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Steven C. BOURASSA
University of Louisville

Donald R. HAURIN
Ohio State University

Patric H. HENDERSHOTT
De Paul University Åe åHomburg Academy

Martin HOESLI
University of Geneva, Swiss Finance Institute, University of Aberdeen Business School, and Bordeaux Business School

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Steven C. Bourassa (contact author)

Department of Urban and Public Affairs, 426 W. Bloom Street, University of Louisville, Louisville, KY 40208

Phone: (502) 852-5720, Email: steven.bourassa@louisville.edu

Donald R. Haurin

Ohio State University, Columbus, OH

Patric H. Hendershott

Institute for Housing Studies, DePaul University, Chicago, IL

Academic Board, Homburg Academy, Kusnacht, Switzerland

Martin Hoesli

University of Geneva, HEC and Swiss Finance Institute, Geneva, Switzerland

University of Aberdeen Business School, Aberdeen, U.K.

Bordeaux Business School, Bordeaux, France

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ABSTRACT

The aim of this paper is to review the international evidence on the impacts of mortgage interest deductions on homeownership rates. To understand the relationship between the deductions and ownership rates, we develop a model of housing tenure choice. In that model, the probability of becoming a homeowner is a function of the relative cost of owning and renting, borrowing constraints, permanent household income, and a set of taste variables. The relative cost of owning and renting is in part a function of house prices and the annual user cost of owner-occupied housing. Tax policies affect the user cost of owner-occupied housing and, in turn, the probability of becoming a homeowner. They also affect the price of housing due to capitalization effects. We draw on a number of empirical studies that have been conducted for the United States and other, mainly European, countries. The empirical evidence suggests that, contrary to popular wisdom, the deduction generally does not increase the ownership rate. This result is likely due to the fact that the MID is capitalized into house prices, especially where housing supply is inelastic.

INTRODUCTION

      A household's decision whether to own or rent its dwelling is influenced by the tax and subsidy policies of the jurisdictions where it resides: national, state or provincial, and local. Similarly, the supply of housing and landlords' choices are affected by such policies. The outcome is that tenure choices depend on a complex set of behavioral responses to tax and subsidy policies.

In this paper we review the modeling and empirical analysis of such policies with special emphasis on the mortgage interest deduction (MID). We take a global perspective because different countries use different housing policies. Some countries allow deduction of mortgage interest, while others do not. Moreover, some countries tax the imputed rental income of owner-occupiers but then allow deduction of expenses such as mortgage interest. In the latter case, the tax benefit afforded by the MID is offset by the tax on imputed rent. For example, the United States allows for deduction of mortgage interest from income for tax purposes but does not tax imputed rent. The United Kingdom neither allows for a MID nor taxes imputed rental income. In contrast, Switzerland both taxes imputed rental income and allows for a MID.

In the next section of this paper we present a general model of tenure choice, establishing a framework to be used to evaluate existing research. Of particular interest is the proper specification of the set of policy variables in the tenure choice equation. One advantage of full specification of the tenure decision equation is that the role of owner-occupied dwelling prices becomes apparent. A recent emphasis of empirical work has been on the capitalization effects of tax policies. We discuss how capitalization can offset the direct effects of housing taxes and subsidies, complicating the empirical analysis.

Our review of empirical studies in the third section of this paper focuses on the U.S., which has received the most attention in the literature. A variety of modeling approaches have been used to simulate the hypothetical effects of ending the MID. Most of the studies conclude that there would be negligible impacts on the homeownership rate. We then shift in the fourth section to other, mainly European, countries, several of which have made changes to housing tax policy. The general conclusion from these studies is consistent with that from the U.S. studies. The United Kingdom is a particularly interesting case, having gradually abolished the MID over several decades. We also review a study that considers the tax treatment of mortgage interest across a number of countries that are members of the Organisation for Economic Co-operation and Development (OECD). The OECD study uses a comprehensive set of

determinants to model ownership rates across 15 countries that have different approaches to mortgage interest taxation. The final section of the paper summarizes our conclusions.

IMPACTS OF HOUSING POLICIES ON TENURE CHOICE

The probability of ownership is a function of the relative costs of owning and renting, borrowing constraints, real permanent income (X), and "tastes" (T):

$$P(\text{Own}) = f(\text{Relative Cost, Constraints}, X, T) \tag{1}$$

The relative cost ratio compares the annual user cost of owning, which converts the cost of owning into a rental equivalent, to the annual cost of renting. Borrowing constraints are the down payment and mortgage payment requirements for obtaining a loan. The preference for ownership is related to various taste proxies, including demographic measures such as age and household composition. Household permanent income is another proxy for taste; income may be positively related to the desire for privacy and control over space. Housing policies affect the probability of ownership through the relative cost and borrowing constraint variables.

The relative cost variable is the ratio of estimates of the annual cost of owning a unit of housing to the annual cost of renting the same unit of housing (quality is held constant). The cost of owning a unit equals the product of the annual cost of owning a dollar of housing, u, the asset price, P_o, of the unit, and the fraction $(1 - \gamma_o)$, where γ_o is the fraction of the price subsidized by government or another source. The annual cost of renting the same unit equals the product of the annual cost of renting a dollar of housing, r, and the asset price if the unit is rented, P_r. The amount a renter pays is the product of the asset price, P_r, market rent per dollar of asset value, r, and the fraction $(1 - \gamma_r)$, where γ_r is the subsidized fraction of the rent. Thus, the cost of owning relative to renting is:

Relative Cost = $P_o u(1 - \gamma_o)/P_r r(1 - \gamma_r)$ (2)

