The mortgage interest deduction and its impact on homeownership decisions

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Current draft: August 12, 2010

We thank Colin Cameron, Paul Coomes, Richard Green, Bob Helsley, Hilary Hoynes, Dwight Jaffe, Doug Krupka, Steven Raphael, Hui Shan, and Nancy Wallace for valuable comments. We wish to thank Daniel Feenberg for NBER generated tax data and David Roderer for FHFB data. We thank seminar participants at the University of California at Berkeley, University of California at Davis, and University of Southern California as well as conference participants at the 2009 North American Meetings of the Regional Science Association International in San Francisco, 2009 Swiss Economists Abroad Meetings in Basel, and 2010 AREUEA/ASSA meetings in Atlanta for excellent feedback. We are grateful to Josh Holmgren and Madina Mukhanova for helpful research assistance. Hilber wishes to thank IPFET for a travel grant to present this research. Address correspondence to: Christian Hilber, London School of Economics and Political Science, Houghton Street, London WC2A 2AE, United Kingdom, phone: +44-(0)20-7107-5016, fax: +44-(0)20-7955-7412, email: c.hilber@lse.ac.uk; or to: Tracy Turner: Kansas State University, Department of Economics, 327 Waters Hall, Manhattan, KS 66506-4001, United States, phone: 785-532-4583, fax: 785-532-6919, email: turner@ksu.edu.

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Abstract

This paper examines the impact of the combined U.S. state and federal mortgage interest deduction (MID) on homeownership attainment, using data from 1984 to 2007 and exploiting variation in the subsidy across states, over time and due to inter-state moves. We test whether capitalization of the MID into house prices offsets the positive effect on homeownership. We find that the MID only boosts homeownership attainment of higher income households in less tightly regulated housing markets. In more restrictive places – typically larger coastal cities – an adverse effect exists. The MID is an ineffective policy to promote homeownership and improve social welfare.

JEL classification: H22, H24, H71, R21, R31, R52

Keywords: Homeownership, mortgage interest deduction, tax subsidies, land use regulation.

1 Introduction

The mortgage interest deduction (MID) presents an important tax *subsidy*[1] for U.S. homeowners. In 2007, an additional dollar of mortgage interest generated on average 26 cents in tax savings.[2] This subsidy constitutes a very substantial revenue loss for the U.S. Treasury: the MID is the second largest U.S. tax expenditure, valued at an estimated $104.5 billion in foregone tax revenue in fiscal year 2011 (Office of Management and Budget, 2010).[3] Given the magnitude of the MID subsidy, the assessment of its effectiveness in terms of promoting homeownership is of first order policy relevance.

In addition to the federal subsidy, the MID taken on state income taxes can be substantial as well, with some states providing a net state subsidy in excess of 9 cents per dollar of mortgage interest. However, there are large differences across U.S. states in this tax subsidy: states such as California, Delaware, Maine, Massachusetts and North Carolina rely heavily on personal income taxation to raise revenue, permitting the deduction of mortgage interest, while other states such as Florida, Nevada, South Dakota, Texas, Wyoming and Alaska levy no personal income tax at all (Minnesota Department of Revenue, 2009). There is also substantial variation over time. For example, Arizona, New York and Wisconsin experience roughly a doubling of the net state subsidy rate between 1984 and 2007.

In this paper we take advantage of this cross-sectional and inter-temporal variation in the MID – in conjunction with various fixed effects, interaction effects, and geographical matching of various datasets – to tease out in some detail how the MID impacts individual homeownership

[1] We use the term 'subsidy' because under current U.S. tax law, landlords are taxed on their net rental income. The interest on their mortgages is not a personal expense but an expense necessary to earn the rental income. Owner-occupiers do not have to pay taxes on their *imputed* rental income, yet, they can still deduct mortgage interest from their income taxes.

[2] Authors' calculations using tax subsidy data generated by the National Bureau of Economic Research (NBER), as described in the data section.

[3] The largest tax expenditure is the exclusion of employers' contributions for their employees' medical insurance premiums and medical care.

decisions. Specifically, we exploit variation in the subsidy across states, over the years and due to inter-state moves of households to demonstrate how local housing market conditions and income status affect the way the MID influences household specific homeownership decisions.

Homeownership has been associated with various positive externalities, and, as a result, tax subsidies to homeowners may be efficiency improving.[4] Although intended to encourage homeownership, relatively little is known however as to whether or not the MID indeed increases the likelihood that the individual on the margin will own his or her housing.[5] We hypothesize that, if an impact of the MID on homeownership attainment exists, it will vary by local housing conditions, in particular, it will vary by the tightness of regulatory constraints on land use (i.e., by the extent to which the local housing supply is price inelastic). We also hypothesize that this mechanism generates unintended consequences: In places with tight land use regulation (inelastic supply), notably the highly urbanized places that stand to benefit most from the potential positive externalities of homeownership, the tax subsidies will tend to be capitalized into house prices, and the housing stock will not expand to facilitate higher homeownership rates. The mortgage subsidies will thus generate price capitalization effects rather than quantity responses. In this instance, not only will the MID not bring about higher homeownership attainment, such price capitalization effects may create a perverse outcome whereby the MID adversely affects the homeownership attainment of certain groups: increases in the MID may decrease the likelihood that down-payment-constrained households will be able to

[4] See, for example, Dietz and Haurin (2003).

[5] While the federal income tax put in place by 16th Amendment to the U.S. Constitution allowed for the deduction of any interest paid and did not distinguish mortgage interest, the intent of keeping mortgage interest deductible in the 1986 Tax reform Act was to promote homeownership. In a 1984 speech regarding his tax reform agenda, President Reagan stated he would "preserve the part of the American dream which the home mortgage interest deduction symbolizes" (Howard, 1997, p. 108). Thus, if not before, at least by 1986 there was arguably an explicit intent to use the MID to encourage homeownership.

purchase a house in order to take advantage of the mortgage subsidy. It may also make homeownership a less attractive option for mobile (better off) households, with shorter expected durations in their properties.

In places with elastic housing supply (lax land use controls), we hypothesize that the positive impact of the MID may vary by income status, although the direction of the effect is not clear *a priori*. Higher income households are the primary beneficiaries of the MID as they are both more likely to itemize and have higher valued homes (Poterba and Sinai, 2008), thus it may be that the impact of the MID where it exists will be greater for higher income households. On the other hand, higher income households are believed to have a probability of homeownership that is more price inelastic than lower income households (Glaeser and Shapiro, 2002), suggesting that their homeownership decision will be unresponsive to changes in the MID, and, as a result, to the extent that an effect is observed, it will be observed in the homeownership decisions of lower income households.

We investigate these issues using longitudinal household data from the Panel Study of Income Dynamics (PSID) from 1984 to 2007, as well as various secondary data sources. Specifically, we examine the impact of the combined state and federal MID on homeownership attainment, allowing for the possibility that the value of these subsidies varies by income group, over time, and by local housing market conditions. We test our proposition that the capitalization of the MID into higher house prices offsets the positive effect of the MID on homeownership attainment by exploiting data on regulatory restrictiveness in the late 1970s/early 1980s (compiled by Saks, 2008) as a proxy for the inelasticity of local housing supply.

