Per capita income in PMSA, 1990 (000s)	29.28	28.65	28.62	28.67
Per capita wages in PMSA, 1990 (000s)	33.67	32.42	32.44	32.40
Change in PMSA per capita income, 1990s	51.25	52.02	51.90	52.15
Change in PMSA per capita wage, 1990s	47.40	46.88	46.86	46.91
MSA annual house price growth rate, 1995-2000	0.77	0.77	0.76	0.79
Supply-constraint index	21.07	20.52	20.55	20.50
Number of tracts	37545	7602	4140	3462

NOTE: All the change variables are in percent. We obtain tract level data for 1990 Census and the 2000 Census for the whole nation. Non-MSA tracts are excluded from our analysis. 1990 and 2000 Census data are matched to calculate the percent change variables; those tracts with boundary changes are excluded from the analysis. We further exclude tracts with less than 100 total housing units to alleviate problems of outliers in the statistical analysis. We form sub-samples based on census tract relative income (tract median family income relative to MSA median) and other criteria in order to assess the robustness of results to sample stratification. The first column includes tracts from all income ranges. Columns (2) – (4) contain tracts with minority ratios of less than 30% and median family incomes of 80-100%, 90-100% and 80-90% of MSA median, respectively. The GSE affordable housing goals geographic goal target are defined as census tracts with median family income of less than 90% of MSA median or tracts with median family income of less than 120% of MSA median and over 30% of minority population, respectively. Column 4 includes GSE targeted tracts and column 3 is comprised of non-target tracts. In column 4, an asterisk (*) indicates a value that is statistically different from the above margin sample (column 3). ***- $p < .001$, ** - $p < .01$, * - $p < .05$.

Table 4. Regression Results for the Percent Change in the Homeownership Rate, Vacancy Rate and Median House Value (1990 – 2000) with 3 GSE Incentive Controls

Independent variable	Dependent variable		
	Change of Homeownership	Change of Vacancy rate	Change of Median house value
Intercept	0.032 (0.018)	-0.059*** (0.018)	-0.084*** (0.017)
GEOG	-0.018 (0.030)	0.003 (0.029)	0.031 (0.028)
LOW-MOD	-0.004 (0.034)	-0.024 (0.033)	-0.025 (0.031)
AFFORD	0.012 (0.030)	0.028 (0.029)	0.077** (0.028)
Price to income, 1990	0.127*** (0.016)	-0.114*** (0.016)	
Change in price to income	0.007 (0.013)	0.042*** (0.013)	
MSA annual house price growth rate, 1995-2000	0.074*** (0.012)	-0.141*** (0.011)	
Supply constraint index	-0.084*** (0.013)	-0.005 (0.013)	-0.158*** (0.011)
Percent single family homes,1990	0.024 (0.014)	-0.089*** (0.013)	0.228*** (0.012)
Change in percent single family	0.057*** (0.012)	-0.018 (0.012)	0.032** (0.011)
Percentage aged 65 or older, 1990	-0.085*** (0.014)	0.094*** (0.014)	-0.143*** (0.013)
Change in percentage aged 65 or older	0.052*** (0.013)	0.015 (0.013)	-0.128*** (0.012)
Percent minority,1990	0.025 (0.014)	-0.062*** (0.014)	-0.157*** (0.013)
Change in percent minority	-0.055*** (0.012)	0.056*** (0.012)	-0.020 (0.011)
Percent Asian,1990	-0.033* (0.015)	-0.040** (0.014)	0.090*** (0.013)
Change in percent Asian	-0.016 (0.011)	-0.016 (0.011)	-0.029** (0.011)
Household size, 1990	-0.012 (0.014)	0.058*** (0.014)	-0.002 (0.013)
Change in household size	0.042**	-0.015	-0.039**

	(0.013)	(0.012)	(0.012)
Unemployment rate, 1990	-0.034**	-0.011	0.171***
	(0.013)	(0.012)	(0.012)
Change in unemployment rate	0.014	0.052***	0.067***
	(0.012)	(0.012)	(0.011)
Central city, 1990	-0.069**	0.150***	0.149***
	(0.025)	(0.025)	(0.023)
Number of units, 1990	0.088***	-0.122***	-0.035**
	(0.012)	(0.011)	(0.011)
Change in number of units	0.026*	0.011	0.124***
	(0.012)	(0.011)	(0.011)
N	7,602	7,602	7,602
Adjusted R-square	0.051	0.101	0.177

NOTE: Standard errors are in parenthesis, ***- $p < .001$, ** - $p < .01$, and * - $p < .05$. All change variables are in percent. GEOG is an indicator of whether the tract qualified according to the “geographically targeted/underserved area” GSE affordable housing loan purchase goal (indicated by whether the Census tract had a median income in the range of 80-90 percent of area median income). LOW-MOD is an indicator of whether the tract is ranked among the top 25% of tracks in the metro area by share of families qualifying for the low - moderate income GSE affordable housing goal; AFFORD is an indicator of whether the tract is ranked among the top 25% tracks in the metro area by share of families qualifying for the GSE special housing affordable goal. All continuous variables are standardized before running the regressions.

