HOME PURCHASE SUBSIDY PROGRAMS:
AN ANALYSIS OF MORTGAGE REVENUE BONDS

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By

Jonathan Harris Kivell, B.S.

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Abstract

Mortgage Revenue Bonds ("MRBs") are tax-exempt debt securities issued by state and local governments’ Housing Finance Agencies ("HFAs") that facilitate subsidized interest rates for low- and moderate-income ("LMI") individuals’ mortgage loans. The capital raised through HFAs’ issuance of MRB debt is used to fully underwrite qualifying homebuyers’ mortgages, lowering their cost of borrowing.

This thesis explores the factors which affect the price of a home purchased through MRB subsidies. The data set for the analysis uses state-level HFA statistics obtained from the National Council of State Housing Agencies ("NCSHA") from 1996 thru 2003. Using Ordinary Least Squares regression analysis and controlling for fixed effects, this paper explores the statistical significance of a first time homebuyer’s income level in relation to the price of the home purchased. The analysis finds a positive and statistically significant relationship between prices of homes purchased with MRB subsidies and a series of independent variables, including average borrower income, percentage of loans originated to minority borrowers, percentage of loans for existing homes, dummy variables representing various regions in the United States, and several years of those analyzed in the data set.

The analysis reveals that the Federal government ought to improve the extent to which MRB subsidies reach those who are at the lowest income levels – relative to AMI – and are in the greatest need for government assistance in purchasing homes.
Introduction

In the United States, government entities at the municipal, state and federal levels have introduced programs aimed at facilitating homeownership for low- and moderate-income (“LMI”) Americans. The country’s homeownership rate has grown steadily to its current position of nearly 70%\(^1\). Among the market conditions and public policies that have encouraged this trend are low long-term interest rates, deductions of interest payments from borrowers’ federal income tax, government guarantees of mortgages to enhance borrowers’ credit, and issuance of mortgage revenue bonds (“MRBs”) to subsidize mortgage interest rates. The goal of this thesis is to examine the effects that MRBs have had on facilitating the transition from renting to owning for LMI Americans.

MRBs are income-tax-exempt debt securities, underwritten by state housing finance agencies (“HFAs”) in forty nine states – as well as the District of Columbia, Puerto Rico, and U.S. Virgin Islands – to subsidize mortgage interest rates for LMI homeowners (Temple 1993)\(^2\). MRBs are one type of Private Activity Bonds (“PABs”), which are tax-exempt securities that state and local governments issue to facilitate public-private partnerships (NCSHA 2001). Other debt issuances categorized as PABs include: “…multifamily housing, industrial development, redevelopment, and student loan bonds” (NCSHA 2005). Through an act of Congress, states are permitted to issue

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\(^{1}\) The United States Census Bureau (2006) defines the homeownership rate as, “the number of owner-occupied housing units [divided] by the number of occupied housing units.”

\(^{2}\) Kansas is the only state that does not have an HFA.
PABs in the recently increased amount of $80 multiplied by the state’s population, with a per-state cap of $233,795,000 per annum (NCSHA 2005). After issuing MRBs, state HFAs can hold the capital raised for three years before they are legally obligated to use those funds to underwrite LMI borrowers’ home purchases.

State HFAs offer their MRB subsidy programs to first-time homebuyers who meet certain income requirements and choose to buy a home within a set purchase price range; these guidelines require that a qualifying MRB-subsidized homebuyer’s income is less than 115% of AMI, and the value of the home being purchased cannot exceed 90% of the area’s median home value (Greulich & Quigley 2003). Given that MRBs lower the cost of borrowing for LMI Americans, this program facilitates homeownership, as mortgage rates for MRB-financed homes are roughly 150 basis points lower than homes purchased with mortgages at market rates (Cooperstein 1992)³. HFAs work with certified mortgage originators – small, regional banks, for example – to direct the MRB subsidies to qualifying homebuyers. To participate in the program, loan originators receive certification from the HFAs so that qualifying borrowers can have the subsidies applied to their mortgages. The participating lenders earn fees from originating the mortgages, which is their incentive for participating in the program. After the HFAs raise capital through an MRB debt issuance, those funds are applied to qualifying homebuyers’ loans on a first-come, first-served basis.

³ For example, a mortgage of $100,000 and an interest rate of 5 percent instead of 6.5 percent would lower monthly payments from 632.07 to $536.82 (mortgage-calc.com 2006).
In 1974, the Virginia State Housing Finance Agency (“HFA”) issued the first series of tax-exempt MRBs to lower mortgage payments for the state’s LMI borrowers (Durning 1992). The program has since expanded to the extent that state HFAs issued more than $10 billion in MRB debt in 2003, which provided subsidies to more than 70,000 home purchases (NCSHA 2004). That figure is derived from recent Congressional legislation, which the National Council of State Housing Agencies (“NCSHA”) strongly supported, that raised each state’s maximum allowable issuance of PAB debt by 60% from $50 per capita to $80 (NCSHA 2004).

**Literature Review**

Within the last thirty years in the United States, government entities at the federal, state, and municipal levels have taken significant steps towards addressing the need for access to credit among low- and moderate-income LMI Americans. Among the policy steps that the government has taken to address this issue are the establishment of regulations, as well as supply- and demand-side subsidies. The Community Reinvestment Act (“CRA”), which was passed by Congress in 1977, mandates that banks originate loans in all areas where they accept deposits, with particular emphasis on LMI communities (Canner & Passmore 1997). The New Markets Program – signed into law by President Clinton – authorized tax credits for firms that make debt and equity investments in financially underserved parts of the country (Sass Rubin &
And programs at all levels of government have targeted LMI individuals to offer financial education or lower the cost of borrowing capital.

Demand-side programs have focused extensively on homeownership and helping LMI individuals move from renting to owning their homes. As Greulich and Quigley (2003) indicate, “The most significant [federal] housing subsidy programs in the U.S. are funded by expenditures through the Internal Revenue Code” (p. 1). State governments also have taken an active role in using state and federal tax laws to create programs that target LMI populations to increase their homeownership rate. Mortgage Revenue Bond programs fall into this category, although their efficiency in providing subsidies has been brought into question.