The annual cost of renting a dollar of housing is computed as the landlord's user cost, which varies from country to country depending largely on differences in tax treatment, financing costs, and expected house price changes (Hendershott, Follain, and Ling, 1987):

$$r = (1 - \alpha)(1 - t)e + \alpha(1 - t)i + (\tau + \mu)(1 - t) + T_r - (q - d)(1 - t_{cg}) - td_x$$ (3)

This cost is the sum of the after-tax cost of capital (the first two terms), after-tax property tax (τ) and maintenance (μ) expenses, and the landlord's annualized transaction costs per dollar of property value (T_r), less the expected after-tax price appreciation (q is nominal price appreciation, d is the depreciation rate, and t_{cg} is the annual equivalent capital gains tax rate)[1] and a tax depreciation deduction (the annual equivalent rate of tax depreciation is d_x). Regarding the after-tax cost of capital, e is the pretax required return on equity, t is the landlord's marginal tax rate, α is the loan-to-value ratio (LTV), and i is the debt rate. The required after-tax equity return exceeds $(1 - t)i$ by a risk premium that is higher the greater is α (*i.e.*, the riskier the investment).

The annual cost of owning a dollar of owner-occupied housing is:

$$u = (1 - t_y)(1 - \alpha)e_o + \alpha(1 - \beta_d t_y)(1 - \gamma_i)i + \mu(1 - \beta_\mu t_y) + \delta\tau(1 - \beta_\tau t_y) + T_o$$

$$+ (1 - \gamma_e)t_y r - (q - d)(1 - (1 - \gamma_{cg})t_{cg}) - \alpha(1 - \gamma_i)(1 - \beta_i)i$$ (4)

This cost is the sum of the after-tax cost of capital (the first two terms), after-tax maintenance and property taxes (the third and fourth terms), and annualized transactions costs and taxes on imputed rents (the fifth and sixth terms), less after-tax expected appreciation and the mortgage interest tax credit, if any.[2] In this equation, e_o is the pretax required return of the owner, t_y is the tenure choice tax rate,[3] and T_o is the owner's annualized transactions cost. The various betas are the deductible fractions of mortgage debt (β_d),

maintenance (β_μ), and property taxes (β_t), and the fraction of mortgage interest *not* eligible for a tax credit (β_l). The gammas are the fractions of mortgage interest not paid by the household (γ_i), of imputed rents not taxed (γ_e), and of capital gains excluded from tax (γ_{cg}). Delta is the fraction of property taxes that is not offset by the value of local public goods.[4] As with the landlord's user cost, the first two terms on the right-hand side of the equation are the costs of equity and debt financing, respectively, assuming no mortgage interest tax credit.[5] If there is a tax credit, then the last term on the right-hand side also affects the cost of debt financing.

In a Haig-Simon neutral income tax system, all of the betas would equal one and the gammas would be zero: equity returns would be fully taxed and all costs would be both fully paid and deductible by homeowners. In addition, tax depreciation would be allowed and other changes would be made to treat owner-occupied housing the same as investment property. In this case, the MID would not be a subsidy for homeownership or housing, but an appropriate business deduction. Most countries do not have an imputed rent tax on owner-occupied housing but do apply a property tax that at least partly substitutes for such a tax.[6] The property tax rate that is equivalent to taxing imputed rents is $t_y r$. That is, if the renter user cost is 0.10 and the income tax rate is 0.4, then the equivalent property tax rate is 0.04 (assuming that $\delta = 1$ and $\beta_\tau = 0$). Transactions costs, which are a component of equation (4), can occur at both purchase and sale dates. They differ across countries due to differences in brokerage fees and transfer taxes paid on sale, as well as differences in mobility rates. To obtain annual costs the total transaction cost must be annuitized over the period of expected occupancy, which likely varies with household type (Haurin and Gill, 2002).[7]

To the extent that debt and equity costs are treated differently, a critical variable for the user cost of owner-occupancy is the LTV. If debt usage is penalized (*e.g.*, $\beta_d = 0$), the higher the LTV, the higher is the user cost, while if debt usage is subsidized (*e.g.*, a high γ_i), the higher the LTV, the lower the user cost. However, the LTV itself depends on the differential treatment of debt and equity (Hendershott, LaFayette,

and Haurin, 1997; Follain and Melamed, 1998; Hendershott and Pryce, 2006; Hendershott, Ong, Wood, and Flatau, 2009). In particular, the lower is β_d (the more mortgage debt is tax-penalized), the lower the LTV should be; the higher is γ_i (the more debt is subsidized), the higher the LTV should be.

Two borrowing constraints are imposed by lenders and in some cases governments: a minimum down payment requirement and a limit on the ratio of the mortgage payment to income.[8] Haurin, Hendershott, and Wachter (1997) find that the down payment constraint enters the tenure choice equation in the form of a "gap" variable, where the gap is a measure of the difference between a household's desired amount of housing and the amount that can be purchased given the household's wealth. This gap depends on a number of factors, including: the variables that influence a household's demand for housing in the absence of constraints (*e.g.*, income and real house price), the minimum down payment ratio (which is time and country specific), the household's real net wealth, and the availability of down payment and other subsidies. Both the down payment constraint and the mortgage payment constraint are more likely to bind in regions where real house prices are relatively high. On the other hand, the higher is real net wealth, the less likely are the constraints to bind.

Hendershott, LaFayette, and Haurin (1997) estimate how borrowers adjust the LTV in order to minimize the impact of borrowing constraints. If the mortgage payment constraint binds and the wealth constraint does not, the household will increase the down payment, loosening the mortgage payment constraint. The household might also be able to reduce this constraint by selecting an adjustable rate mortgage rather than one with a fixed rate.