Table 5. First Stage Estimates of the Levels and Changes of GSE Purchase Intensity

Independent variable	Dependent variable	
	Average GSE intensity, 1995-2000	Percent change of GSE intensity, 1995 to 2000
Intercept	0.138*** (0.029)	0.186*** (0.032)
GEOG	-0.128*** (0.03)	0.068* (0.032)
LOW-MOD	-0.174*** (0.033)	-0.099** (0.036)
AFFORD	0.023 (0.029)	0.021 (0.032)
Total number of conforming loans in 1995	0.059*** (0.011)	-0.013 (0.012)
Central City Indicator, 1990	-0.145*** (0.024)	-0.036 (0.026)
Percent Asian	0.228*** (0.011)	-0.046*** (0.012)
Percentage aged 65 or older	0.112*** (0.011)	0.019 (0.013)
Unemployment rate, 1990	-0.196*** (0.012)	0.057*** (0.016)
Urban tract indicator	0.003 (0.031)	-0.218*** (0.034)
Change in total number of conforming loans (1995-2000)		-0.067*** (0.015)
Change in percent Asian		-0.014 (0.012)
Change in percentage aged 65 or older		0.039** (0.013)
Change in unemployment rate		0.007 (0.014)
N	7,246	6,996
Adjusted R –square	0.123	0.019

NOTE: Standard errors are in parenthesis, ***- $p < .001$, ** - $p < .01$, and * - $p < .05$. All change variables are in percent. All continuous variables are standardized before running the regressions. We lose 356 and 606 observations in the level and change equations, respectively, because of missing values in the dependent variables.

Table 6. Second Stage Results of Homeownership Rate, Vacancy Rate, and Median House Value Regressions

Independent variable	Dependent variable		
	Change of Homeownership	Change of Vacancy Rate	Change of Median House Value
Intercept	0.012 (0.015)	-0.025 (0.015)	-0.128*** (0.012)
GSE intensity (^)	0.289*** (0.086)	0.010 (0.087)	0.027 (0.069)
Change in GSE intensity (^)	0.208 (0.120)	-0.830*** (0.111)	0.878*** (0.088)
Price to income, 1990	0.126*** (0.016)	-0.117*** (0.016)	
Change in price to income	0.027 (0.014)	0.053*** (0.015)	
MSA annual house price growth rate, 1995-2000	0.070*** (0.011)	-0.133*** (0.011)	
Supply constraint index	-0.088*** (0.013)	-0.001 (0.013)	-0.173*** (0.009)
Percent of single family , 1990	0.008 (0.013)	-0.070*** (0.014)	0.242*** (0.01)
Change in percentage of single family	0.059*** (0.011)	-0.015 (0.012)	0.033*** (0.009)
Percentage aged 65 or older, 1990	-0.126*** (0.017)	0.102*** (0.017)	-0.162*** (0.013)
Change in percentage aged 65 or older	0.066*** (0.013)	0.030* (0.013)	-0.156*** (0.01)
Percent minority	0.031* (0.014)	-0.073*** (0.014)	-0.145*** (0.011)
Change in percentage minority	-0.059*** (0.011)	0.055*** (0.012)	-0.017 (0.009)
Percent Asian	-0.093*** (0.025)	-0.090*** (0.025)	0.127*** (0.02)
Change in percent Asian	-0.011 (0.011)	-0.038*** (0.011)	-0.013 (0.009)
Household Size, 1990	-0.083*** (0.014)	0.046** (0.014)	-0.057*** (0.011)
Change in household size	0.079*** (0.012)	-0.014 (0.013)	-0.035*** (0.01)
Unemployment, 1990	0.024 (0.024)	0.048 (0.025)	0.056** (0.02)

Change in unemployment	-0.037** (0.013)	0.045*** (0.013)	0.024* (0.01)
Central City, 1990	-0.037 (0.028)	0.078** (0.028)	0.221*** (0.022)
Number of units, 1990	0.060*** (0.012)	-0.116*** (0.012)	-0.020* (0.009)
Change in number of units	0.024* (0.012)	0.021 (0.012)	0.128*** (0.009)
N	6,989	6,989	6,989
Adjusted R -square	0.067	0.110	0.243

NOTE: Standard errors are in parenthesis, ***- $p < .001$, ** - $p < .01$, and * - $p < .05$. All change variables are in percent. The fitted values of levels and changes of GSE purchase intensity are used as instruments. All continuous variables are standardized before running the regressions. We lose 613 observations in the regressions because of the missing values in the instrumental variables.