While MRBs assist LMI individuals in becoming homeowners through lower interest rates for their mortgages, the programs have been criticized as costly to administer (GAO 1988). With fees paid to investment banks for underwriting the bonds – as well as the attorneys involved in MRB issuances – raising funds for mortgage subsidies is expensive for HFAs (Durning 1992). An alternative program that state HFAs offer is Mortgage Credit Certificates (“MCCs”), which use individuals’ personal income taxes to provide subsidies (Greulich and Quigley 2003).

Danny Durning’s (1992) book compiled scholarly literature on MRBs, and is the seminal work on this government program. Within the book, Clauretie and Sirmans (1992) assessed the extent to which MRB issuance was correlated with increases in

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4 The Joint Committee on Taxation (2005) estimates that the mortgage interest deduction will amount to a tax expenditure of $72.6 Billion in 2005.
local housing prices. Specifically, these authors assessed the resulting impact on the market value of homes in Shreveport, Louisiana following publicity that MRB-induced subsidies would be applied to new mortgages. Anecdotal evidence referenced in their paper explains how following the local HFA announcement of the subsidies, more than 2,500 people lined up to apply for the loans (Clauretie and Sirmans 1992). With this increased demand and a relatively fixed supply of houses, to which the MRB subsidies could be applied, the authors show how home purchase prices were higher.

In a related work, Sa-Aadu, Benjamin, and Sirmans (1992) examined the extent to which capitalization was a factor in lessening the benefits of MRB financing for borrowers. Capitalization occurs when sellers of homes in targeted neighborhoods raise their prices, knowing that buyers will be able to obtain MRB-subsidized mortgages. Their findings indicate that sellers – knowing that borrowers have increased purchasing power through the MRB subsidies they will receive – will raise prices to extract greater profits from the sale and reduce the size of the subsidy flowing to homebuyers (Sa-Aadu, et al. 1992). Those findings are useful for this paper, as they provide a framework for examining the relationship between the price of a home purchased with MRB subsidies and the distribution of borrowers’ income, relative to AMI. Given that housing prices may rise once MRB-subsidies are announced and applied to home purchases, relatively poorer LMI borrowers may be priced out of their local housing market. The potential result would be a skew of the application of mortgage subsidies
towards those with higher incomes relative to AMI. Ratzenberger (1992) described how Congress has changed eligibility requirements for MRB-subsidized borrowers. In the Tax Reform Act of 1986, Congress moved that borrowers earning above 115 percent of AMI could not qualify for an MRB-subsidized mortgage (GAO 1988); this added another eligibility constraint to the 1980 ruling that a home purchased under the program could not exceed 90 percent of the median home price for an area.

The GAO (1988) study on MRBs examined whether or not the appropriate eligibility criteria are in place for receipt of the subsidies. That report’s findings indicate that imposing restrictions for borrowers based on age and number of children might help prevent those, who would otherwise be eligible for market-rate financing, from obtaining MRB-subsidized loans. Ratzenberger (1992) wrote, “With limited bond funds and a subsidy that is in great demand, an MRB program can achieve a higher public purpose by helping households with greater need for a housing subsidy before it helps those with a lesser need” (p. 68).

The work done by Greulich and Quigley (2003) on MCCs approximates the type of evaluation that this paper will offer for MRBs. These authors reviewed California’s MCC program, which as of the time of publication was larger than its MRB program. However, they explain that MCC programs and the subsidies they provide nationwide are smaller than MRB programs in the United States. Using data from California’s HFA from 1996-1998 shows that subsidies were applied to mortgages held by
participants in the program, based on their income, in an approximately normal
distribution. The authors found that income, household size, and race were all
statistically significant predictors of the size of the subsidy that a borrower will receive
(Greulich and Quigley 2003). Greater income and household size are both associated
with a greater subsidy, whereas the size of a subsidy is demonstrably lower for Black,
Hispanic, and Asian members of the sample than for Whites. As LMI borrowers may
obtain a mortgage subsidy through either a state’s MCC or MRB program, this paper
makes a case for the use of the former program, due to its relatively lower
administrative costs.\footnote{The North Carolina Housing Finance Agency, for example, offers MRB subsidies to LMI homebuyers based on credit qualifications. Those individuals, whose credit rating does not meet the stated criteria, are encouraged to utilize the state’s MCC program (NCHFA 2004).}

The view of those authors, however, is opposed by Cooperstein (1992), who
explained that MCCs are not refundable credits. This means that LMI borrowers – with
MCCs applied to their annual income tax payments – can only receive credit for the
MCC subsidy up to the amount of their tax bill. As a result, monies that would have
been distributed to LMI populations through MRB subsidies may be forgone through
the MCC program (Cooperstein 1992). In comparing the MCC program in North
Carolina with that state’s MRB program, Stegman (1992) showed similarities in profiles
of borrowers given mortgage assistance. Stegman’s work, however, in determining
which program is more cost-effective, echoes the views of Cooperstein, as he asserts,
“…depending upon their tax status, some MCC recipients may not be receiving all the
financial assistance to which they are otherwise entitled” (p. 158). This criticism of MCCs is inherently a supporting comment for state HFAs to expand their MRB programs as the primary policy lever used by municipal and state governments to promote homeownership through discounts in mortgage borrowing costs. Additionally, as MCCs and MRBs have the same eligibility criteria, individuals with a small tax burden – or no tax burden at all – would likely prefer the latter program so that they can have the subsidy applied to their mortgage (Arizona Department of Housing 2003).

In examining the efficacy of MRB subsidies in reaching LMI borrowers, who conceivably need them the most, it is prudent to assess the impact of this program on the federal budget. Temple (1993) explained that Private Activity Bonds provide federal subsidies to state and local governments, whose HFAs raise capital through the debt offering to cover the cost of the program’s administration. States, as well as the Federal government, forgo the tax revenue that would have been generated on interest income from investors purchasing and holding taxable bonds.