Measuring the effects of an actual or hypothetical change in taxation of owner-occupied housing on the homeownership rate requires calculation of the change in user costs, the change in house price, and finally estimation of equation (1). As equation (4) indicates, governments affect the tenure decision through tax variables and policies reflected in the betas and gammas. Analysis of tenure choice should account for

all of these factors. Ideally, the analysis would also account for behavioral responses to tax policy changes at the level of households, including changes in their LTV ratios and responses to changes in house prices caused by capitalization of the tax change. Other endogeneity issues that should be addressed include the possible relationships between tenure status and household income and wealth (households may work harder to achieve and maintain ownership and may also accumulate more wealth, in the form of home equity, than renters). Moreover, if tax policy changes are expected to be revenue neutral, it is appropriate to model the effects of eliminating the deduction on marginal (and thus tenure choice) tax rates.

The importance of a capitalization effect can be seen in equation (2), where the numerator of the relative cost term is the product of the price per unit of owner-occupied housing and the user cost. The dependency of the user cost on housing policy variables is described in equation (4). However, to the extent that there is capitalization of the policy change into house prices, the impact will be partially or completely offset. The result is that the relative price of owner-occupancy will change less than predicted solely by the direct effect on user costs, and the likelihood of a household owning will be less affected.[9]

A number of studies have provided evidence of capitalization of housing subsidies into house prices. Berger, Englund, Hendershott, and Turner (2000) study the capitalization of interest rate subsidies in Sweden. In their favored model specification, the estimated capitalization coefficients center on unity, indicating full capitalization of after-tax interest rate subsidies. Many studies estimated the value of creative finance arrangements (below market interest rate subsidies) on house prices during the period of high interest rates in the U.S. (see Jaffee, 1984, for a survey). Haurin and Hendershott (1986) analyzed the creative financing of loan contracts in Columbus, Ohio, and found that a dollar of below market financing is valued at nearly a dollar when affordability is a major problem (market interest rates are high) but has little value when affordability is not an issue.

Capozza, Green, and Hendershott (CGH, 1996) estimate the price impacts in 63 metropolitan areas

of eliminating the mortgage interest and property tax deductions using data from the 1970, 1980, and 1990 Censuses. We focus on their results that assume revenue neutrality achieved by reducing marginal tax rates. They assume that in equilibrium the annual user cost of owner-occupied housing multiplied by the house price equals the annual rent for equivalent housing. They posit that rents would likely be unaffected by elimination of the deductions. Consequently, any change in user cost has to be compensated for by a change in house price to maintain equilibrium. This implies that no change in the quantity of housing occurs; that is, supply is perfectly inelastic, which maximizes price capitalization effects. Their model also implies that elimination of the deductions would have no effect on the ownership rate. Taking into account the switch from debt to equity financing that would result from eliminating the MID, CGH conclude that the average price decline across the 63 metropolitan areas would be 13 percent (based on 1990 data). House price effects vary dramatically with higher priced cities having greater price effects. The decline in house prices among MSAs had a range of 8 percent in El Paso to 26 percent in Honolulu.

Holtz-Eakin (1996) takes exception to the assumption of no quantity effect. He has separate user costs for building and land components, which allow quantity effects to vary with the elasticities of supply of land and buildings. Using a numerical simulation approach, Holtz-Eakin finds a much smaller price impact than that reported by CGH. This approach is developed further in Bruce and Holtz-Eakin (1999), where the simulated house price effect of eliminating the deductions is less than two percent (although in some scenarios the price effect could be much larger). There is a large short-run impact (akin to that of CGH), but this is dampened as supply responds.

TAX POLICIES AND HOMEOWNERSHIP IN THE U.S.

The fundamental income tax concessions for homeownership in the U.S. are the non-taxation of imputed rent and the exemption of most capital gains from taxation. If imputed rent was taxed, mortgage interest and property taxes would naturally be considered deductible expenses. However, in the absence of

an imputed rent tax, the mortgage interest and property tax deductions are considered to be tax expenditures. The impacts of non-taxation of imputed rent and exemption of capital gains on the ownership rate have received limited attention in the literature.[10] This is likely because the main policy debate has not revolved around the possibility of taxing imputed rent or eliminating the capital gains exemption. Instead, the policy question has been defined in terms of whether the mortgage interest and property tax deductions should be retained, with some emphasis on the MID given its larger potential impact on tax revenue.

The MID became part of the U.S. federal tax code in 1913 at a time when tax rates were very low and a large proportion of households paid no income tax (Baer, 1975). Stansel and Randazzo (2011) summarize the history of the MID's tax expenditure since inception, including the broadening of the income tax during World War II, increases in tax rates and reductions in exemptions, the massive growth in homeownership during the 1940-1970 period, and the sharp rise in mortgage interest rates through 1980.

A major change was the Tax Reform Act of 1986, which raised the standard deduction and substantially reduced the percentage of households that itemized their deductions, effectively reducing the tax expenditure of the MID (Hendershott, Follain, and Ling, 1987; Follain and Ling, 1991). Subsequently the amount deducted grew again, especially during the housing and homeownership boom from 1996 to 2007. The amount of nominal tax expenditures as estimated by the Joint Committee on Taxation more than doubled from 2000 to 2010 (Stansel and Randazzo, 2011). The amount of mortgage interest deducted was $394 billion in 2010, claimed on 37 million tax returns (Bryan, 2012). The current limit on the mortgage amount for which a household can deduct interest is $1.1 million.[11]

The federal income tax treatment of homeownership costs has been subject to regular criticism by economists. One theme has been distortion of capital allocation due to the reduction in the cost of owner-occupied housing relative to other assets. Hendershott (1983) and Taylor (1998) have documented this

distortionary effect. Others have advanced proposals to tax imputed rental income from owner-occupied housing (see, *e.g.*, Simons, 1938; Goode, 1960; Laidler, 1969; Vickrey, 1993). A subsequent theme has been the appropriateness of deducting expenses when imputed income is not taxed. Many have argued in favor of removing the deduction, but Woodward and Weicher (1989) defend the MID on the grounds that it equalizes the cost of debt and equity financing.