Table 9: Comparison of Means of 1992 and 1996 Vintage of FHA Loans

	1992 vintage	1996 vintage
Credit score < 620	0.13 (0.34)	0.24*** (0.42)
Credit score 620-680	0.28 (0.46)	0.33*** (0.46)
Credit score 680-740	0.35 (0.48)	0.29*** (0.45)
Credit score > 740	0.24 (0.43)	0.14*** (0.34)
Black	0.09 (0.3)	0.13*** (0.33)
Asian	0.02 (0.13)	0.02 (0.12)
Hispanic	0.08 (0.27)	0.16*** (0.36)
White	0.80 (0.41)	0.66*** (0.46)
Other race/ethnicity	0.01 (0.11)	0.03*** (0.17)
Age under 25	0.11 (0.31)	0.11 (0.31)
Age between 25 and 35	0.52 (0.5)	0.48** (0.49)
Age between 35 and 45	0.25 (0.44)	0.26 (0.43)
Loan to value ratio	0.93 (0.06)	0.94*** (0.06)
Housing expenditure to income ratio between 20-38%	0.61 (0.49)	0.65*** (0.47)
Housing expenditure to income ratio over 38%	0.01 (0.1)	0.01* (0.11)
Debt-to-income ratio 20-41%	0.84 (0.37)	0.77*** (0.42)
Debt-to-income ratio 41-53%	0.12 (0.33)	0.20*** (0.39)
Debt-to-income ratio over 53%	0.01 (0.1)	0.01 (0.09)
Loan for refinance an existing property	0.07 (0.25)	0.04*** (0.2)
Indicator of buy down	0.03 (0.18)	0.03 (0.16)
Log of house value	11.13	11.28***

	(0.37)	(0.36)
Short term mortgage	0.05	0.03***
	(0.22)	(0.16)
Central city borrower	0.45	0.42**
	(0.5)	(0.49)
Rural borrower	0.05	0.07***
	(0.23)	(0.26)
First-time home buyer	0.62	0.72***
	(0.49)	(0.44)
Loan for new home	0.08	0.06***
	(0.27)	(0.23)
Co-borrower not married	0.09	0.13**
	(0.29)	(0.33)
Single male	0.18	0.20**
	(0.39)	(0.39)
Single female	0.19	0.21
	(0.4)	(0.4)
Number of dependent	0.80	0.73**
	(1.13)	(1.06)
Log of liquid asset	8.53	8.41***
	(1.56)	(1.62)
Log of income	8.00	8.07***
	(0.39)	(0.4)
Census tract percentage Black	0.10	0.09
	(0.19)	(0.17)
Census tract percentage Asian	0.02	0.02**
	(0.04)	(0.04)
Census tract percentage Hispanic	0.07	0.09***
	(0.14)	(0.15)
Census tract percentage other race/ethnicity	0.01	0.01
	(0.01)	(0.02)
Census tract median family income as of MSA median	1.02	1.03**
	(0.26)	(0.26)
Census tract median rent	0.32	0.32
	(0.18)	(0.17)
Month of origination (from Jan. 1992)	8.03	54.46***
	(2.66)	(2.39)
Low liquid asset	0.46	0.52***
	(0.5)	(0.49)
High liquid asset	0.54	0.48***
	(0.5)	(0.49)
Loan age	63.54	36.28***
	(27.47)	(9.1)
Prepayment	0.61	0.37***
	(0.49)	(0.47)

Default	0.05 (0.22)	0.04 (0.2)
Current	0.34 (0.48)	0.59*** (0.48)
Number of loans	3384	4673

NOTE: These are loan characteristics. The FHA loan sample statistics are from Deng and Gabriel (2006). The FHA sample includes a random sample of all FHA loans originated in 1992 and 1996.