For investors, PABs are advantageous because they provide a tax exemption on the interest earned (although the yields are lower than market rate)\(^6\). Temple’s (1993) research finds that increased PAB issuance could crowd out demand for state and local governments’ general obligation bonds. The result could mean higher debt service payments for municipalities and states, as bond yields move inversely to their prices. This has potentially negative implications for MRBs.

\(^6\) Tax exempt interest income can be taxed at the Federal level if the investor is subject to the Alternative Minimum Tax.
In reviewing time-related impacts on MRB subsides, Gross (1992) examined the efficacy of MRBs for LMI populations, given changes in monetary policy. That study showed a positive correlation between the interest rates on 30-year treasury bills and the size of the subsidy received by MRB-assisted borrowers. As monetary policy tightens and interest rates rise, the spread in the number of basis points between a subsidized mortgage and the prevailing interest rate for homebuyers grows as well (Gross 1992). In the reverse scenario, Gross (1992) states, “…the relatively low nominal interest rates that have persisted since 1988 likely have not contributed to substantially reduced MRB-financed mortgage rates” (p. 125). This shows how policy decisions – entirely independent of state HFAs – can have adverse effects on the size and efficacy of MRB subsidies awarded to LMI populations.

In terms of policy outcomes, the primary economic and societal benefits of MRBs are their assistance provided to help renters become homeowners, stimulation of economic factors, and improvement of housing and neighborhoods (Durning 1992). The work of Clauretie and Sirmans displays how the literature on MRBs has examined loan-level data for individual cities or states. In contrast, this paper utilizes aggregated state-level data to obtain a bird’s eye view of how MRB subsidies are being applied to home purchases for first time buyers. Additionally, this will involve a closer examination of the extent to which MRB subsidies are equally distributed among LMI borrowers in the purchase of their first homes. As the literature shows, evaluating how
well these goals are achieved requires an examination of the impacts of MRBs on federal budgeting and homeownership trends around the country.

**Hypothesis and Statistical Model**

As this thesis examines the relationship between Mortgage Revenue Bonds and housing prices, it is important to understand the intended effects that policymakers envision for MRBs. The theoretical framework for this thesis is built on the work of Ermisch (1996), who researched the relationship between housing prices and income. That model estimates that housing price is a function of “…characteristics of the house and its neighbourhood, dummy variables for the year of purchase, and a random variable” (Ermisch, 1996, p. 385). For this thesis, that model will be adapted for the framework of homes purchased with MRB-subsidized mortgages. The theoretical model, therefore, includes housing price as the dependent variable in a demand equation. The model is estimated as:

\[
\ln (P_{H_{ati}}) = \alpha_a + \beta_a X_i + \gamma_a Y_i + e_i
\]

In the equation above, “…\(P_{H_{ati}}\) is the price of the house purchased by household \(i\) in year \(t\) in area \(a\)...” (Ermisch 1996, p. 385). For the analysis in this thesis, Ordinary Least Squares (“OLS”) regression will be used to estimate the correlations between a set of independent variables and the price of home purchased with an MRB-subsidized
mortgage. The proposed functional form, with price of a home purchased with MRB-subsidies as the dependent variable, is:

\[
\text{Price of MRB-subsidized house} = f(\text{Size of Household}, \text{Income of MRB-subsidy Recipients}, \text{Year of Data Point}, \text{Region where loan was originated}, \% \text{ of an HFA’s Loans Originated for Minorities}, \text{Number of Loans Originated by the State HFA}, \% \text{ of Loans for Existing Homes, and Average Borrower Age})
\]

The data for this analysis have been taken from the NCSHA, which aggregates and publishes statistics on housing programs for the fifty states. Data points used in the analysis represent state-wide averages ranging from 1996 thru 2003 and include information from all states except Kansas. To account for missing data, means have been imputed for states (i.e. fewer than five), which did not collect certain statistics. Imputing means was necessary for data points for Arizona, the District of Columbia and Nebraska. In total, the sample size is 380, as some states’ data points for a given year had to be deleted because they had too many missing entries for the set of explanatory variables. The data have been deflated – in 1996 dollars – according to the Housing Component of the Consumer Price Index (“CPI”) for the variables for Average MRB-subsidized Mortgage and Average Price of an MRB-subsidized House. The Average Borrower Income variable was deflated according to the full CPI calculation. The breakdown of states into the regional dummy variables was done using research by the

\footnote{A total of 12 (i.e. 392 (49 states and 8 years) minus 380) data points representing states and years were omitted from the data set.}
United States Census Bureau as a reference. Descriptive statistics for the variables in this analysis are included in Table 1.

**Data Analysis**

Using OLS regression analysis, the impact of various factors on the price of a house, purchased with an MRB-subsidized mortgage, was examined. The explanatory variables in the regression models include the natural log of borrowers’ deflated average income, the percentage of MRB-subsidized mortgages applied to minorities’ home purchases, the average size (i.e. number of people) of a household which was purchased through MRB subsidies, the natural log of the number of loans originated by a state HFA in a given year, the percentage of MRB-subsidized mortgages applied to existing homes, a set of region dummy variables, and a set of year dummy variables. The region dummy variables – nine in total – were created to account for “local” differences in housing prices, and the Pacific Region was used as the baseline, as its housing prices were – on average, holding all else constant – larger than those of every other region in the country. Similarly, the year dummy variables – eight in total – were created to

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8 Similar regression models were created with each of two dependent variables, deflated average price of a home purchased with MRB subsidies and deflated average size of a mortgage subsidized by MRBs. The correlation coefficient between these variables was .98 and the results in both sets of models were similar; for this analysis, the housing price variable was selected as the dependent variable, based on the model previously discussed.
account for annual differences in prices of homes financed through MRB-subsidized mortgages.