As a preview of our findings: controlling for household, MSA, state and year fixed effects and state time trends as well as time-varying household and location characteristics, we find that the MID, on average, has no discernible impact on U.S. homeownership outcomes. Allowing the impact of the MID to vary by regulatory and income status, we find that only in markets with lax land use regulation does the MID have a positive impact on homeownership attainment, and the positive effect of the MID occurs only for higher income households. The MID has an adverse impact on the homeownership attainment of households residing in tightly regulated housing markets. In these places the MID reduces the likelihood of homeownership for all income groups except the lowest. The homeownership attainment of low-income households is unaffected by the MID regardless of the regulatory status of the city in which they reside. Our simulations suggest that a lower bound of the subsidy cost per converted homeowner amounts to a staggering $53,590. Overall, our findings cast serious doubt on the benefits of the mortgage interest deduction as a policy for boosting homeownership rates, particularly in more urbanized places and among low income and minority households, who tend to live in the more urbanized places.

The remainder of this paper is organized as follows. Section 2 discusses related research. Section 3 provides a discussion of the implication of economic theory for the impact of tax subsidies on homeownership attainment. Section 4 details the data and sample issues, outlines our empirical approach, presents our empirical findings and discusses the quantitative significance. Section 5 concludes.

2 Related research

A voluminous literature recognizes the importance of taking into account federal tax policy when constructing the user cost of owner-occupied housing (e.g., Rosen, 1979; Dynarski

and Sheffrin, 1985; Poterba, 1992; Turner and Smith, 2009). Early efforts to determine the impacts of removing the preferential tax treatment of owner occupied housing on homeownership attainment include papers by Rosen (1979), Hendershott and Shilling (1980), Rosen *et al.* (1984) and Berkovec and Fullerton (1994) and, although the findings are not entirely conclusive, they suggest that the tenure choice impacts of removing the mortgage interest deduction in isolation of other tax changes are likely to be small.

Several studies highlight the need to consider housing supply elasticities when examining the housing market impacts of tax reform (Capozza *et al.*, 1996; Green and Vandell, 1999). Capozza *et al.* (1996) maintain that the stock of prime residential land is inelastic, and thus altering the current tax treatment of owner-occupied housing will have price rather than quantity effects. In an examination of rent-price ratios in 63 metropolitan areas, Capozza *et al.* conclude that eliminating the mortgage interest and property tax deduction would reduce house prices by 2 percent to 13 percent depending on the metropolitan area. Using the Public Use Microdata Sample of the 1990 Census, Green and Vandell (1999) examine the likelihood of homeownership, controlling for state fixed effects in an effort to adjust for differing supply elasticities across states and find that replacing the MID with a revenue neutral tax credit would boost the national homeownership rate by about 5 percentage points.

Several papers document that the distribution of (primarily) federal housing tax benefits favors young and higher income homeowners and homeowners residing in regions with high incomes and high house prices (Glaeser and Shapiro, 2002; Sinai and Gyourko, 2004; Poterba and Sinai, 2008). However, high income households also tend to be higher wealth households and therefore they are likely to use equity financing to purchase their homes in the absence of the

mortgage interest deduction (Gervais and Pandey, 2008), thus further suggesting that the MID may have little impact on homeownership attainment.

Two papers broach the subject of state mortgage subsidies. Consistent with Capozza *et al.*'s (1996) finding that the tax subsidies to homeowners primarily generate price effects, Bourassa and Min (2008) find that the combined state and federal mortgage interest deduction has an adverse effect on homeownership attainment of the young. In contrast, in an examination of state mortgage subsidies, Glaeser and Shapiro (2002) report that state homeownership rates are unrelated to the size of state subsidies (p. 40). Taken as a whole, existing research suggests that the MID may not be a particularly effective policy tool for boosting homeownership attainment. However, to our knowledge, no study to date has sorted out the extent to which the MID impacts may vary depending on local housing supply conditions, a task we turn to next.

3 Capitalization and the homeownership rate

Our theoretical predictions are straightforward. Tax subsidies to owner-occupied housing will increase demand for owner-occupied housing, all else equal. However, the degree to which tax subsidies benefits households depends upon the local elasticity of housing supply and likely differs by income as different income tax brackets are differentially affected. To see the importance of the supply elasticity, consider the standard model of housing market dynamics.[6] In the short run, the consumer's willingness to pay for new or expanded housing increases according to the present discounted value of the tax subsidy. The stock of housing is fixed in the very short run, thus the tax policy results in disequilibria in the housing market, and, depending on the extent to which a supply side adjustment is expected, the price of housing in the short run may rise by the full amount of the present discounted value of the tax subsidy.

[6] Based on Poterba (1980).

In response to the demand-side housing market shock, the quantity supplied of owner-occupied housing may increase along two dimensions: New construction and conversion of rental units into owner-occupied units. At one extreme, if the long run supply of owner-occupied housing is perfectly elastic (very lax land use controls and no scarcity of developable land), the equilibrium purchase price of housing will return to its pre-tax change level. The subsidy in this case results in an expanded housing stock, an increased homeownership rate, zero capitalization and a lower user cost of owner-occupied housing. At the other extreme, if the owner-occupied housing stock is perfectly inelastic (very tight regulatory constraints and/or no open land to build), the subsidy is fully capitalized into the purchase price of owner-occupied housing, the owner-occupied housing stock does not expand, and the subsidy does not increase the homeownership rate, although it likely changes the composition of owners. The user cost of owner-occupied housing is unchanged.

There is ample evidence that indices of the restrictiveness of land use regulation are good proxies for the housing supply elasticity and thus for the potential for expansion of owner-occupied housing through new construction. For example, Saks (2008) derives a 'combined' measure of regulatory restrictiveness for the late 1970s and early 1980s (by using information from a number of surveys, see Saks (2008) for details) to demonstrate that locations with relatively few barriers to construction experience more residential construction and smaller increases in house prices in response to an increase in housing demand. Furthermore, housing supply constraints alter local employment and wage dynamics in locations where the degree of regulation is more severe. Quigley and Raphael (2005) use a city-level index of regulatory stringency for California cities and relate this index to local house prices in 1990 and 2000. They document, consistent with the findings in Saks (2008) and in this paper, that more regulated

cities have more expensive housing and a slower growth in housing stock. They confirm that these more regulated places also have a lower price elasticity of housing supply. Finally, Saiz (2010) uses a current measure of regulatory restrictiveness – the Wharton regulatory index that captures the restrictiveness of regulation around 2005 – and relates this directly to measures of supply elasticity, demonstrating that more regulated metro areas have more inelastic supply. In our empirical analysis we use the regulatory index compiled by Saks, since the regulatory stringency in the late 1970s / early 1980s is exogenous to (and not determined by) subsequent changes in tax policies and subsequent housing tenure decisions. (In contrast, the Wharton regulatory index from around 2005 and other recent measures of regulation are plausibly endogenous to prior changes in tax policies and in homeownership rates.)