Recent assessments of the deductions have tended to focus on their efficacy with respect to the policy objective of increasing the homeownership rate (*e.g.*, Bourassa and Grigsby, 2000; Gale, Gruber, and Stephens-Davidowitz, 2007). Noting that the main beneficiaries of the deductions are not households on the margin between renting and owning, some have advocated replacing the deductions with tax credits (Follain, Ling, and McGill, 1993; Dreier, 1997; Green and Vandell, 1999; President's Advisory Panel on Federal Tax Reform, 2005). It is argued that tax credits would be more effective than tax deductions in providing a broad-based housing subsidy because many households do not itemize deductions.

Some empirical work has focused on the impact of removing the mortgage interest and property tax deductions and replacing them with tax credits. Using household survey data for 1970, Rosen (1979) simulates the impact of replacing the deductions with a tax credit equal to 25 percent of the value of the deductions. He predicts that homeownership rates would increase for lower income households and decrease for upper income households. Although not reported, it appears that the overall impact on the ownership rate would have been close to zero. Green and Vandell (1999) use household survey data for 1990 and simulate the impact of replacing the housing deductions with a revenue-neutral tax credit that is a fixed amount for all homeowners. They find that the ownership rate would have grown by 3 to 4.6 percentage points, depending on assumptions about the impact on LTV ratios and whether wealth constraints are taken into account. The difference in results is likely at least in part due to the different credits: Rosen's is a percentage of existing household deductions while Green and Vandell give a flat dollar

amount per household. The latter are giving a relatively greater credit to lower income households whose homeownership choice is more sensitive to a credit than is that of higher income households. Green and Vandell also estimate and analyze a model with aggregate data for states, and obtain a 5.2 percent increase in the ownership rate.

Rosen and Rosen (1980) use aggregate national data for 1949 to 1974 to explore the effects of replacing the mortgage and property tax deductions with an imputed rent tax based on the equity invested in the home.[12] They conclude that this would have resulted in a four percentage point reduction in the ownership rate in 1974, although how much of this is due to eliminating the deductions and how much to the imputed rent tax is unclear. Several other papers estimate the impacts of taxing imputed rent on the ownership rate using general equilibrium models, reaching a wide range of conclusions: minimal effect (Berkovec and Fullerton, 1992), large negative effect (Gervais, 2002), and small positive effect (Chambers, Garriga, and Schlagenhauf, 2009). The general equilibrium study that finds a large negative impact relies on time series analysis of aggregate data, while the other two rely on either cross-sectional microdata (minimal effect) or cross-sectional aggregate data developed from microdata (small positive effect).

Several studies have focused directly on estimating the impacts of removing the mortgage and property tax deductions. These studies are summarized in Exhibit 1, which indicates how well each study's approach conforms to our model of tenure choice. The table excludes elements of our model that are not addressed by any of the studies, such as the rental and ownership subsidies captured by γ_r and γ_i in equations (2) and (4), respectively. As the exhibit shows, most of the studies conclude that the MID has little or no effect on the ownership rate. The earliest studies relied on aggregate data, usually time series, which may yield incorrect results because such data do not allow for estimation of the distributional effects of policy changes across different types of households and locations. These studies also neglected LTV and price capitalization responses. The most recent studies all use microdata from household surveys (and in

some cases allow for LTV and capitalization responses), which should yield more nuanced and robust results.[13] Two recent studies pay particular attention to the house price capitalization issue and find either that there would be no effect from eliminating the MID (Hilber and Turner, 2010) or a small positive effect for young adult households (Bourassa and Yin, 2008). These and the other studies listed in the exhibit are discussed in more detail in the following paragraphs.[14]

Hendershott and Shilling (1982) use aggregate national data for 1955 to 1979 and conclude that removal of the deductions would have resulted in a 5 to 6.5 percentage point reduction in the homeownership rate. Using national aggregate data for 1956 to 1979, Rosen, Rosen, and Holtz-Eakin (1984) found that eliminating the deductions would have resulted in a 0.4 percentage point reduction in the ownership rate. These authors suggest that earlier estimates were too high in part because the assumed marginal income tax rates were too high. Based on a time series analysis of national aggregate data for 1970 to 1988 and a cross-sectional analysis of state aggregate data for 1980, Rosen (1989) concluded that the homeownership rate in the U.S. in 1988 would have been 1.0 to 1.5 percentage points lower in the absence of the MID. Using a static general equilibrium model estimated with household survey microdata, Berkovec and Fullerton (1992) conclude that eliminating the MID would reduce the ownership rate by only two-tenths of a percentage point. Gervais (2002) estimates a dynamic general equilibrium model with aggregate data calibrated to approximate the U.S. economy, and concludes that eliminating the MID would result in a 4.2 percentage point drop in the ownership rate. This drop is attributed to young households delaying their initial home purchase.

All of the remaining studies use American Housing Survey (AHS) or Panel Survey of Income Dynamics (PSID) data. Bourassa and Yin (2006) use 1989 AHS microdata for 11 metropolitan areas and conclude that eliminating the deductions would have reduced the ownership rate of young adult households by less than one percentage point. Chambers, Garriga, and Schlagenhauf (2009) use aggregate

national data derived from a variety of sources, including the AHS and PSID, to estimate a static general equilibrium model. They conclude that eliminating the MID would lead to a small increase in the ownership rate, attributed largely to the lower tax burden resulting from their assumption of tax revenue neutrality. Hanson (2012b) uses 2007 AHS data and exploits the fact that some states allow the deduction of mortgage interest from income for state income tax purposes while others do not. His conclusions imply that eliminating the MID would have no effect on the ownership rate, but that it would decrease the average size of homes purchased.