In Table 2, regional means are calculated over the entire period examined in the analysis (i.e. 1996 – 2003). Notable findings from these data are the relationships between the percentage of loans originated to individuals at the lowest levels of AMI and average borrower income in those regions. For example, states in the East South Central Region (i.e. Alabama, Kentucky, Mississippi, and Tennessee) have the second lowest deflated mean income and also a disproportionately low percentage of loans originated to those below 50% and between 51 and 60% of AMI. The correlation is that homebuyers in the East South Central Region earn less than individuals in other regions and homeownership opportunities there are pursued by the “wealthier” individuals.

The data presented in Table 2 offer an insightful look into the relationships between the income, mortgage size, and housing price variables. Reviewing the findings indicates the extent to which individuals in various parts of the country have seemingly used MRB-subsidized mortgages to purchase homes that they can or cannot afford. These data suggest that LMI individuals may be leveraging their income to purchase homes at seemingly unaffordable rates. The last row – representing the divisor of mortgage size and home price – is a proxy for what mortgage originators term loan-to-value (“LTV”) ratio. As all of the LTVs in this estimation exceed 90% and the national average exceeds 95%, it seems that recipients of MRB subsidies are taking on

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9 The baseline year for the regressions was 1996
substantial amounts of debt (i.e. putting very little equity down) in purchasing their homes. For example, the states of the East South Central Region (i.e. Alabama, Kentucky, Mississippi, and Tennessee) had a low percentage of their loan originations going to individuals at the lowest levels of AMI (i.e. approximately 27% of loans in ESC went to individuals at or below 60% of AMI). As this region has the nation’s highest ratio of mortgage/price, the data suggest that individuals in these states are highly leveraged in purchasing homes (i.e. with a mean LTV of .98). This finding may also suggest that the prevailing culture in East South Central Region states views highly-leveraged debt as wise, which is not the case in the Pacific Region states. As the data provide a macro-level analysis of MRB-subsidized mortgages, it is unclear whether or not regions with higher mean LTVs for borrowers have higher default rates as well.

In examining the data from Table 2 by region, other interesting stories emerge. Whereas the West North Central (“WNC”) Region (i.e. states such as Iowa, Kansas, Minnesota, Missouri, Nebraska, North Dakota, and South Dakota) has the lowest average housing prices, its ratio of income levels to the price of homes purchased is the nation’s highest\(^{10}\). That finding suggests that LMI borrowers in the WNC Region are not leveraging their incomes as greatly as individuals in the Pacific Region (i.e. states such as Alaska, California, Hawaii, Oregon, and Washington), which has the nation’s lowest ratio of income/housing price. The implications of these findings relate to the

\(^{10}\) This variable was created to show the extent to which MRB-subsidized homebuyers are leveraging their incomes in purchasing homes; as the value of this ratio falls, individuals are leveraging their incomes far more (i.e. and, on the aggregate, taking on more debt to purchase homes).
extent to which MRB-subsidized homebuyers are shown as defaulting on their mortgages, based on their region of residence. An interesting follow-up study would examine how the income/price ratio varies regionally and is correlated with defaults on MRB-subsidized mortgages for homebuyers at differing income levels over time. This type of analysis would require an examination of micro-level data, which has not been accessible at this time.

Table 3 displays the regression results from the aforementioned models, and each of the four models presents a different combination of interval ratio and dummy variables. In the first model, the dummies for both region and years are excluded; the second model includes only the interval ratio variables with the region dummies, while the third model includes only the interval ratio variables and the year dummies. Lastly, the four models include the interval ratio variables and both the region and year dummies. The analysis of these four models controls for the fixed effects of the region and year dummies on housing price.

As the R-squared terms at the bottom row of Table 3 indicate, adding only the region dummies added more explanatory power to the model than the year dummies. This finding suggests that price varies more by region than it does by year, holding all else constant. (In the real estate market, it seems, where you buy is more important than when.) However, including both sets of dummy variables with the interval ratio variables in the model yielded an R-squared value of .7525. That is, in Model 4,
75.25% of the variation in the price variable is explained by variation in the independent variables.

The variables representing income and percentage of loans to minorities are the only two that remain highly statistically significant throughout all four models. Both of the variables are positively correlated with the dependent variable, housing price. For income, a 1% increase in the income of an MRB-subsidized borrower is correlated with an increase in home price purchased of .7 %, holding all else constant. This suggests that as homebuyers earn higher salaries, they are using MRB subsidies to purchase more expensive homes. One implication of that finding may be regressivity in the distribution of the subsidies. Regression analysis also showed a highly statistically significant correlation between income and mortgage size. As a result, it appears that borrowers at greater income levels have larger mortgages and buy more expensive homes. Another implication in terms of the possible regressivity of this program is that a greater percentage of the capital raised by HFAs through MRB issuance is being used to subsidized the home purchases of wealthier eligible persons (i.e. those at 80-115% of AMI). To prove this case, however, further research – including loan-level data on MRB-subsidized borrowers – is required to show the extent to which wealthier eligible individuals are using the subsidies to purchase more expensive homes.

The percentage of minority borrowers coefficient is small, but interesting because it is always significantly positive. This suggests that states, which provided a
greater percentage of their MRB-subsidized mortgages to minorities, have correspondingly greater average housing prices, holding all other factors constant. Whereas minority populations are generally associated with lower incomes, this finding runs counter to the expected result, but can be explained by demographics. That is, the subgroup of minorities purchasing MRB-subsidized homes is not specified in the NCSHA data, which implies that one group (e.g. Hispanics, Asians, or Blacks) may be utilizing this program far more often than others. To the extent that the group utilizing the program has higher incomes on average, its constituents will be able to purchase more expensive homes.