As we use the regulatory index compiled by Saks (2008) in our analysis, her finding that in more strictly regulated metro areas house prices respond more strongly to changes in housing demand is particularly reassuring, as it supports our implicit assumption that in more tightly regulated places (defined as in our study) the extent of capitalization of demand factors – e.g., the mortgage subsidy – is greater. In a further attempt to confirm our implicit assumption that house price capitalization effects are greater in more tightly regulated places, we conduct a simple test of the proposition that regulatory restrictiveness affects the extent to which the mortgage subsidy rate raises house prices within our sample. Table A1 in the Appendix reports the results of regressing the house-price appreciation rate on the percentage change in the mortgage subsidy rate, controlling for year, state and MSA fixed effects. The results confirm that more regulated places have a greater extent of capitalization of the mortgage subsidy rate: greater increases in the mortgage subsidy are associated with higher house prices, and this effect is more than twice as large for the more regulated half of the observations in our sample. While

this is a preliminary and rather coarse look at capitalization, it is suggestive. It is also worth noting that other studies (e.g., Quigley and Raphael, 2005, for the US; Hilber and Vermeulen, 2010, for the UK) that use different measures to proxy for regulatory stringency also come to the same conclusion; house prices react more strongly to demand shocks (i.e., the extent of house price capitalization is greater) in more tightly regulated markets and hence, all else equal, housing is more expensive in those markets. Finally, in addition to the regulatory control, the homeownership specifications control for housing stock composition in the census tracts in which the households reside in order to capture at least in part the other aspect of housing supply elasticity: the extent to which the existing rental stock can be converted to owner-occupied use.

4 Empirical analysis

4.1 Data and sample issues

This paper uses data from multiple sources. The primary data source is three decades of data from the 'confidential version' of the PSID, which is a longitudinal survey of families – from whom we (confidentially) know their Census tract of residence – that has been carried out continuously since 1968 and provides a unique opportunity to follow households over time and across space.[7] We select all PSID households observed from 1984 to 2007. We begin the panel in 1984 because this is the first year in which the PSID collects information on the household wealth holdings. Data are collected annually until 1997 and biennially after 1997, providing up to 19 observations per household.[8] The data include (i) the original 1968 PSID core sample of 5,000 households selected as a random cross-section sample of the U.S. population with an additional low-income sample, and (ii) persons living within a household unit that enter the sample as a

[7] The PSID tract and MSA location indicators are confidential data from the PSID GEOCODE data files and can be obtained from the PSID under special contract. These data are not available from the authors.
[8] Due to missing data, we allow for a slightly unbalanced panel in our analysis in order to include the greatest number of households. Most households are included from 1984 to 2007.

separate household when they form their own household. The PSID reconstituted its sample in 1997 by dropping 1/3 of the core sample, changing to biennial data collection, and reformatting sample weights. Thus, our sample includes only those households observed from 1984 through 2007, roughly 2/3 of the original core sample. All of the household data used in this study are collected in each year of observation, except wealth data. Prior to 1997, the wealth data are collected every 5 years. After 1997, they are collected with each survey. For the pre-1997 wealth data, we apply a linear function to impute annual estimates of total net wealth.

In addition to the 'confidential version' of the PSID, we use five secondary data sources that report data at the tract, metro area or state level: NBER mortgage subsidy data, Federal Housing Finance Board mortgage interest rate data, Federal Housing Finance Authority house price indexes, 1980 U.S. Census data on tract-level housing stock characteristics, and the regulatory restrictiveness index from Saks (2008). We link these data to PSID households using PSID geographic location data. Our key variable of interest, the subsidy to homeowners through use of the federal and state mortgage interest deductions, comes from the NBER publicly available data on tax rates. The NBER generates the mortgage subsidy data by simulating the effects of the U.S. federal and state tax systems using SOI micro data on individual tax returns. As detailed in Feenberg and Coutts (1993) and at http://www.nber.org/taxsim, the mortgage interest subsidy is calculated as follows. State and federal income tax liabilities owed by a large sample of taxpayers in each state in each year are calculated. The mortgage interest is then increased by 1 percent for each taxpayer, the state and federal taxes are recalculated, and the mortgage interest subsidy is generated as the ratio of the additional tax (savings) to the additional mortgage interest. It measures the tax savings from an additional dollar of mortgage interest, or, equivalently, it is the marginal subsidy rate on mortgage interest. The average mortgage interest subsidy is then computed by state and year, using a fixed

sample of taxpayers across time so that year to year changes in the mortgage subsidy reflect only changes in tax law and not changes in the income distribution. The property tax subsidy is similarly generated. Importantly, using the marginal subsidy to the average taxpayer in the state in which the PSID household resides (varying in each year from 1984 to 2007) provides an exogenous measure of the mortgage interest subsidy for our analysis.

We use publicly available data from the Federal Housing Finance Board (FHFB) on metropolitan and state average effective mortgage interest rates at the time of mortgage origination for conventional, single-family, non-farm loans. The data are from the FHFB Monthly Interest Rate Survey and are computed based on fully amortized loans. Refinances, non-amortized loans, and balloon loans are excluded from the FHFB data, as are non-conventional loans (www.fhfb.gov). We use metro area data where available and state level data for PSID households that are not residing in one of the FHFB reported metro areas. The effective mortgage interest rate is the contracted rate adjusted for fees and charges. We use the mortgage interest rate data as part of the user cost controls in a robustness check of our main specifications.

The house price appreciation data, used in this study in Table A1 as well as in specifications controlling for the relative cost of homeownership, come from the Federal Housing Finance Authority (FHFA), formerly known as Office of Federal Housing Enterprise and Oversight. FHFA produces public use house price indexes at the metropolitan and state level using a repeat sales methodology and data on single-family properties whose loans have been purchased or securitized by Freddie Mac or Fannie Mae over the years (see www.fhfa.gov). As with the FHFB data, we use the metro level indexes where available and the state level indexes for households that are not residing in one of the FHFA metro areas. Finally, as noted

previously, we use the metropolitan-level regulatory index generated by Saks (2008) as a measure of the housing supply inelasticity. The 'Saks index' is scaled to have a mean of 0 and a standard deviation of 1. The index is available for 83 metro areas; generally regulation is tightest in the larger coastal cities – with New York and San Francisco being the two most regulated metro areas. Places in the Midwest and the South typically have rather relaxed land use controls.