One characteristic of all of these studies of the impacts of eliminating the MID is that they neglect the likelihood that the deduction is at least partly capitalized into house prices. Eliminating the deduction increases the annual user cost per dollar of investment on one hand and decreases the price of housing on the other hand. The focus of empirical work has tended to be solely on the former effect, hence biasing the estimated impact on ownership rates of removal of the MID. Two recent studies attempt to overcome this problem. Bourassa and Yin (2008) allow owner occupiers' housing demand to be a function of the user cost, meaning that the housing demand curve shifts downwards when the housing deductions are removed. They examine both the effects of eliminating the deductions and the effects of replacing them with the tax credit proposed by the President's Advisory Panel on Federal Tax Reform (2005). Using 1998 AHS microdata for 11 metropolitan areas, they focus on young adults because they are most likely to be on the margin between renting and owning. Eliminating the deductions without replacing them with a credit would have a small *positive* impact (one percentage point) on average ownership rates in the metropolitan areas studied, but the effects would be greatest in supply-constrained cities such as those in California. Their estimated impacts range from 0.2 percent in Birmingham to 2.8 percent in San Francisco. Replacing the deductions with a credit would have no impact on the ownership rate of the young adults in the sample because the credit would be capitalized into house prices just like the MID. This result contrasts with that of Green and Vandell (1999) in part because their credit is more targeted to households at the margin between owning

and renting.

Hilber and Turner (2010) provide further analysis of the impact of eliminating the tax deductions. Using longitudinal data from the PSID for 1984 through 2007, they are able to take into account changes over time and across space (states) in income tax rates.[15] They focus particularly on the role of the elasticity of housing supply with respect to capitalization of the interest and property tax deductions, using an index of land use regulatory restrictiveness as a proxy for inelasticity. They conclude that, while on average the MID has no impact on the homeownership rate, its impact varies across locations and income groups. Where housing supply is more elastic (less regulated), the MID increases the likelihood of ownership for moderate and high income groups (by 3.6 to 5 percentage points). Where housing supply in inelastic (more regulated), the MID reduces the likelihood of homeownership for moderate and high income groups (-3.7 and -3.4 percentage points, respectively). The MID has no effect on the homeownership rates of low income households.

Hilber and Turner's conclusions are consistent with the fact that itemization of deductions is less likely among low income households in the U.S. (see, *e.g.*, Bourassa and Grigsby, 2000). Thus there is no direct benefit of the MID and ownership is not subsidized. If the households live in Midwestern and Southern metropolitan areas, house prices are little affected by the MID because housing supply elasticities are large. The regional concentration of the use of the MID is supported by Gyourko and Sinai (2003) and Brady, Cronin, and Houser (2003).[16] Thus, the ownership rates of low income households are likely little affected by the MID in these areas. Higher income households in these areas enjoy the tax savings due to the MID, but any house price increases for higher quality housing are likely very modest. The positive impact on ownership is likely small because few higher income households are on the margin between renting and owning.

For low income households that live in the Northeast and West, ownership rates are relatively low

because of the relatively high price of owner-occupied housing (which is highly correlated with these metropolitan areas' low housing supply elasticities). The percentage of low income households directly benefiting from the MID is relatively small as few itemize deductions. If the housing market is segmented by income, house prices for low quality housing would not be affected, but if arbitrage occurs then low quality housing will have a higher price. The net impact of the MID on low income households in these areas is likely either no change or a reduction in their homeownership rate. Higher income households in the Northeast and West likely own high price housing and itemize deductions, yielding a relatively large direct benefit from the MID. However, the inelasticity of housing supply suggests that house prices are higher because of the MID. These effects are offsetting, yielding an ambiguous effect on the homeownership rate.

In summary, empirical studies of the effects of the MID on the homeownership rate in the U.S. have generally found very small impacts. The more carefully that these studies control for general equilibrium effects, such as capitalization of the deduction into house prices and LTV responses, the smaller the impact of the deduction. In one case, Bourassa and Yin (2008), the deduction is found to reduce ownership rates for those that it would need to assist if it were to have a positive impact on overall homeownership rates.

TAX POLICIES AND HOMEOWNERSHIP IN OTHER COUNTRIES

Exhibit 2 gives ownership rates and mortgage interest deductibility for selected countries.[17] Although a number of countries with ownership rates higher than in the U.S. allow deductibility of mortgage interest, the country with the highest ownership rate—Singapore—does not and the four countries that are perhaps the most comparable to the U.S.—Australia, Canada, New Zealand, and the United Kingdom—also do not. Of course, even if there was an obvious relationship between the MID and the ownership rate, that would ignore all of the other relevant economic, financial, demographic, and policy differences across countries. For example, although Singapore does not have an MID, it is perhaps in a class by itself with respect to the extent to which its government has promoted homeownership. Since the 1960s,

Singaporeans have been allowed to use their mandatory retirement (Central Provident Fund) savings to purchase apartments built by the government at subsidized prices and with subsidized interest rates (see, *e.g.*, http://mycpf.cpf.gov.sg). Another example is Australia, which has focused on cash subsidies to first-time home buyers as a means of encouraging ownership.[18]

European countries illustrate a wide range of housing policies. Twelve of the 16 European countries listed in Exhibit 2 provide for some kind of MID, while four—France, Germany, Poland, and the U.K.—do not. Whereas most countries do not tax imputed rent, it is taxed in Belgium, The Netherlands, and Switzerland. Tax policies have changed in a number of countries. In recent decades the MID in the U.K. and mortgage tax credits in France were abolished, and the taxation of imputed rents in Italy and Spain was eliminated (for principal residences). Such changes in tax policies make for fertile ground to study the impacts on homeownership rates.