In addition, as minority populations have been shown to have income levels lower than those of the population as a whole, this finding suggests that MRB-subsidies may be applied to wealthier individuals in those populations. If that is the case – this can be confirmed through an analysis using loan-level data – then the progressivity of a state’s MRB program can be called into question (i.e. as wealthier individuals can obtain market-rate financing for their home purchases). This positive, statistically significant correlation also indicates that within states, MRB subsidies may be applied in urban or suburban areas – where housing prices are greater – than rural parts of states. That is, minorities receiving the MRB subsidies for their home purchases may be disproportionately concentrated in urban areas, spending more on housing in those locations. In the given data, no coding was available for the location of the home
purchased (i.e. urban, suburban, or rural). Additionally, given the aforementioned statistical significance of the $\text{SUB50AMI}$ and $\text{ABOVE100AMI}$ variables, this finding may also indicate that the extent to which minorities participate in State HFAs’ MRB subsidy programs varies by region. Further analysis of these data could examine the variation in minority home purchase rates, based on the geography of the financial institutions that participate in MRB programs (i.e. and the extent to which there are branches in predominantly minority neighborhoods).

In both Models 2 and 4, the regional variables are all highly statistically significant. For those models, the Pacific region was selected (i.e. data points from Alaska, California, Hawaii, Oregon, and Washington) as the baseline, and the prices of houses in that area are consistently higher than the other eight regions. As Model 4 indicates, the next most “expensive” region – relative to the Pacific states – is the Mountain states (i.e. Arizona, Colorado, Idaho, Montana, Nevada, New Mexico, Utah, and Wyoming), followed by New England (i.e. Connecticut, Maine, Massachusetts, New Hampshire, Vermont, and Rhode Island). The regions with the least expensive homes, which were purchased through MRB-subsidies are West North Central (i.e. Iowa, Kansas, Minnesota, Missouri, Nebraska, North Dakota, and South Dakota) and West South Central (i.e. Arkansas, Louisiana, Oklahoma, and Texas), respectively. The high statistical significance of these variables indicates that location is an important determining factor for the prices of homes purchased through MRB-subsidies.
The year dummies, included in Models 3 and 4, are mostly statistically significant. That is, using 1996 as the baseline, the data points for 1999 through 2003 are statistically significant in both models. Holding all else constant, deflated average prices of houses subsidized by MRBs have risen during the period 1999 through 2003. Low interest rates, which persisted during that period kept the cost of borrowing low and induced renters to become homeowners. These results indicate that median value of homes rose due to higher than expected demand, pushing all housing prices up.

In Model 4, the variable for the percent of mortgage loans for existing homes is shown as statistically significant at the p<.05 level. The negative correlation between this variable and housing prices seems plausible. It is expected that this relationship would be negative and statistically significant, as the price of older homes would likely be lower than the price for newly constructed properties. As a result, homebuyers who purchase older homes with MRB subsidies are paying less (as an absolute) for their homes. An interesting follow-up study would examine the relationship between borrowers’ incomes and the decision to buy a new or existing home, given the neighborhood and various borrower characteristics.

Although data points were included in the data set to indicate the percentage of loans to individuals, with various income levels – relative to their state’s AMI – only two of those five variables were found to be statistically significant. Including the variables for percentage of loans originated to those below 50 percent of AMI and
percent of loans to those above 100 percent of AMI in Model 4 of Table 3 yields statistical significance for both of those terms. The breakdown of the percentage of loans – as distributed to borrowers’ income levels relative to AMI – was found to vary regionally, and is further explored in Table 2. The data in Table 2 indicate differences in State HFAs’ commitments to originating MRB-subsidized mortgages to buyers at various income levels, relative to AMI.

As the four models in Table 3 indicate, the magnitude and statistical significance of four of the independent variables change once the OLS analysis controls for the fixed effects of region and year. Moving from Model 1 to Model 4 indicates how the magnitude of the average household size and average borrower age variable decline between Models 1 and 4 and the variables loses their statistical significance. Controlling for region in Model 2 causes the statistical significance of both of these variables to disappear as well and the signs of their coefficients to become negative. The models in Table 3 indicate that region has a larger effect on average household size and average borrower age than year, and controlling for the fixed effects of both sets of dummies causes their coefficients to be statistically insignificant.

The number of loans variable is statistically significant at the $p<.05$ level in Model 1, yet not statistically significant in Model 4. Controlling for fixed effects in Models 2 and 3 shows that this variable loses its statistical significance easily. The

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11 The $Sub50AMI$ variable is significant at the $p<.001$ level and the $Above100AMI$ variable is significant at the $p<.1$ level.
12 For each row in Table 2, the two highest and lowest values – as well as the means for the entire data set – are bolded and underlined.
decrease in the magnitude of the number of loans variable is greater between Models 1 and 3 than Models 1 and 2, which indicates that region has a stronger correlative relationship than year\textsuperscript{13}. Model 4 indicates that controlling for region and year accounts for the omitted variable bias in the number of loans variable in Model 1.

Table 3 also displays the change in magnitude and statistical significance for the variable representing the percentage of loans for existing homes. In Model 1, this variable is not statistically significant, whereas it is statistically significant at the p<.01 level in Model 3 and p<.05 level in Model 4. In Model 2, the coefficient for the variable is positive, which suggests that the percentage of loans for existing homes is more strongly correlated with year than with region. Therefore, time is more important than place in determining the extent to which MRB-subsidized borrowers purchase existing homes. Controlling for fixed effects, the percentage of loans for existing homes variable is lower in Model 4 than it was in Model 1 (i.e. moving from -0.0002475 to -0.0008504). This finding suggests that the variable was upward biased in Model 1 (i.e. less negative).

\textbf{Conclusions and Policy Recommendations}

As a policy lever, MRB subsidies aim to aid LMI Americans in becoming homeowners through an innovative approach to financing the purchase of their first home. As a housing policy output, MRB subsidies have achieved their goal of moving

\textsuperscript{13} The difference in magnitude between Models 1 and 2 is -0.015 whereas the difference in magnitude between Models 1 and 3 is -0.012.
LMI individuals from renting to owning their homes. However, the extent to which MRB subsidies are distributed progressively varies by region. That is, given the income and housing price stipulations for receiving MRB subsidies, individuals – in certain parts of the country – who could otherwise acquire market-rate financing for their home purchases are receiving a discount on their mortgages at the expense of state and local government entities.