To control for location specific factors that affect homeownership, we merge 1980 U.S. Census data on the composition of the housing stock at the tract level to the PSID households. The specific variables we examine include the share of housing units in the tract that are single-family and the share of units that are in multiplexes (structures with 5 or more units). We use the 1980 composition of the housing stock as it will be exogenous in an analysis of the probability of homeownership post 1980. The sample includes 4,197 households corresponding to 53,279 household-year observations residing in metropolitan and non-metro areas for the base empirical specifications, and 2,620 households corresponding to 29,621 household-year observations residing in metropolitan areas for which we have Saks (2008) regulatory index data. Roughly 2.5 percent of households move to a different state and 4 percent of households move to a different MSA in any given year. All dollar amounts are adjusted to 2007 dollars using the urban Consumer Price Index. All analysis is weighted using the PSID 2005 sample weights.[9]

4.2 Empirical approach

We estimate the following base specification for household *i* at time *t* (in location *j*) as a linear probability model:

$$\Pr\left(own_{it}\right) = \alpha_0 + \alpha_1 mrs_{it} + X_{it}'\beta + L_{it}'\delta + D_i'\lambda + e_i, \qquad (1)$$

[9] The PSID sample is not representative of the U.S. population without the application of sample weights. The post-1997 weights are stratified to the U.S. population according to data from the Current Population Survey. See Heeringa and Connor (1999) for more discussion. We use the 2005 combined family weight because the more recent 2007 weight is preliminary and not available for as many households as the 2005 weight.

where *mrs* is the mortgage subsidy rate, which is expected to have a positive coefficient to the extent that it facilitates homeownership, *X* is a vector of household characteristics that vary over time, *L* is a vector of location characteristics that vary over time as households move locations, *D* is a vector of individual fixed effects. The vector of time-varying household characteristics includes controls for total family income, total net wealth, age of head, marital status, children, and unemployment of head and spouse if present. We control for income by use of three income categories: low, moderate or high income. A low-income household is one whose annual income is less than or equal to 80 percent of state median income; moderate-income households include households with incomes between 80 and 120 percent of state median income, and high-income households are those with incomes above 120 percent of state median income.[10] The vector of time-varying location characteristics includes tract-level housing stock controls (the share of housing units that are single family units and the share of housing units in multiplexes), MSA fixed effects and state fixed effects. The rationale for including both MSA- and state fixed effects is that not all households reside in MSAs. The state fixed effects provide location controls for those places. Also, there could be unobservable time-invariant effects at the MSA and state level. We also estimate equation (1) with state time trends to control for unobserved factors at the state level that may affect homeownership attainment and may be changing over time. We estimate (1) with a household cluster correction. This implies that the standard errors allow for intra-household correlation, relaxing the usual requirement that the observations are independent. That is, the observations are independent across groups (clusters) but not

[10] We use state median income data from the U.S. Census Bureau Table H-7, which provides annual median income estimates by state from 1984 to 2007, based on the Current Population Survey. Regarding the income classifications, note that state homeownership assistance programs, such as Florida's State Housing Initiatives Partnership Program (SHIP), the largest state housing trust fund, use these income definitions. For example, see http://www.floridahousing.org/Home/HousingPartners/LocalGovernments. The U.S. Department of Housing and Urban Development's HOME program, which supports homeownership, defines low income as 80% of MSA median income. (http://www.hud.gov/offices/cpd/affordablehousing/lawsandregs/index.cfm). Nelson (1994) defines 50% as very low income and 80% as low income.

necessarily within groups. As noted previously, PSID households do move across MSAs and across states. Hence, there is variation in our MSA-specific as well as in our state-specific measures. We also run specifications that allow for a differential impact of tax subsidies depending on the household's income by interacting *mrs* with income status.

One advantage of estimating equation (1) as a fixed effect model is that household fixed effects capture all unobserved heterogeneity in household characteristics – such as race/ethnicity of the household head – that are time invariant. To the extent that households don't move, the fixed effects also capture time invariant location characteristics (at neighborhood-, municipality-, county-, state-, region-, and national-level). However, households do move across space and we observe such changes in our panel. As a result, we also include the location controls discussed above. Regarding total net wealth, note that changes in net asset wealth are driven in part by changes in income. Hence, once we control for fixed effects and household income, the impact of household net wealth on homeownership attainment can be expected to be quite limited.

To explore the impact of regulatory restrictiveness, we also estimate the following specification for household *i* at time *t* (in location *j*), again, as a linear probability model:

$$\Pr\left(own_{it}\right) = \alpha_0 + \alpha_1 mrs_{it} + \alpha_2 mrs_{it} * reg_{it} + \alpha_3 reg_{it} + X_{it}'\beta + L_{it}'\delta + D_i'\lambda + e_i, \qquad (2)$$

where *reg* equals the value of the regulatory index with higher values of the index indicating greater regulatory restrictiveness and hence more inelastic housing supply. Economic theory suggests that $\alpha_2 < 0$: the positive impact of the subsidy on homeownership attainment ought to be weaker (and the negative impact stronger) in more regulated metro areas. Note that reg_{it} varies in the panel even though our regulatory proxy is time-invariant and only varies by location. This is because reg_{it} varies as households move between metro areas or states and thereby move from more to less restrictive places and vice versa. We also run specifications that interact regulatory

status, *mrs*, and income status in order to investigate the extent to which different income groups are differentially affected by the mortgage rate subsidy in different regulatory environments.

Missing from the analysis so far is a control for the relative cost of homeownership: the cost of housing services in the owner mode relative to the cost of housing services in the rental mode. In studies of homeownership, the annual cost of housing services in the owner mode is generally approximated as the user cost of housing, which is a household–specific variable measuring the expected consumption value of the housing services from purchasing a home. The user cost is the sum of depreciation and maintenance costs, the after-tax opportunity cost of the down-payment, the after-tax mortgage interest payments and after-tax property tax payments minus the expected, nominal capital gain on the housing structure (Poterba, 1980). Of these components of user cost, equations (1) and (2) control for the mortgage interest tax break using the NBER SOI data (*mrs*). We also run these models adding controls for additional determinants of user cost: the FHFB reported effective mortgage interest rate, the NBER property tax subsidy rate and the FHFA contemporaneous house price appreciation rate as well as the price of rental housing, which we control for as the average annual rent in the city and year in which the family is observed.[11]

4.3 Results

Table 1 presents population weighted summary statistics for the full sample and the regulatory restrictiveness sub-sample. Table 2 provides detailed summary statistics for our key variable of interest, the mortgage subsidy, by state. While our econometric analysis uses the combined federal and state mortgage subsidy rate, we also report the net state rate to illustrate

[11] The remaining terms in UC, depreciation and maintenance, are each typically set to a value of 0.02 (see e.g. Poterba, 1992), and thus would be part of the constant in an estimation. For the rent data, we compute the average self-reported rent in the PSID in the city and year in which we observe the household. For households residing in non-metropolitan areas or metropolitan areas with a relatively small sample size (less than 100 PSID respondents), we compute a regional rent based on the metropolitan areas being located in one of the nine Census Divisions.

the extent to which there is across and within state variation in the net state mortgage subsidy. As can be seen from Table 2, 15 states provide no state level mortgage subsidy. Among the states that do provide a mortgage subsidy, the rate varies considerable across states, reaching a maximum of 10 cents per dollar of mortgage interest in the District of Columbia, as well as within states over time.

Table 3 reports the results for the baseline estimations on the full PSID sample. Column (1) provides results for the specification that includes only the *mrs*, household controls, and household fixed effects. Column (2) then adds locations controls (the housing stock variables, MSA fixed effects and state fixed effects). Column (3) adds year fixed effects, and column (4) adds state time trends. Column (5) allows for separate effects of *mrs* by income group. Across all five specifications, the key variable of interest, the *mrs*, has no statistically significant impact on the likelihood of homeownership, not even for the highest income households, in column (5), who tend to receive the greatest tax breaks from this feature of the tax code. This result is consistent with Glaeser and Shapiro (2002) and suggests that, on aggregate, this very costly tax subsidy to U.S. homeowners has no discernible impact on the likelihood of homeownership attainment.