Hilber (2007) analyzes homeownership in 15 European countries. Variables affecting the owner user cost include dummy variables for the removal of the taxation of imputed rents (in Spain in 1999 and Italy in 2000) and of mortgage interest tax credits in France (1998) and of the MID in the U.K. (gradually from 1972 through 2000). Removal of imputed rent taxation is estimated to have increased the homeownership rate in Spain and Italy, while removal of tax credits and the MID in France and the U.K., respectively, had a positive impact (France) and no impact (U.K.) on the homeownership rate. The result pertaining to the U.K. could be due to the fact that as mortgage relief was progressively phased out, the actual impact on ownership during the period studied by Hilber (1994 to 2001) was limited.

The U.K. case is interesting as the country experienced a substantial restructuring of housing finance during the period 1975 to 2000, including removal of the MID (called mortgage tax relief in the U.K.). The first limitation on mortgage interest deductibility was put in place in 1972 when the maximum debt for which interest could be deducted was set at £25,000, significantly affecting only the purchases of high value

units. The limit was raised to £30,000 in 1983. High inflation subsequently caused the real value of the MID to decline rapidly. Tax relief was finally abolished in 2000. Gibb and Whitehead (2007) report that the MID fell from representing 38 percent of interest on owner-occupiers' mortgages in 1975 to 30 percent in 1985, 19 percent in 1990, and 9 percent in 1995.

The homeownership rate in the U.K. increased from 52.7 percent in 1974 to 66.8 percent in 1994 (Gale, 1997) and 68.3 percent in 2001. It is difficult, however, to disentangle the impacts that the various policy and economic changes had on the ownership rate. During this period, general economic conditions were more favorable for buying a house; for example, the mortgage interest rate fell. The liberalization of financial markets also made it easier to access mortgage debt. Income tax rates declined, raising after-tax income. Also, property taxes fell substantially during this period. Last but not least, this period saw the introduction of the right to buy as well as of supply and demand subsidies (Hendershott, Pryce, and White, 2003; Gibb and Whitehead, 2007).[19]

Switzerland is also an interesting case because it has the lowest homeownership rate in Western Europe. Imputed rents are taxed, while mortgage interest and other expenses are deductible (Bourassa, Hoesli, and Scognamiglio, 2010). Bourassa and Hoesli (2010) use household survey data to investigate reasons for the low ownership rate. They estimate a tenure choice equation and use it to simulate a number of hypothetical changes to taxation and other policies, underwriting criteria, and price levels to assess the importance of those variables in explaining the ownership rate. They conclude that high house prices—relative to household incomes and wealth—and the tax on imputed rent are the most important causes of Switzerland's low ownership rate. Removing the imputed rent tax while retaining the deductions would increase the ownership rate by nine percentage points. This result assumes no capitalization of the deductions.[20] Removing both the tax and the deductions reduces the ownership rate by about one percentage point, reflecting the fact that mortgage interest and other housing expenses on average exceed

imputed rent because the latter is calculated conservatively (probably at a 30 to 40 percent discount relative to market rate).

Andrews and Caldera Sánchez (2011) cast a wider net by analyzing changes in ownership rates in OECD countries over roughly the 1994-2004 decade using household level microdata. Their modeling incorporates a comprehensive range of determinants of ownership, including the age and structure of households, borrowing constraints, the taxation of housing, and subsidies for rental housing. During the decade studied, aggregate ownership rose by over three percentage points, on average, with the change ranging from negative two points (Australia) to plus seven (Canada). In one of their analyses, they use data from 15 countries (12 European countries plus Australia, Canada, and the U.S.) to assess the impact of changes in the maximum LTV (*i.e.*, the minimum down payment) and differences in MID policies.

The authors concentrate on segments of the population that likely represent marginal buyers: households that are both in the second income quintile and within the 25 to 34 age range. They measure mortgage tax relief as the wedge between the market debt rate and the actual after-tax debt financing cost—the product of the market interest rate, the debt beta (the effective tax deductibility of interest payments), and the household's tax rate. Unfortunately, the wedge variable was available for 2009 only. Because the variable has no time variation, it is not included directly in the estimation. Rather, it is entered interactively with the maximum LTV, allowing the response to increases in that maximum (due to "financial deregulation") to vary with the degree of debt relief.

The estimation results are consistent with theory. A ten percentage point increase in the maximum LTV raises the ownership rate for those in the second income quintile by 1.9 percentage points; for the 25 to 34 age group, the increase is over twice as great, 4.4 percentage points. These results are measured at the average level of debt taxation (tax relief). When tax relief is "half a standard deviation more generous," the 4.4 point increase is reduced to 3.2 points. This suggests that capitalization of debt relief into house prices

reduces the potential income tax benefit from a higher LTV.

CONCLUSIONS

One aim of this paper is to help inform the U.S. debate about the impacts of the mortgage interest deduction (and other tax and subsidy policies) on homeownership. In a model of housing tenure choice, we show how housing tax policies influence the relative cost of owning and renting through the annual user cost. The relative cost ratio is also a function of the price of housing and tax policies affect the price of housing through capitalization of tax benefits.

Consistent with theory, the U.S. empirical literature shows that, while the MID can lower the user cost of housing, the stimulus to ownership raises house prices, particularly in places where the supply of housing is relatively inelastic (CGH, 1996; Bourassa and Yin, 2008; Hilber and Turner, 2010). Thus the removal of the MID would lower house prices in such locations and a price decline could increase affordability (reducing the required down and mortgage payments) sufficiently to increase homeownership. The loss of deductions would be greater among high income households, but such households are likely to be owners in any case. Low income households who are more likely to be on the margin between renting and owning are less likely to itemize deductions and thus would be less affected by the elimination of the MID, and the price effects on housing affordable to low income households would likely be small or nonexistent.