The goal of this analysis has been to examine the relationship between the price of homes, which were purchased through MRB subsidies and a set of explanatory factors. The findings indicate that as an individual’s income grows, he or she will likely purchase a more expensive home, since the income elasticity is between 0.69 percent and .79 percent. As policymakers aim to design programs that will primarily aid those who most need financial assistance to become homeowners, the data here indicate that not all states’ MRB programs are well targeted.

When examined on the aggregate, the findings indicate that the progressivity of the programs can be improved. That is, the data in Table 1 indicate that, on average, 18.94% of MRB subsidies were distributed to those homebuyers whose incomes were at or below 50% of AMI. If the program were progressive, the “poorest” 50% of individuals in an area would receive a share of these subsidies that equals or exceeds that group’s percentage of the overall population for a given region. Additionally, as Table 1 reveals, on average, more than 31% of MRB-subsidized mortgages were

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14 This is an unweighted calculation; for further explanation, please see Footnote 17 below Table 2
originated to individuals earning between 81% and 115% of AMI. Without an MRB subsidy, the poorest individuals would likely face usurious interest rates, whereas those at 80-115% of AMI could obtain market-rate financing. To direct the programs’ subsidies to those who need them, Congress should act to restrict access to state HFAs’ MRB programs through additional qualification criteria.

This analysis has found both home prices and median income levels to vary regionally. As a result, amending MRB programs – through action of the federal government – must acknowledge these regional differences. To bring about progressivity in the distribution of subsidies, Congress should opt to implement nationwide standards for how State HFAs can operate these programs. That is, Congress can mandate that HFAs throughout the country must more effectively target their MRB programs towards individuals whose incomes are at the lowest levels of AMI. As Table 2 indicates, several regions in the country have targeted their MRB subsidies to the “neediest” homebuyers, originating upwards of 45% of loans to individuals at or below 60% of AMI. In contrast to the calculated national average of 35.61% of State HFAs’ loans going to those at or below 60% of AMI, Congress could mandate that this figure must be at least 40%\(^\text{15}\). The East North Central and South Atlantic Regions – as indicated in Table 2 – have achieved this level, and therefore have achieved greater progressivity in their MRB programs. By targeting mortgage loan

\(^{15}\) This figure, 35.61%, is the sum of 18.94 and 16.67, the national means for % of loans originated to those individuals whose incomes were below 50% of AMI and those with incomes between 51% and 60% of AMI.
Another suggestion is for Congress to alter the income and housing price requirements for MRB subsidies. As the GAO (1988) study advised, to receive MRB subsidies, borrowers ought to meet a more strictly defined set of criteria. Lowering the level of income – as a percentage of AMI – as the ceiling for receipt of MRB subsidies will help enhance the progressivity of the program (i.e. “poorer” individuals may move towards homeownership at enhanced rates, relative to society as a whole). Additionally, Congress can change the existing criteria that a home purchased with MRB subsidies cannot exceed 90% of median house price. By lowering this figure, the program can more directly target homeownership opportunities for those who will not otherwise be able to buy homes.

This suggestion seemingly recommends the limitation of HFAs’ Mortgage Revenue Bond programs, yet it actually presents a new approach for directing the subsidies to where they are most needed. As MRBs subsidize mortgage interest rates, they make homeownership more affordable for individuals whose incomes are lower, relative to AMI. A key aspect of individuals moving from renting to owning their homes is financial education; this is why HFAs ought to devote greater resources to finding community partners – financial institutions, for example, which originate MRB-
subsidized mortgages – to provide consumers with basic information on homeownership and homebuying. Expanding the base of individuals at the lowest levels of AMI, who aim to become homeowners, necessitates the expansion of educational outreach. Programs such as those offered by the Washington, DC HFA that teach home finance to individuals in the community must be replicated in other areas\textsuperscript{16}. This can be done by expanding partnerships with community-based development organizations and the frequency of classes.

In achieving these solutions, politics will be a key consideration and present significant challenges. Mortgage Revenue Bonds, as they are underwritten by firms in the private sector and purchased by institutional investors (e.g. pension funds, insurance companies, the Government Sponsored Enterprises, etc.), have powerful advocates at all levels of government. As a result, investment banks and large investors would not support legal changes to MRB programs that would compromise their income or menu of investment opportunities. Therefore, to retain the support of these organizations, Congress must make HFAs commit to expanding their percentage of MRB-subsidized mortgages to weigh more heavily towards individuals at lower levels of AMI. The key component of that effort, as HFAs’ advocates ought to indicate to their opposition, is moving the lowest wage-earning households towards homeownership and trumpeting the profitability of that aim.

\textsuperscript{16} More information on the DC HFA’s programs is available at: http://www.dchfa.org/homeownership/homeownership_freeworkshop.html
This analysis has shown how MRB programs are successful at moving LMI Americans from renting to owning their homes. Given the nature of the data utilized – aggregate figures from State HFAs – future research will need to examine MRB-subsidized mortgages at the loan level. It is prudent to understand whether there is a supply-side explanation for the small numbers of individuals in certain states – with incomes below 50% of AMI – receiving these mortgage subsidies. Are banks and mortgage lenders less willing to expand their footprints into areas where individuals at lower percentages of AMI live? The implications of that question are staggering, as the possibility lingers that financial institutions are less likely to establish operations and originate loans in areas predominantly populated by LMI individuals. As a result, financial institutions’ geography could prohibit LMI individuals from obtaining mortgages (i.e. assuming that LMI individuals are unwilling to travel further distances to obtain these banking services). A resulting policy suggestion would be for all levels of government to increase incentives for financial institutions to operate in LMI areas, opening more branches and facilitating use of financial services for these individuals. The incentives can come in the form of expanding tax credit or subsidy programs – such as the New Markets Tax Credit – to make operating in LMI areas more profitable.