The control variables all generate results that are sensible, intuitive and robust across all models. Income, wealth, age, being married and having children all positively impact the likelihood of homeownership, with income and being married having particularly large impacts: based on the coefficients reported in column (4), high-income households are roughly 14 percentage points more likely to own than low-income households; being married increases the likelihood of homeownership by 17.3 percentage points. An episode of head or spouse unemployment lowers the likelihood of homeownership by roughly 4 percentage points. The

location controls indicate that the composition of the housing stock matters for homeownership attainment: a greater fraction of single family units boosts homeownership attainment whereas a greater fraction of multiplexes lowers it.

Table 4 reports results for specifications where the *mrs* is interacted with regulatory tightness and with income status. Our proposition is that in more regulated places (with inelastic supply), the tax subsidies get capitalized into house values rather than expand the (owner-occupied) housing stock and thereby have little impact on homeownership attainment, or, may in fact have a negative impact, for example, because fewer moderate income households 'at the margin' manage to qualify for a mortgage or because owning may become comparably less attractive for mobile (better-off) households with short expected durations in their homes. Columns (1) and (2) allow for the impact of the *mrs* to vary by regulatory restrictiveness on the full sample for which we have regulatory data, with column (2) adding in state time trends. Column (3) further decomposes the impact of the *mrs* on homeownership attainment by interacting the subsidy with regulatory restrictiveness and with income status.

Columns (1) and (2) indicate that the *mrs* has no statistically significant impact on the likelihood of owning if a household lives in a metro area with an average degree of regulatory restrictiveness. If a household lives in a place with relaxed land use controls the *mrs* will have a positive impact on homeownership attainment, whereas the effect is negative in more tightly constrained locations, in line with our theoretical conjectures. According to column (2), evaluating the regulatory index at its sample mean of 0.191 suggests that the marginal effect of a one standard deviation increase in the *mrs* is negligible, decreasing the homeownership rate by 0.1 percentage point. Evaluating the regulatory index at its extreme values of -2.4 (Bloomington-Normal, IL) and 2.21 (New York, NY) generates the following range: a one

standard deviation increase in the *mrs* increases the likelihood of homeownership attainment by 3.6 percentage points in the least regulated place and reduces the likelihood of homeownership by 3 percentage points in the most tightly regulated place.

Referring to column (3), we see that a further decomposition is insightful. It reveals that the impact of the subsidy on homeownership attainment by regulatory status varies considerably by income status. Very few low income households itemize and this is apparent in the estimations, whereby the subsidy has no effect on the likelihood that low-income households will attain homeownership, regardless of the regulatory status of the city in which they reside.[12] The coefficients on the interaction terms for moderate- and high-income households are statistically significant and meaningful. Evaluating the regulatory index at its extreme values generates the following range for moderate-income households: a one standard deviation increase in the *mrs* increases the likelihood of homeownership attainment by 3.6 percentage points in the least regulated location and reduces it by 3.7 percentage points in the most tightly regulated place. For high-income households, the impact of a one standard deviation increase in the mortgage subsidy on the likelihood of homeownership ranges from a 4.9 percentage point increase (least restrictive) to a reduction of 3.4 percentage points (most restrictive). Regarding the other results from Table 4, the household and location controls continue to be intuitive, plausible and robust across samples and specifications; the coefficient estimates are available from the authors upon request.

Finally, as a robustness check, we re-estimate the specifications in Table 4 controlling for additional components of user cost: the NBER combined state and federal property tax subsidy

[12] Even among low-income homeowners itemization rates are low. For example, using 2004 data from the Survey of Finances combined with NBER TAXSIM data, Poterba and Sinai (2008) report in their Table 2 that only 23 percent of low-income homeowners (those earning less than $40K in 2003) itemize whereas over 98% of high income homeowners do (those earning $125K or more).

rate, the FHFB effective mortgage rate, and the FHFA metropolitan house price appreciation rate as well as the price of rental housing. The results are reported in the Appendix Table A2. The additional controls have a negligible impact on our key findings. Of the controls, only the coefficient on rent is statistically significant and suggests that a one standard deviation increase in local rents ($1,565), holding the user cost of owner-occupied housing constant, increases the likelihood of homeownership by 1.7 percentage points. We should interpret these findings with some caution however as both additional controls are subject to endogeneity concerns. The property tax rate is affected by house prices; places with greater housing wealth can set lower property tax rates, all else equal, and can still offer better local public services. At the same time an increase in the local homeownership rate may cause higher prices for owner-occupied housing. Hence homeownership may affect property tax rates via house prices, that is, reverse causation may be present. In a similar vein, if the homeownership rate increases, demand for mortgage credit strengthens as well. This in turn can raise mortgage interest rates. Again, reverse causation may be present. For all these reasons we only report these results as an Appendix Table rather than as our main specifications.

4.4 Quantitative effects

One way to gauge the cost of the MID is to compute the cost per net new homeowner created by the MID. To do so, we first determine the net number of households that are hypothetically moved into homeownership as a result of the mortgage interest subsidy. Using the specifications in Tables 3 and 4, we compute the probability of homeownership for each household with and without the mortgage subsidy. If in a given year the subsidy moves a household from a less than 50 percent likelihood of homeownership to a likelihood that exceeds 50 percent, the household is counted as moving from renting to owning. If the household's

likelihood of homeownership decreases from above 50 percent to less than 50 percent as a result of the subsidy, this household is counted as moving from owning to renting. If the household does not experience a change in the likelihood of homeownership that crosses the 50 percent threshold, the household is counted as not having experienced a change in its housing status.

We then compute the fraction of the sample that falls into each category: moving from renting to owning, moving from owning to renting, or having no change in tenure status. The net impact is computed as the percent of the sample moved into homeownership minus the percent of the sample moved out of homeownership, as defined above, as a result of the MID. Table 5 reports these results by specification. Notice that for the U.S. on average, based on the econometric results in Table 3, this exercise suggests a net *negative* impact of the MID on the likelihood of homeownership (although the effects are all not statistically significant), whereas the specifications reported in Table 4 imply a relatively small positive (and statistically significant) impact. Our most refined specification reported in column (3) of Table 4, which allows the impact of the MID to vary by regulatory restrictiveness and by income status, results in a net positive gain in the number of homeowners by 1.7 percent, and this is the estimate we proceed with to compute the subsidy cost per net additional homeowner.