Recent international empirical research supports the findings of U.S. studies. Hilber (2007) concludes that the removal of mortgage relief in France had a positive impact on ownership, while the removal of MID in the U.K. had no significant impact on ownership. In their study of 15 OECD countries, Andrews and Caldera Sánchez (2011) find that more generous mortgage tax relief reduces the positive benefits of an increase in the maximum LTV (a decrease in the down payment). These findings are

consistent with the idea that, while the MID reduces the annual user cost of owner-occupancy per dollar of

investment, capitalization of the MID has an impact on house prices that offsets the tax benefit.

ENDNOTES

[1] In the U.S., the capital gains tax rate applicable to investment property is a weighted average of two tax rates. The first is a tax rate applied to recapture of accumulated depreciation, while the second is the tax rate that applies to any gains remaining after subtracting accumulated depreciation.

[2] Börsch-Supan (1987) separates the user cost into opportunity costs and out-of-pocket (or cash) costs on the grounds that households may respond differently to these two components. Bourassa and Peng (2011) give an example of this.

[3] As Hendershott and Slemrod (1983) note, the relevant rate for the housing tenure decision is the average tax saving per dollar of tax-favored housing expense, not the marginal tax rate that is relevant to the housing quantity demanded decision. This tenure choice tax rate is the difference between the federal taxes the household would pay as renter and as owner, divided by the income the tax saving is based upon (the return foregone on the home purchaser's equity stake).

[4] Tiebout (1956) argued that households select their residential location based on a comparison of a jurisdiction's local tax and public services levels. Hamilton (1975) extended the argument to include property taxes on residential housing and strict zoning laws. He showed that households will sort into communities such that the value of the locally provided governmental services equals the amount of the property tax. In this case, the property tax should be viewed as the price of local public services, and thus this model argues that property taxes should not be included in the user cost (they will not distort housing consumption).

[5] Poterba and Sinai (2008) argue that the default and prepayment options embedded in the mortgage rate should not be included in the user cost because there are offsetting benefits, similar to the discussion of the exclusion of the property tax rate because of the link between local public goods and local property taxes.

[6] Details about the tax treatment of owner-occupied housing for various countries can be found in International Monetary Fund (2011) and Cheung (2011). Evans (2012) argues that the property tax in the U.S. is substantially equivalent to an imputed rent tax.

[7] More mobile (younger) households are more likely to rent in part because their expected annualized transaction costs are high.

[8] Andrews, Caldera Sánchez, and Johansson (2011, p. 33, Table 4), list regulatory limits on LTV ratios in OECD countries.

[9] Another countervailing effect of the MID is explored by Hanson (2012a), who concludes that 9 to 17 percent of the MID subsidy is captured by lenders through higher interest rates.

[10] See Rosen and Rosen (1980), Berkovec and Fullerton (1992), Gervais (2002), and Chambers, Garriga, and Schlangenhauf (2009) on the non-taxation of imputed rent and Rosen, Rosen, and Holtz-Eakin (1984) on exemption of capital gains.

[11] Details of the current tax law related to mortgage debt are contained in Joint Committee on Taxation (2011).

[12] Taxing imputed rent based on equity only while disallowing the MID is equivalent to taxing the full imputed rent of the property while allowing the MID *if* the imputed rental rate is the same as the mortgage interest rate; that is, $(1 − \alpha)t_y r + \alpha i = t_y r + \alpha(1 − t_y)i$, when $r = i$. The Rosen and Rosen simulation does not allow deductions for property taxes and other expenses, which is odd because such deductions would presumably be allowed if imputed rent was taxed.

[13] Meta-analysis of the data in Exhibit 1 suggests that only the use of microdata is significantly ($p = .099$) related to the estimated percentage point change in the homeownership rate resulting from elimination of the MID. The average percentage point change for the microdata studies (0.016) is higher than the average for the aggregate data studies (-2.24). The meta-analysis consisted of estimating regression models with the midpoint of the range of each study's estimated percentage point changes as the dependent variable and various combinations of summary measures of the remaining study characteristics as independent variables.

[14] Although they do not provide an empirical estimate of the impact of removing the deductions, Glaeser and Shapiro (2003) imply that the impact would be small. They point out that the value of the ownership tax subsidy is closely related to the inflation rate, which has varied dramatically over time. They regress the U.S. homeownership rate (quarterly, 1965 to 2001) on the inflation rate and various control variables and find no relationship between the inflation rate and the ownership rate.

[15] The income tax rate at which deductions are assumed to be taken is an estimate of the marginal tax rate rather than the tenure choice tax rate.

[16] Brady, Cronin, and Houser find that the average size of the MID varies from a low of $5,700 in the West North Central division and $5,900 in the East South Central to $7,438 in New England and $10,000 in the Pacific division (1995 data). They conclude that two-thirds of the regional variation in the average MID results from regional differences in housing prices and state and local income and property taxes, which influence the choice between the standard deduction and itemized deductions (because they are also deductible for itemizers).

[17] Proxenos (2002) points out that international comparisons of homeownership rates are complicated by differing definitions on ownership (among other factors).

[18] However, evidence suggests that it is doubtful that Australia's subsidies have been any more effective than those in the U.S. appear to be. Bourassa, Haurin, Haurin, and Hendershott (1994) concluded that the subsidies merely allowed young Australians who were likely to become homeowners to do so a bit earlier than they otherwise would. Bourassa and Yin (2006) simulated application of Australian-style grants in lieu of the MID to their U.S. sample of young adults and found that the grants were no more effective at encouraging ownership than the deduction.