Future research ought to focus on the incidence of default among MRB-subsidized mortgages and the relationship of that variable to income level. Showing that default rates are constant across income level (represented as a percentage of AMI)
of MRB subsidy recipients would prove that mortgages originated to poorer
homebuyers can be profitable for financial institutions as well. By utilizing state HFAs’
aggregated data over time, this analysis has displayed key statistical relationships for
MRB subsidy recipients. Expanding MRB programs – such that the goal of
homeownership is realized by LMI Americans at lower percentages of AMI – will
require proof at the borrower level that financial institutions (i.e. some of the most
powerful advocates of MRB programs) can still profit, even if lower income levels are
targeted.
### TABLE 1 – DESCRIPTIVE STATISTICS

<table>
<thead>
<tr>
<th>VARIABLE</th>
<th>NUMBER OF OBSERVATIONS</th>
<th>MEAN</th>
<th>STD DEV</th>
<th>MODE</th>
<th>VAR</th>
<th>RANGE</th>
<th>MIN</th>
<th>MAX</th>
</tr>
</thead>
<tbody>
<tr>
<td>AVG MRB-SUBSIDIZED MORTGAGE AMOUNT</td>
<td>380</td>
<td>74,473.74</td>
<td>16,157.01</td>
<td>NO MODE</td>
<td>261,048,972.1</td>
<td>105,502</td>
<td>45,782</td>
<td>151,284</td>
</tr>
<tr>
<td>AVG PRICE MRB-SUBSIDIZED HOUSE</td>
<td>380</td>
<td>78,421.84</td>
<td>18,273.45</td>
<td>NO MODE</td>
<td>333,918,974.9</td>
<td>118,041.37</td>
<td>47,668.03</td>
<td>165,709.4</td>
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<td>PERCENT TO MINORITIES</td>
<td>380</td>
<td>24.99</td>
<td>17.45</td>
<td>31</td>
<td>304.59</td>
<td>96</td>
<td>0</td>
<td>96</td>
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<tr>
<td>AVG HOUSEHOLD SIZE</td>
<td>380</td>
<td>2.24</td>
<td>0.37</td>
<td>2</td>
<td>0.14</td>
<td>3</td>
<td>1</td>
<td>4</td>
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<tr>
<td>AVG BORROWER AGE</td>
<td>380</td>
<td>32.3</td>
<td>1.59</td>
<td>32</td>
<td>2.53</td>
<td>13</td>
<td>26</td>
<td>39</td>
</tr>
<tr>
<td>AVERAGE BORROWER INCOME</td>
<td>380</td>
<td>31,333.39</td>
<td>5,476.49</td>
<td>30849</td>
<td>29991920.81</td>
<td>41,951.97</td>
<td>19,901.03</td>
<td>61,853</td>
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<td>TOTAL YEARLY ISSUANCE OF MRB DEBT</td>
<td>380</td>
<td>1.94E+08</td>
<td>2.20E+08</td>
<td>0</td>
<td>4.84E+16</td>
<td>1,780,000,000</td>
<td>0</td>
<td>1.78E+09</td>
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<td>NUMBER OF LOANS CLOSED</td>
<td>380</td>
<td>2,018.85</td>
<td>1,428.54</td>
<td>931</td>
<td>2,040,729.39</td>
<td>9,599</td>
<td>4</td>
<td>9,603</td>
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<tr>
<td>Percent of Loans for Existing Homes</td>
<td>380</td>
<td>72.59</td>
<td>26.73</td>
<td>94</td>
<td>714.57</td>
<td>97.3</td>
<td>2.7</td>
<td>100</td>
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<tr>
<td>Percentage of Loans to Those below 50% of AMI</td>
<td>380</td>
<td>18.94</td>
<td>12.38</td>
<td>8</td>
<td>153.33</td>
<td>79</td>
<td>0</td>
<td>79</td>
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<td>Percentage of Loans to those bet 51 and 60% of AMI</td>
<td>380</td>
<td>16.67</td>
<td>6.07</td>
<td>19</td>
<td>36.88</td>
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<td>Percentage of Loans to those bet 61 and 80% of AMI</td>
<td>380</td>
<td>32.80</td>
<td>8.61</td>
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<td>74.11</td>
<td>72</td>
<td>3</td>
<td>75</td>
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<td>Percentage of loans to those above 100% of AMI</td>
<td>380</td>
<td>22.18</td>
<td>8.72</td>
<td>27</td>
<td>76.01</td>
<td>58</td>
<td>0</td>
<td>58</td>
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<tr>
<td>Percentage of loans to those above 100% of AMI</td>
<td>380</td>
<td>9.63</td>
<td>11.34</td>
<td>0</td>
<td>128.65</td>
<td>80</td>
<td>0</td>
<td>80</td>
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### Table 2 – Descriptive Statistics