There are an estimated 115 million households in the US in 2010 (the most recent Census Bureau estimate available).[13] Hence, specification (3) in Table 4 implies that the subsidy in any given year generates 1.95 millions new homeowners in the United States (1.7 percent times 115 million). At an estimated total cost of 104.5 billion in 2011 (OMB, 2010), the subsidy per converted homeowner thus amounts to a staggering $53,590. That is, to move a renter household into homeownership through the MID costs US taxpayers $53,590 in foregone tax revenue

[13] See www.census.gov/population/projections/nation/hh-fam/table1n.txt.

annually. This amount is likely a lower bound estimate. The other rigorous specification in Table 4 that includes state time-trends (column 2) implies an amount of $75,920. The (non-significant) coefficients on the MID-variable reported in the various specifications in Table 3 – if taken at face value – all imply that the tax payer may spend 104.5 billion in 2011 with the overall net effect being that *fewer* households own, as a consequence of the MID. More importantly, the amount may be a lower bound because 'inertia' or moving costs may prevent households from changing their tenure status, even if it were per se optimal to do so. This is because the moving cost may exceed the gains associated with the tenure change. In practice, most households will only question their optimal tenure status when they have to relocate for other reasons. Hence, the net addition of homeowners, as a consequence of the MID, may only be a small fraction of the 1.95 millions that our simulation implies. To the extent this is true; the subsidy per converted homeowner may be a multiple of $53,590.

5 Conclusions

Using multiple data sources in the context of a fixed effects household-level analysis, this paper provides a first look at the impact of the combined state and federal mortgage interest tax subsidy on homeownership attainment taking into account housing supply conditions via measures of regulatory restrictiveness in local housing markets. Controlling for household, MSA, state and year fixed effects as well as state time trends and time-varying household and location characteristics, we find that, on average, the MID has no statistically significant impact on homeownership attainment. However, the MID does have an impact on individual homeownership decisions – both positive and negative – depending on the restrictiveness of land use regulations at the place of residence and the income status of the household: in places with more elastic housing supply, the MID has a positive effect on homeownership attainment, but

only for higher income groups, increasing their likelihood of homeownership by about 3.6 to 5 percentage points depending on income status, with the effect being stronger for high-income than moderate-income households. In contrast, regardless of regulatory status, the MID has no impact on the homeownership attainment of low-income households. In more restrictive places, the mortgage tax subsidies have a significant adverse impact: they reduce the likelihood of homeownership, with this effect being slightly more negative for moderate-income households (-3.7 percentage points) than high-income households (-3.4 percentage points).

The implications of the MID for redistribution are striking. The fact that the subsidies have an adverse effect on homeownership attainment in the more regulated markets, implies that an increase in the subsidy rate only serves to make existing (typically higher-income) homeowners better off and existing (usually lower-income) renters worse off. In less regulated places we do find the intended tenure transitions but, again, only for the higher income groups.

The implications from a welfare economics point of view are similarly striking. One argument in favor of the tax deductibility of mortgage interest is that it may help to increase homeownership attainment in highly urbanized (inner city) areas. These areas are often confronted with underperforming public schools, lack of social capital and poor governance and recent research has highlighted that positive externalities associated with homeownership may help local communities to improve along those dimensions (Hoff and Sen, 2005; DiPasquale and Glaeser, 1999; Hilber and Mayer, 2009; Fischel, 2001). However, our research suggests that the deductibility of mortgage interest decreases rather than increases homeownership attainment in the typically more tightly regulated urbanized places. What about the less urbanized places with lax land use controls? In these places the MID does have a positive impact on homeownership attainment (at least for higher income groups). However, recent research (Hilber and Mayer 2009

and Hilber 2010) suggests that in these 'elastically supplied' places homeownership may generate few or no positive externalities.[14] We conclude that the MID is a costly and ineffectual policy for boosting homeownership and social welfare.

[14] Hilber and Mayer (2009) suggest that the positive externalities of homeownership related to investment in local public schools may be confined to places with inelastic supply of housing. In a similar vein, Hilber (2010) provides evidence that homeowners may only be 'better citizens' (i.e., invest in local social capital) in neighborhoods with inelastic housing supply.

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TABLES

TABLE 1
Population Weighted Summary Statistics: PSID Households 1984 to 2007

Variable	Obs.	Mean	Std. Dev.	Min	Max
Full regression sample					
Owner-occupier = yes	53279	0.716	0.451	0	1
TAXSIM mortgage rate subsidy (absolute)	53279	0.260	0.0284	0.187	0.405
Household income in 2007 US-$10,000	53279	8.29	10.20	0	583.91
Household has low income	53279	0.234	0.423	0	1
moderate income	53279	0.190	0.392	0	1
high income	53279	0.576	0.494	0	1
Age of household head	53279	45.10	13.51	0	97
Married	53279	0.643	0.479	0	1
One child	53279	0.176	0.380	0	1
Two children	53279	0.173	0.379	0	1
Three or more children	53279	0.0917	0.289	0	1
Head in labor force and unemployed last year	53279	0.0802	0.272	0	1
Wife in labor force and unemployed last year	53279	0.0317	0.175	0	1
Share units in tract that are single family	53279	0.648	0.243	0	1
Share units in tract in apartment b. (5+ units)	53279	0.155	0.191	0	1
Total net wealth in 2007 US-$1 million	53279	0.331	1.21	-1.30	50.48
Year of observation	53279	1994.27	6.88	1984	2007
Sample of observations with MSA-level information on regulatory restrictiveness					
Owner-occupier = yes	29621	0.694	0.461	0	1
TAXSIM mortgage rate subsidy (absolute)	29621	0.261	0.0293	0.194	0.405
Household income in 2007 US-$10,000	29621	9.06	11.26	0	583.91
Household has low income	29621	0.218	0.413	0	1
moderate income	29621	0.170	0.376	0	1
high income	29621	0.612	0.487	0	1
Age of household head	29621	45.08	13.46	18	96
Married	29621	0.621	0.485	0	1
One child	29621	0.173	0.379	0	1
Two children	29621	0.175	0.380	0	1
Three or more children	29621	0.0863	0.281	0	1
Head in labor force and unemployed last year	29621	0.0764	0.266	0	1
Wife in labor force and unemployed last year	29621	0.0276	0.164	0	1
Share units in tract that are single family	29621	0.617	0.279	0	1
Share units in tract in apartment b. (5+ units)	29621	0.194	0.225	0	1
Total net wealth in 2007 US-$1 million	29621	0.353	1.27	-1.30	50.48
Year of observation	29621	1994.16	6.94	1984	2007
Regulatory index compiled by Saks (2008)	29621	0.191	0.985	-2.40	2.21
TAXSIM property tax rate subsidy	29621	0.254	0.0419	0.161	0.501
Effective mortgage interest rate	29621	0.0836	0.0187	0.0543	0.132
House price appreciation rate (only years w/o move)	29621	0.0363	0.0474	-0.174	0.276
Av. annual rent in MSA/region in 2007 US-$10,000	29621	0.698	0.161	0.351	1.34

TABLE 2
NBER SOI Mortgage Rate Subsidy by U.S. State in %, 1984-2007 (PSID Sample Years Only)