[19] The right to buy policy, which was introduced in 1980, gave local housing authority tenants the right to purchase their homes at a discount related to the length of time in the tenancy.

[20] Bourassa and Hoesli (2010) were unable to identify a relationship between user cost and housing demand and, as a consequence, could not quantify a capitalization effect.

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Exhibit 1. Summary of US Empirical Studies of the Effects of the MID on Homeownership

Author(s) and year	Effect of eliminating deductions on ownership rate (percentage points)	Geographical coverage and time period	Primary data source	Data type				Model type		Main components of tenure model				Components of user cost								Endogeneity controls					
				Time series aggregate data	Cross-sectional aggregate data	Cross-sectional microdata	Panel microdata	General equilibrium	Partial equilibrium	Relative cost ratio	Borrowing constraints	Permanent income	Demographic/taste measures	Financing costs	Property taxes	Other expenses	Transaction costs	Expected capital gains	Tenure income tax rate	Wasted deductions	State income taxes	Income	Wealth	Interest rate	House price capitalization	LTV adjustment	Constant tax revenue
Hendershott and Shilling (1982)	-5.0 to -6.5 (no MID or PTD)	National, 1955-1979	V	X					X	X		X	X	X	X		X	X									
Rosen, Rosen, and Holtz-Eakin (1984)	-0.4 (no MID or PTD)	National, 1956-1979	NR	X					X	X	P	P		X	X	X		X									
Rosen (1989)	-1.0 to -1.5 (no MID)	National, 1970-1988, 1980	NR	X	X				X	X		X	X	X	X	X		X									
Berkovec and Fullerton (1992)	-0.2 (no MID), +0.6 (no PTD)	National, 1983	SCF			X		X				P	X	X	X	X			X			X	X	X			X
Gervais (2002)	-4.2 (no MID)	National, ND	V	X				X				X	X	X								X	X				X
Bourassa and Yin (2006)	-0.9 (no MID or PTD; young adults only)	11 MSAs, 1989	AHS			X			X	X	X		X	X	X			X	X	X	X	X	X			X	
Bourassa and Yin (2008)	+1.0 (no MID or PTD; young adults only)	11 MSAs, 1998	AHS			X			X	X	X	X	X	X	X			X	X	X	X	X	X		X	X	
Chambers, Garriga, and Schlagenhauf (2009)	+0.1 to +0.7 (no MID)	National, 1994-1996	AHS, POMS, PSID		X			X				X		P		X	X	P				X	X	X			X
Hilber and Turner (2010)	0.0 (no MID)	National, 1984-2007	PSID				X		X		P	P	X	P	P			P		P				X		
Hanson (2012)	0.0 (no MID)	National, 2007	AHS			X			X			P		X		X										

Definitions: MID: mortgage interest deduction; PTD: property tax deduction; ND: the analysis does not pertain to a particular date or time span;

X: the item is incorporated in the study; P: a roughly equivalent or proxy measure is used. Data sources (for more details see the papers cited

above): AHS: American Housing Survey; HS: Historical Statistics of the United States; NR: not reported; POMS: Property Owners and Managers

Survey; PSID: Panel Survey of Income Dynamics; SA: Statistical Abstract of the United States; SCF: Survey of Consumer Finances; V: various.

Exhibit 2. Ownership Rates and Mortgage Interest Deductibility for Selected Countries

Country	Percentage	Mortgage interest is deductible	Country	Percentage	Mortgage interest is deductible
Singapore	87.2	No	United States	65.1	Yes
Taiwan	83.9	Yes[a]	Finland	63.5	Yes
Spain	82.1	Yes	Belgium	63.1	Yes[b]
Ireland	76.9	Yes	Japan	61.0	No
Norway	76.7	Yes	Sweden	59.9	Yes
Portugal	74.8	Yes	Poland	58.9	No[b]
Greece	71.7	Yes[b]	France	54.7	No[c]
Italy	71.2	Yes	Korea	54.2	No
Australia	70.2	No	Netherlands	50.4	Yes[b]
Canada	68.4	No	Austria	48.7	Yes
United Kingdom	68.3	No	Germany	41.6	No
New Zealand	66.9	No	Switzerland	34.6	Yes[b]

Sources: Ownership rates: Australian Bureau of Statistics (http://www.abs.gov.au); European Commission (http://epp.eurostat.ec.europa.eu); Statistics Canada (http://www.statcan.gc.ca); Statistics New Zealand (http://www.stats.govt.nz); Statistics Singapore (http://www.singstat.gov.sg); Japan Statistics Bureau (http://www.stats.go.jp/english); National Statistics, Republic of China (Taiwan) (http://eng.stat.gov.tw); Statistics Korea (http://kostat.go.kr/eng/); German Statistical Office (http://www.destatis.de); and U.S. Census Bureau (http://www.census.gov); and Swiss Statistical Office (http://www.bfs/admin.ch). Data are from the most recent census reported (2000 for Switzerland, 2001 for the European countries other than Germany and Switzerland, 2005 for Japan, 2006 for Australia,

Canada, Germany, and New Zealand, and 2010 for Korea, Singapore, Taiwan, and the U.S.). Mortgage interest deductibility for countries other than Singapore: Cheung (2011); for Singapore: Tan (2009).

Notes:

a. Although Taiwan has a mortgage interest deduction, it is tied to another deduction that is available to renters (Bourassa and Peng, 2011).

b. Belgium, Greece, Poland, The Netherlands, and Switzerland all have imputed rent taxes, although Greece's applies only to large dwellings (Cheung, 2011)

c. France abolished mortgage interest credits for first-time buyers in 2011. The credits began in 2007.

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