<table>
<thead>
<tr>
<th></th>
<th>MA</th>
<th>ESC</th>
<th>NE</th>
<th>WNC</th>
<th>ENC</th>
<th>SA</th>
<th>WSC</th>
<th>MT</th>
<th>PAC</th>
<th>ALL DATA</th>
</tr>
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<tr>
<td>DEFAVGINC</td>
<td>36,817.92</td>
<td>28,717.71</td>
<td>34,436.16</td>
<td>30,455.93</td>
<td>30,824.16</td>
<td>28,546.41</td>
<td>29,573.36</td>
<td>33,076.63</td>
<td>31,341.30</td>
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<tr>
<td>DEFAVGPRICE</td>
<td>85,262.08</td>
<td>66,352.11</td>
<td>90,013.34</td>
<td>63,047.20</td>
<td>70,118.64</td>
<td>63,924.20</td>
<td>82,710.67</td>
<td>100,095.90</td>
<td>78,077.67</td>
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<tr>
<td>DEFAVGMORT</td>
<td>77,746.10</td>
<td>65,522.89</td>
<td>83,017.46</td>
<td>61,025.38</td>
<td>65,636.76</td>
<td>62,541.87</td>
<td>79,875.20</td>
<td>95,942.66</td>
<td>7,4452.27</td>
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<tr>
<td>% of Loans to those below 50% of AMI</td>
<td>16.86</td>
<td>13.24</td>
<td>11.91</td>
<td>23.52</td>
<td>26.03</td>
<td>24.21</td>
<td>17.28</td>
<td>14.94</td>
<td>18.51</td>
<td>18.94</td>
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<tr>
<td>% of Loans to those bet 61 &amp; 80% of AMI</td>
<td>33.91</td>
<td>33.1</td>
<td>35.63</td>
<td>28.97</td>
<td>30.61</td>
<td>31.24</td>
<td>28.78</td>
<td>37.69</td>
<td>34.51</td>
<td>32.8</td>
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<tr>
<td>% of Loans to those bet 81 &amp; 100% of AMI</td>
<td>23.76</td>
<td>23.73</td>
<td>27.6</td>
<td>22.07</td>
<td>17.79</td>
<td>17.02</td>
<td>23.34</td>
<td>23.8</td>
<td>24.1</td>
<td>22.17</td>
</tr>
<tr>
<td>% of Loans to those bet 100 &amp; 115% of AMI</td>
<td>7.23</td>
<td>16.61</td>
<td>11.16</td>
<td>8.98</td>
<td>7.7</td>
<td>8.21</td>
<td>13.22</td>
<td>9.13</td>
<td>6.04</td>
<td>9.62</td>
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<tr>
<td>INC/PRICE</td>
<td>0.4318</td>
<td>0.4328</td>
<td>0.3826</td>
<td>0.4831</td>
<td>0.4520</td>
<td>0.3864</td>
<td>0.4466</td>
<td>0.3576</td>
<td>0.3304</td>
<td>0.4014</td>
</tr>
<tr>
<td>INC/MORT</td>
<td>0.4736</td>
<td>0.4383</td>
<td>0.4148</td>
<td>0.4991</td>
<td>0.4829</td>
<td>0.4027</td>
<td>0.4564</td>
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<td>0.3448</td>
<td>0.4210</td>
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<tr>
<td>MORT/PRICE</td>
<td>0.9118</td>
<td>0.9875</td>
<td>0.9223</td>
<td>0.9679</td>
<td>0.9361</td>
<td>0.9593</td>
<td>0.9784</td>
<td>0.9657</td>
<td>0.9585</td>
<td>0.9536</td>
</tr>
</tbody>
</table>

**State Regions:**
- Middle Atlantic = MA – New Jersey, New York, and Pennsylvania
- East South Central = ESC – Alabama, Kentucky, Mississippi, and Tennessee
- New England = NE – Connecticut, Maine, Massachusetts, New Hampshire, Vermont, and Rhode Island
- West North Central = WNC – Iowa, Kansas, Minnesota, Missouri, Nebraska, North Dakota, and South Dakota
- East North Central = ENC – Illinois, Indiana, Michigan, Ohio, and Wisconsin
- South Atlantic = SA – Delaware, District of Columbia, Florida, Georgia, Maryland, North Carolina, South Carolina, Virginia, and West Virginia
- West South Central = WSC – Arkansas, Louisiana, Oklahoma, and Texas
- Mountain = MT – Arizona, Colorado, Idaho, Montana, Nevada, New Mexico, Utah, and Wyoming
- Pacific = PAC = Alaska, California, Hawaii, Oregon, and Washington

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17 The means calculated above are unweighted. That is, the mean deflated average mortgage home price was calculated by summing the annual means for that region and dividing that figure by the number of year-region data points. A weighted mean (i.e. the disaggregated – mean home price multiplied by number of loans, by region) home price was calculated for one region and the result was very similar to that above. Additionally, the two highest and lowest figures – by region – are in bold and underlined for each row.
| TABLE 318 |
|------------------|-------|-------|-------|-------|
| LN(DEFAVGPRICE) – DEP VAR | (1)   | (2)   | (3)   | (4)   |
| LN (DEF AVG INCOME)          | .7991139*** | .690541*** | .7932*** | .6954231*** |
| % Loans to Minorities        | .0026304*** | .002717*** | .0020899*** | .0023578*** |
| Avg Household Size           | .0524148**  | -.0329672 | .0915753*** | .0193708 |
| LN (Number of Loans)         | -.0239633** | -.0093306 | -.0122434 | -.0014329 |
| % Loans for Existing Homes   | -.0002475   | .00006   | -.0016864*** | -.0008504*** |
| Average Borrower Age         | .0149804*** | -.0034943 | .0206974*** | .0020501 |
| PAC                           | -       | BASELINE | -       | BASELINE |
| MIDATL                        | -       | -.2254424*** | -       | -.2136392*** |
| EASTSC                        | -       | -.3158247*** | -       | -.2846346*** |
| NEWENG                        | -       | -.1306552*** | -       | -.111574*** |
| ENORCEN                       | -       | -.2969309*** | -       | -.2609756*** |
| WNORCEN                       | -       | -.3740758*** | -       | -.3394414*** |
| SOUTHATL                      | -       | -.2182809*** | -       | -.186066*** |
| WSOUCEN                       | -       | -.3738413*** | -       | -.3586815*** |
| MOUNT                         | -       | -.1081481*** | -       | -.1070355*** |
| 1996                          | -       | -       | BASELINE | BASELINE |
| 1997                          | -       | -       | .027786  | .030339 |
| 1998                          | -       | -       | -.0550296 | -.0080579 |
| 1999                          | -       | -       | .0847727*** | .0752423*** |
| 2000                          | -       | -       | .0943912*** | .0832175*** |
| 2001                          | -       | -       | .1039599*** | .1002655*** |
| 2002                          | -       | -       | .1689322*** | .1444537*** |
| 2003                          | -       | -       | .2157534*** | .189187*** |
| R-squared                     | 0.4445  | 0.6835  | 0.5511  | 0.7525 |

18 *** indicates statistical significance at p<0.01; ** indicates significance at p<.05; * indicates significance at p<.1
REFERENCES