Table 10 Cumulative Prepayment/Default Rates of Different Vintage FHA Pools

Relative income group	Cumulative probability	Prepayment		Default	
		1992 vintage	1996 vintage	1992 vintage	1996 vintage
<=80%	1 year	0.01	0.02	0.00	0.01
	3 year	0.17	0.25***	0.02	0.03
	5 year	0.32	0.38**	0.04	0.04
80-90%	1 year	0.02	0.02	0.00	0.01
	3 year	0.21	0.24	0.03	0.05**
	5 year	0.33	0.35	0.04	0.05
90-100%	1 year	0.01	0.01	0.00	0.01
	3 year	0.20	0.26***	0.03	0.04
	5 year	0.34	0.37	0.04	0.05
100-120%	1 year	0.02	0.01	0.00	0.01
	3 year	0.18	0.27***	0.02	0.03
	5 year	0.31	0.38***	0.04	0.04
>120%	1 year	0.03	0.01***	0.00	0.01***
	3 year	0.20	0.26***	0.02	0.04
	5 year	0.34	0.37	0.04	0.04

NOTE: Relative income is defined as tract median family income relative to MSA median. In 1996 vintage columns, an asterisk (*) indicates a value that is statistically different from that of the 1992 vintage. ***- $p < .001$, ** - $p < .01$, * - $p < .05$.

Table 11 Cox Partial Likelihood Estimates of the Prepayment and Default Models

Explanatory variable	Prepayment model	Default model
Calendar time dummy (loan outstanding after January 1996)	-2.68*** (0.05)	-2.73*** (0.14)
Loan in GSE-target tract	-0.11 (0.08)	0.39* (0.2)
Call	7.74*** (0.36)	2.27** (0.77)
Put	-0.09 (0.26)	1.71*** (0.43)
Calendar time dummy * loan in GSE-target tract	0.20* (0.08)	-0.10 (0.2)
Call * calendar time dummy	-1.05* (0.42)	4.12*** (0.94)
Put * calendar time dummy	-2.91*** (0.32)	-1.33* (0.57)
Call * loan in GSE-target tract	1.02 (0.54)	-3.41** (1.28)
Put * loan in GSE-target tract	-1.25** (0.39)	-0.12 (0.6)
Call * calendar time dummy * loan in GSE-target tract	-2.33*** (0.6)	2.30 (1.51)
Put * calendar time dummy * loan in GSE-target tract	1.17* (0.49)	1.56* (0.79)
Unemployment rate	-0.15*** (0.01)	-0.01 (0.01)
Herfindahl index	0.05* (0.02)	-0.35*** (0.08)
Black * Herfindahl index	0.49*** (0.07)	-0.18 (0.15)
Hispanic * Herfindahl index	0.18* (0.08)	0.61*** (0.17)
Credit score < 620	0.05 (0.03)	1.19*** (0.11)
Credit score 620-680	-0.05 (0.03)	0.93*** (0.1)
Credit score 680-740	0.08*** (0.02)	0.46*** (0.11)
LTV	0.73*** (0.17)	1.39* (0.59)
Black	-3.05*** (0.39)	1.72* (0.82)

Asian	0.31*** (0.07)	0.69** (0.22)
Hispanic	-1.15** (0.42)	-3.05** (0.95)
Other	-0.35*** (0.07)	-0.81** (0.29)
Housing expenditure to income less than 20-38%	0.02 (0.03)	0.10 (0.09)
Housing expenditure to income less than over 38%	-0.14 (0.1)	-0.90* (0.44)
Debt-to-income ratio 20-41%	-0.10 (0.05)	-0.75*** (0.14)
Debt-to-income ratio 41-53%	0.08 (0.06)	-0.58*** (0.15)
Debt-to-income ratio over 53%	0.30* (0.12)	-0.85 (0.45)
Loan for refinance	0.36*** (0.05)	-0.15 (0.18)
Indicator of buy down	0.00 (0.05)	-0.04 (0.18)
Log of appraisal house value	0.72*** (0.05)	0.28 (0.15)
Short term loan indicator	0.01 (0.05)	-3.70*** (1)
Loan in central city	0.02 (0.02)	-0.13* (0.06)
Loan in rural area	0.22*** (0.03)	-0.52*** (0.13)
First time home buyer	-0.04* (0.02)	0.15* (0.07)
New house	-0.13*** (0.03)	-0.16 (0.12)
Co-borrower unmarried	0.06* (0.03)	-0.30** (0.1)
Single male borrower	0.07** (0.03)	0.21** (0.07)
Single female borrower	0.02 (0.03)	-0.39*** (0.09)
Number of dependents	-0.07*** (0.01)	0.10*** (0.02)
Log of liquid assets	0.04*** (0.01)	-0.14*** (0.02)
Borrower age under 25	0.28*** (0.04)	-0.12 (0.11)
Borrower age 25-35	0.19*** (0.03)	-0.45*** (0.08)