U.S. State	Average of State Net MRS	Std. Dev.	Min.	Max.	Average of Combined MRS	Std. Dev.	Min.	Max.
ALABAMA	3.56	0.12	3.29	3.72	25.19	2.10	22.8	29.37
ALASKA	0	0	0	0	26.92	3.10	23.21	33.3
ARIZONA	4.21	0.86	3.37	5.61	26.14	2.11	23.19	30.51
ARKANSAS	5.46	0.83	3.81	6.43	28.26	1.62	25.95	31.22
CALIFORNIA	6.01	0.32	5.43	6.54	26.67	1.41	24.94	29.48
COLORADO	4.71	0.27	4.44	5.28	27.08	2.07	24.55	31.48
CONNECTICUT	0.06	0.07	0	0.22	25.60	2.45	22.89	30.55
DELAWARE	6.41	0.87	5.1	8.56	27.37	2.21	24.06	31.95
DISTRICT OF COLUMBIA	8.98	0.56	7.94	10.17	34.68	2.60	32.36	40.48
FLORIDA	0	0	0	0	22.97	2.14	20.15	27.22
GEORGIA	5.32	0.11	5.21	5.56	27.78	2.26	25.32	32.68
HAWAII	8.86	0.67	7.57	9.46	28.20	1.75	25.31	31.83
IDAHO	5.74	0.37	4.96	6.56	25.81	2.22	22.76	29.71
ILLINOIS	0	0	0	0	24.50	2.37	21.73	29.48
INDIANA	0	0	0	0	23.62	2.35	20.26	28.11
IOWA	5.59	0.21	5.25	5.81	27.63	2.03	25.1	31.93
KANSAS	5.33	0.84	3.07	6.19	28.83	2.33	25.85	33.66
KENTUCKY	5.26	0.72	3.96	5.83	27.80	1.93	25.63	31.4
LOUISIANA	2.23	1.37	-1.45	3.08	26.78	2.71	21.74	31.23
MAINE	7.28	0.36	6.31	7.78	28.13	1.79	25.98	31.53
MARYLAND	3.89	1.70	0.06	4.69	26.49	0.97	24.56	28.08
MASSACHUSETTS	0	0	0	0	24.18	2.12	21.65	28.74
MICHIGAN	0	0	0	0	25.03	2.42	21.93	29.94
MINNESOTA	7.05	1.08	5.34	9.59	29.40	3.36	25.05	37.39
MISSISSIPPI	4.04	0.31	3.47	4.53	27.80	1.67	25.22	31.08
MISSOURI	4.19	0.53	3.38	4.93	27.26	1.84	24.95	30.58
MONTANA	5.25	0.86	3.56	6.19	26.12	1.93	24.13	29.59
NEBRASKA	5.02	0.52	4.17	6.3	27.05	1.82	25.09	30.79
NEVADA	0	0	0	0	24.23	1.90	21.77	28.11
NEW HAMPSHIRE	0	0	0	0	23.00	2.08	20.49	27.46
NEW JERSEY	0	0	0	0	24.70	2.29	22.2	29.68
NEW MEXICO	5.29	0.80	3.69	6.22	26.88	1.30	24.15	28.9
NEW YORK	5.73	1.21	4.44	8.49	28.26	2.60	25.88	34.23
NORTH CAROLINA	6.27	0.53	5.52	7.05	28.49	1.78	26.53	31.81
NORTH DAKOTA	3.28	0.17	3.08	3.58	27.51	2.61	24.89	33.36
OHIO	0	0	0	0	24.23	2.31	21.35	28.9
OKLAHOMA	4.56	2.44	0.4	6.41	26.70	2.09	24.72	30.79
OREGON	8.12	0.51	6.7	8.86	28.97	2.11	26.45	33.64
PENNSYLVANIA	0	0	0	0	24.03	2.26	21.25	28.56
RHODE ISLAND	5.22	0.50	4.31	6.07	26.10	2.46	23.37	31.69
SOUTH CAROLINA	5.90	0.44	5.3	6.52	27.29	2.14	24.23	31.84
SOUTH DAKOTA	0	0	0	0	22.86	2.11	20.52	27.59
TENNESSEE	0	0	0	0	24.50	2.42	20.96	29.25
TEXAS	0	0	0	0	25.55	2.68	22.26	30.83
UTAH	6.07	0.41	5.41	7.34	25.70	1.62	23.73	29.13
VERMONT	5.72	0.70	4.4	6.76	27.48	2.67	24.07	33.25
VIRGINIA	5.29	0.12	5.15	5.49	27.99	1.89	25.82	32.04
WASHINGTON	0	0	0	0	22.12	1.88	19.37	25.8
WEST VIRGINIA	0.87	2.06	0	5.6	23.00	2.77	19.66	28.89
WISCONSIN	4.84	0.79	3.73	7.15	27.56	2.30	24.98	32.96
WYOMING	0	0	0	0	21.77	3.20	18.71	28.58

TABLE 3
Baseline Specifications: To Tax Subsidies Increase Homeownership Attainment?

	Dependent variable: household is owner-occupier				
	(1)	(2)	(3)	(4)	(5)
	Household controls only	Add location controls	Add year-FE	Add state × time-trends	MRS varies by income group.
Mortgage rate subsidy	-0.128	-0.0453	-0.223	-0.0882	
	(0.123)	(0.110)	(0.380)	(0.377)	
Low income × Mortgage rate subsidy					-0.272
					(0.402)
Moderate income × Mortgage rate subsidy					-0.211
					(0.404)
High income × Mortgage rate subsidy					-0.00728
					(0.390)
Moderate income	0.0781***	0.0780***	0.0784***	0.0785***	0.0626
	(0.00931)	(0.00897)	(0.00898)	(0.00888)	(0.0650)
High income	0.142***	0.137***	0.138***	0.138***	0.0687
	(0.0106)	(0.0100)	(0.0100)	(0.00997)	(0.0617)
Total net wealth	0.00542**	0.00446**	0.00453**	0.00486**	0.00494**
	(0.00231)	(0.00190)	(0.00191)	(0.00202)	(0.00203)
Age of head	0.0347***	0.0313***	0.0310***	0.0313***	0.0313***
	(0.00186)	(0.00175)	(0.00176)	(0.00176)	(0.00176)
Age of head squared	-0.000254***	-0.000227***	-0.000226***	-0.000228***	-0.000228***
	(1.92e-05)	(1.78e-05)	(1.84e-05)	(1.84e-05)	(1.84e-05)
Married	0.196***	0.174***	0.174***	0.173***	0.173***
	(0.0126)	(0.0116)	(0.0116)	(0.0115)	(0.0115)
One child	0.0572***	0.0513***	0.0518***	0.0535***	0.0531***
	(0.00781)	(0.00732)	(0.00728)	(0.00725)	(0.00727)
Two children	0.0973***	0.0865***	0.0867***	0.0888***	0.0882***
	(0.00909)	(0.00857)	(0.00857)	(0.00853)	(0.00855)
Three or more children	0.125***	0.107***	0.108***	0.109***	0.109***
	(0.0132)	(0.0119)	(0.0118)	(0.0118)	(0.0119)
Head unemployed	-0.0427***	-0.0401***	-0.0396***	-0.0400***	-0.0395***
	(0.00766)	(0.00727)	(0.00722)	(0.00713)	(0.00712)
Wife unemployed	-0.0359***	-0.0349***	-0.0344***	-0.0339***	-0.0338***
	(0.00992)	(0.00939)	(0.00941)	(0.00950)	(0.00951)
Share of units that are single-family		0.0894**	0.0891**	0.0977**	0.0978**
		(0.0414)	(0.0414)	(0.0412)	(0.0412)
Share of units that are in 5+ unit-buildings		-0.312***	-0.311***	-0.304***	-0.304***
		(0.0502)	(0.0503)	(0.0497)	(0.0497)
Household fixed effects	*Yes*	*Yes*	*Yes*	*Yes*	*Yes*
MSA fixed effects	*No*	*Yes*	*Yes*	*Yes*	*Yes*
State fixed effects	*No*	*Yes*	*Yes*	*Yes*	*Yes*
Year fixed effects	*No*	*No*	*Yes*	*Yes*	*Yes*
State × time-trends	*No*	*No*	*No*	*Yes*	*Yes*
Constant	-0.512***	-0.534	-0.492	1.394	1.460
	(0.0546)	(0.366)	(0.369)	(1.309)	(1.290)
Observations	53279	53279	53279	53279	53279
Number of households	4197	4197	4197	4197	4197
R-squared overall model	0.308	0.297	0.297	0.299	0.300
R-squared within model	0.221	0.287	0.288	0.294	0.294
R-squared between model	0.374	0.314	0.314	0.314	0.314

Robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

TABLE 4

Results for Specifications with Interaction 'Tax Subsidy × Regulatory Restrictiveness'

	Dependent variable: household is owner-occupier		
	(1)	(2)	(3)
	Full sample / *No* State × time-trends	Full sample / *With* State × time-trends	Specification (2) but × income groups
Mortgage rate subsidy	0.102	0.0531	
	(0.497)	(0.480)	
Mortgage rate subsidy × regulatory index	-0.329**	-0.485***	
	(0.137)	(0.154)	
Regulatory index	-0.00613	0.0384	
	(0.0746)	(0.0781)	
Low income × mortgage rate subsidy			-0.106
			(0.515)
Low income × mortgage rate subsidy × regulatory index			0.149
			(0.268)
Low income × regulatory index			-0.114
			(0.0942)
Moderate income × mortgage rate subsidy			-0.0720
			(0.518)
Moderate income × mortgage rate subsidy × regulatory index			-0.544*
			(0.291)
Moderate income × regulatory index			0.0564
			(0.100)
High income × mortgage rate subsidy			0.195
			(0.491)
High income × mortgage rate subsidy × regulatory index			-0.619***
			(0.179)
High income × regulatory index			0.0744
			(0.0837)
Moderate income	0.0578***	0.0563***	0.0515
	(0.0128)	(0.0126)	(0.0843)
High income	0.139***	0.138***	0.0631
	(0.0149)	(0.0147)	(0.0834)
Total net wealth	0.00352*	0.00385*	0.00393**
	(0.00193)	(0.00196)	(0.00199)
Demographics / employment	*Yes*	*Yes*	*Yes*
Housing stock controls	*Yes*	*Yes*	*Yes*
Household fixed effects	*Yes*	*Yes*	*Yes*
MSA fixed effects	*Yes*	*Yes*	*Yes*
State fixed effects	*Yes*	*Yes*	*Yes*
Year F fixed effects	*Yes*	*Yes*	*Yes*
State × time-trends	*No*	*Yes*	*Yes*
Constant	-1.144***	-0.804*	-0.753*
	(0.202)	(0.438)	(0.444)
Observations	29621	29621	29621
Number of households	2620	2620	2620
R-squared overall model	0.350	0.349	0.350
R-squared within model	0.285	0.291	0.291
R-squared between model	0.360	0.361	0.362

Robust standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.1

TABLE 5
Quantitative Effects

	Implied overall impact of MID on homeownership attainment (in percentage points)			
Specification	Rent → Own	No change	Own → Rent	Net impact
Table 3 (1)	0.0	97.3	2.7	-2.7
Table 3 (2)	0.0	98.9	1.1	-1.1
Table 3 (3)	0.0	94.9	5.1	-5.1
Table 3 (4)	0.0	97.9	2.1	-2.1
Table 3 (5)	0.0	96.0	4.0	-4.0
Table 4 (1)	5.1	92.1	2.8	+2.3
Table 4 (2)	6.0	89.2	4.8	+1.2
Table 4 (3)	5.9	89.9	4.2	+1.7

APPENDIX

TABLE A1
Are tax subsidies capitalized to a greater extent in more regulated locations?

	Dependent variable: House price appreciation rate	
	(1)	(2)
	More regulated	Less regulated
Percent change in mortgage rate subsidy	0.137***	0.0683***
	(0.0175)	(0.0114)
Year fixed effects	*Yes*	*Yes*
State fixed effects	*Yes*	*Yes*
MSA fixed effects	*Yes*	*Yes*
State × time-trends	*Yes*	*Yes*
Constant	0.0579*	0.0674***
	(0.0311)	(0.0255)
Observations	14181	13881
Adjusted R-squared	0.486	0.386

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

TABLE A2
Table 4 but with User Cost Controls

	Dependent variable: household is owner-occupier		
	(1)	(2)	(3)
	Full sample / *No* State × time-trends	Full sample / *With* State × time-trends	Specification (2) but × income groups
Mortgage rate subsidy	0.0941	-0.604	
	(0.704)	(0.640)	
Mortgage rate subsidy × regulatory index	-0.319**	-0.499***	
	(0.140)	(0.155)	
Regulatory index	-0.0105	0.0383	
	(0.0752)	(0.0786)	
Low income × mortgage rate subsidy			-0.772
			(0.662)
Low income × mortgage rate subsidy × regulatory index			0.141
			(0.268)
Low income × regulatory index			-0.116
			(0.0943)
Moderate income × mortgage rate subsidy			-0.740
			(0.674)
Moderate income × mortgage rate subsidy × regulatory index			-0.556*
			(0.290)
Moderate income × regulatory index			0.0556
			(0.101)
High income × mortgage rate subsidy			-0.468
			(0.648)
High income × mortgage rate subsidy × regulatory index			-0.637***
			(0.180)
High income × regulatory index			0.0753
			(0.0841)
Moderate income	0.0576***	0.0563***	0.0521
	(0.0128)	(0.0126)	(0.0841)
High income	0.139***	0.137***	0.0622
	(0.0150)	(0.0147)	(0.0833)
Total net wealth	0.00358*	0.00384**	0.00392**
	(0.00192)	(0.00195)	(0.00197)
TAXSIM property tax rate subsidy	0.00424	0.422	0.426
	(0.274)	(0.289)	(0.289)
Effective mortgage interest rate	-0.367	0.440	0.505
	(1.274)	(1.245)	(1.241)
House price appreciation rate in MSA or state	-0.00855	0.0261	0.0246
	(0.0647)	(0.0662)	(0.0658)
Average annual rent in MSA or region in 10,000 dollar	0.0522	0.108*	0.111*
	(0.0624)	(0.0646)	(0.0644)
Other controls and various fixed effects	*Yes*	*Yes*	*Yes*
State × time-trends	*No*	*Yes*	*Yes*
Constant	-1.135***	-0.903*	-0.865*
	(0.248)	(0.483)	(0.492)
Observations	29621	29621	29621
Number of households	2620	2620	2620
R-squared overall model	0.350	0.349	0.349
R-squared within model	0.285	0.291	0.292
R-squared between model	0.360	0.360	0.362

Robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1