Borrower age 35-45	0.05 (0.03)	-0.27** (0.09)
Log of income	0.11* (0.05)	-0.37* (0.15)
Census tract share of black	0.28*** (0.05)	0.14 (0.17)
Census tract share of Asian	-0.62* (0.27)	1.27 (0.71)
Census tract share of Hispanic	0.15* (0.07)	0.18 (0.2)
Census tract share of other	-18.43 (9.92)	76.22*** (13.1)
Census tract relative income (tract median to MSA median)	-0.57 (0.31)	4.65*** (0.95)
Census tract median rent	0.06 (0.06)	0.20 (0.19)
Woodhead measure	-0.01*** (0)	-0.02*** (0)
Number of loans	12,021	12,021
-2 Log L	238,782	26,229

NOTE: Estimation is based on a random sample of FHA loans originated during 1992 and 1996 and within census tracts with relative income of 80-100%.

Appendix Table 1. List of Variables for GSE-Housing Outcome Test

Variables	Definition
Central city	Central city tract indicator (char).
Change in GSE intensity (^)	The fitted value of percent change of GSE intensity from the GSE intensity model; $\text{GSE purchase intensity} = (\text{number of conforming loans purchased by the two GSEs}) / (\text{total number of conforming loans originated in the census tract})$
Change in GSE intensity (^)*Change in number of units	Interaction of fitted value of change in GSE intensity and percent change of total housing units.
GEOG	GSE geographic loan purchase goal indicator. According to HUD's Affordable Housing Goals, tracts with median family income under 90% of area (MSA) median or tracts characterized by over 30% minority population with median family incomes under 120% of area median qualify under the geographic goal
GSE intensity (^)	The fitted value of GSE intensity from the GSE intensity model; $\text{GSE purchase intensity} = (\text{number of conforming loans purchased by the two GSEs}) / (\text{total number of conforming loans originated in the census tract})$
GSE intensity (^)* change in number of units	Interaction of fitted GSE intensity and percent change of total housing units.
Household size	Persons per household
Homeownership rate	$= (\text{Owner-occupied 1 to 4-unit housing units in tract}) / (\text{total housing units in tract})$.
Hot Market	PMSA/MSA in the upper half of a ranking of metro areas based on average HPI growth, Source: OFHEO
HPI	Geometric weighted-repeat sales House Price Index estimated by OFHEO for each MSA. For more information, please refer to OFHEO HPI website: http://www.ofheo.gov/HPI.asp
LOW-MOD	Indicator of whether the tract is ranked among the top 25% of tracks in the metro area by share of families qualifying for the low-moderate income GSE affordable housing goal.
Median family income	Census tract median family income
Median house value	Census tract median value for all owner-occupied housing units
Median rent	Census tract median gross rent
MSA annual house price growth rate, 1995-2000	The average annual growth rate of house prices in the MSA during 1995 and 2000, Source: OFHEO housing price index (HPI)
Median house value	Median house value for all owner-occupied housing units
Number of units	Total number of housing units in the census tract

Owner-occupied units	Owner-occupied 1 to 4-unit housing units (used to derive the aggregate homeownership measure for groups of tracts, contrasting with the average homeownership measure for groups of tracts);
Per capita income in PMSA	MSA per capita income, Source: BLS
Per capita wages in PMSA	MSA per capita wage, Source: BLS
Percentage aged 17 or less	= (Number of people aged 17 or less in tract)/(total tract population)
Percentage aged 65 or older	= (Number of people aged 65 or older in tract)/(total tract population)
Percentage of single family	Percentage of single family; = (number of 1 unit detached)/(all 1- 4 unit housing units);
Percentage minority	Percentage of minority; (minority is based on census definition—total population minus non-Hispanic white alone population);
Percentage Asian	Percentage of Asian (non-Hispanic)
Poverty rate	Poverty level percentage as defined in Census
Price to income	Price to income ratio; = (census tract median house value)/(tract median family income);
Price to rent	Price to rent ratio; = (tract median rent)/(tract median house value);
Supply-constraint index	MSA (CBSA, based on OMB definition) level supply-constraint index, as estimated by Malpezzi, Chun and Green (1998) in “New Place-to-Place Housing Price Indexes for U.S. Metropolitan Areas, and Their Determinants”.
SPEC	Special affordable goal incentive indicator; =1 if the tract is in the top quartile in the rank of all tracts based on special goal incentive (share of families under goal);
Total number of conforming loans	Total number of loans originated in the census tract falling below the conforming loan limit in one specific year
Unemployment rate	Tract unemployment rate; = (number of unemployed people)/(number of people in labor force);
Urban tract indicator	Urban tract indicator; =1 if population is more than 50% urban
Vacancy rate	Tract vacancy rate; = (number of vacant units)/(total housing units);
Weak market	PMSA/MSA in the lower half of the ranking based on average HPI growth, Source: OFHEO

NOTE: Source is Census unless otherwise indicated. Percent change values are ((value in 2000-value in 1990)/value in 1990), when it applies.

Appendix Table 2 Selected Sample Averages for MSA Census Tracts in US

	Selected Sample (1)	Top 25% of LOW- MOD (2)	Top 25% of AFFORD (3)
<i>Housing Market Indicators</i>			
Homeownership rate, 1990	60.47	57.28***	54.52***
Vacancy rate,1990	7.62	8.13**	8.92***
Median house value, 1990 (000s)	84.40	75.21***	79.26***
Homeownership rate,2000	60.88	57.46***	54.72***
Vacancy rate,2000	7.07	7.60**	8.43***
Median house value, 2000 (000s)	113.27	100.92***	107.62***
Percentage of single family house, 1990	68.82	65.03***	64.99***
Number of units, 1990	1,777	1,755	1,972
Number of owner-occupied units, 1990	1,065	997***	1,094*
Change in homeownership rate, 1990s	1.35	0.90	1.02
Change in vacancy rate, 1990s	7.34	8.27	8.03
Change in median house value, 1990s	45.31	45.56	46.92
Change in percentage of single family, 1990s	4.56	6.16*	5.03
Change in number of units, 1990s	11.01	9.52*	9.33***
Change in owner-occupied units, 1990s	13.16	11.24*	11.26**
<i>Demographic Characteristics</i>			
Percentage aged 17 or less, 1990	23.62	23.61	23.57
Percentage aged 65 or older, 1990	14.84	15.22	14.35***
Percentage minority,1990	8.93	9.64***	18.79***
Percentage Asian, 1990	1.47	1.45	2.65***
Household size,1990	2.59	2.55***	2.48***
Central City,1990	0.37	0.42***	0.45***
Urban Tract, 1990	0.80	0.83*	0.80
Change in percentage aged 17 or less, 1990s	2.70	4.34*	1.84*
Change in percentage aged 65 or older, 1990s	1.06	-4.12***	-4.17***
Change in percentage minority, 1990s	148.83	157.26	130.40***
Change in percentage Asian, 1990s	122.29	135.15	100.92***
Change in household size, 1990s	-1.91	-1.00***	-1.36***
<i>Economic Characteristics</i>			
Median family income, 1990 (000s)	34.08	32.35***	43.61***
Unemployment rate, 1990	4.10	4.26***	4.08

Poverty rate, 1990	10.66	10.98*	13.53***
House price to income, 1990	2.39	2.24***	2.45
House price to rent, 1990	181.47	165.30***	190.00***
Change in median family income, 1990s	42.02	40.00***	40.81**
Change in unemployment rate, 1990s	1.03	2.46	-3.25*
Change in poverty rate, 1990s	15.34	14.18	2.05***
Change in house price to income, 1990s	-0.05	-0.05	-0.03*
Change in house price to rent, 1990s	7.69	8.04	8.22
Per capita income in PMSA, 1990 (000s)	28.65	29.08***	27.94***
Per capita wages in PMSA, 1990 (000s)	32.42	32.62	31.78***
Change in PMSA per capita income, 1990s	52.02	52.30	51.92
Change in PMSA per capita wage, 1990s	46.88	47.35*	45.91***
MSA annual house price growth rate, 1995-2000	0.77	0.87*	0.70
Supply-constraint index	20.52	20.34**	20.68*
Number of tracts	7602	1805	2007

NOTE: Column (2) is defined as the top 25% of tracts in the metro area ranked by share of families qualifying for the low - moderate income affordable housing goal; column (3) is the top 25% of tracts in the metro area ranked by share of families qualifying for the special affordable housing goal. In columns 2 and 3, an asterisk (*) indicates a value that is statistically different from the selected sample (column 1). ***- $p < .001$, ** - $p < .01$, * - $p < .05$.