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This publication URL: https://archive-ouverte.unige.ch/unige:5709

FACULTE DES SCIENCES ECONOMIQUES ET SOCIALES

HAUTES ETUDES COMMERCIALES

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Why Do the Swiss Rent?

Abstract At less than 34%, Switzerland has the lowest home ownership rate in Western Europe. This may seem odd given the economic strength of the country. We use household survey data for five Swiss cantons to explore some possible reasons for this. We estimate a tenure choice equation that allows us to analyze the impacts of a number of key variables on the ownership rate. We pay particular attention to the relative cost of owning and renting, which is a function of house prices, rents, and the user cost of owning. The latter is a function of income tax policy and expected house price inflation, among other things. We also measure mortgage underwriting criteria and consider rent control and other policies affecting rental housing. By simulating a number of hypothetical changes to taxation and other policies, underwriting criteria, and price levels, we assess the importance of these variables in explaining the ownership rate. We 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.

Introduction

At less than 34%, Switzerland has the lowest home ownership rate by a significant margin among a comparison group consisting of Western European countries, Australia, Canada, New Zealand, and the United States (Table 1). The next lowest rates are for Germany, at 42%, and the Czech Republic, at about 47%. Few countries have rates below 50% and most have rates above two-thirds. Switzerland has consistently had a rate below 40% during the latter half of the

20th century. The rate dropped somewhat between 1950 and 1970, and has been increasing very slowly since then. The rate in 2000 remained below the 1950 and 1960 rates.

[Table 1 here]

What accounts for the fact that a relatively wealthy country like Switzerland has such a low home ownership rate? A survey conducted in Switzerland in 1996 found that 83% of respondents would prefer to be home owners if there were no financial or other constraints (Thalmann and Favarger 2002, p. 29). Some 90% of respondents aged 30 to 49 preferred owning to renting. So the explanation for Switzerland's low ownership rate cannot be due to peculiar tastes that differentiate that country's population from the rest of the world. The answer or answers to the question must lie elsewhere.

Several possible explanations relate to housing costs. First, house prices—and especially single-family house prices—are relatively high compared to incomes due to severe constraints on availability of land for development or redevelopment. Switzerland's topography obviously limits the amount of developable land, but tight restrictions on development of agricultural land and redevelopment of urban land also contribute to the high prices of houses and apartments.[1] Second, owner-occupied homes appear to be heavily taxed in Switzerland relative to at least some other countries, making the cost of ownership higher than it otherwise would be. Owner-occupied homes are subject to transfer, property, wealth, imputed rent, and capital gains taxes. However, mortgage interest payments, property taxes, and some other housing expenses are deductible from income for taxation purposes, housing wealth and imputed rent are undervalued

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[1] One could carry this argument further by pointing out that the scarcity of land means higher densities, and higher densities mean more multi-family housing. If multi-family housing can be supplied more efficiently as rental housing with single ownership of buildings or projects, then land scarcity causes lower ownership rates (Linneman 1985).

for taxation purposes, and some households may also benefit from the ability to indirectly amortize their mortgages by paying into a tax-sheltered retirement fund. Third, Swiss mortgage lenders have fairly rigorous down payment requirements, with a minimum 20% deposit required in addition to closing costs. On houses that are quite expensive to begin with, this requirement could easily be prohibitive.

At the same time as owning is fairly expensive, renting seems relatively attractive in Switzerland, at least from the point of view of tenants. Landlord-tenant laws provide substantial protections for renters, including restrictions on rent increases and eviction. In some cantons (which are similar to provinces or states in other countries), rent is at least partially deductible from income for the purposes of the cantonal and communal (municipal) income taxes. A small percentage of renters also benefit from government subsidies.[2] Generally, the system is designed to support long-term rental tenure. Of course, the greater protections for tenants than in some other countries mean that rental housing is less attractive for investors than it otherwise would be. This is reflected in quite low rental vacancy rates in Switzerland.

The aim of this paper is to explore ideas about possible economic causes of Switzerland's low ownership rate. We accomplish this by specifying and estimating a model of tenure choice and then using that model to simulate the effects of changes in taxes and subsidies, mortgage underwriting criteria, and prices. We pay particularly careful attention to measuring the user cost of owner-occupied housing so that the effects of hypothetical changes in taxation can be assessed.

Our primary data source is the 1998 *Enquête sur les revenus et la consommation*, which was a national survey of household income and expenditures (Office fédéral de la statistique

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[2] There are some exceptions to this. For example, a significant percentage of rental housing in Zurich is cooperative housing that receives a substantial subsidy in the form of below-market leasehold land rents.

1999). We focus here on the cantons of Zurich, Berne, Vaud, Geneva, and the two "half" cantons of Basel Stadt (City) and Basel Landschaft (Country). These cantons include the five largest cities in the country and contain 50.4% of the Swiss population (in 1999). Given that the two Basel cantons make up a single housing market, we combine them for analysis purposes.

Swiss tenure choice has been modeled previously by Aebersold (1994) and Thalmann and Favarger (2002). Aebersold used a 1990 household survey to conclude that tenure choice is a function of permanent and transitory income, the relative cost of owning and renting, and demographic characteristics of households, particularly the age and marital status of the household head. He concluded that the user cost of ownership is lower for households in higher tax brackets. The probability of ownership, all else equal, was 0.12 for Swiss household heads of age 25 and 0.49 for those of age 65. In contrast, drawing from Goodman (1990), the probabilities for household heads of those ages in the United States were 0.60 and 0.94, respectively. Aebersold speculated that these differences were due to differences in the supply side of the housing market rather than individual characteristics or preferences.

Thalmann and Favarger (2002) found that tenure choice is a function of preferences for ownership and for single-family homes, age, marital status, nationality, self-employment, parents' home ownership, income, and wealth. All else equal, persons less than 30 years of age had a 0.13 probability of ownership, while those 65 years or older had a 0.57 probability. Individuals in the highest income and wealth brackets were much more likely to be owners than those in the lowest brackets. The probability of ownership was 0.61 for the highest income class and 0.66 for the highest wealth group and even 0.84 when both income and wealth were in the upper category.

Neither Aebersold nor Thalmann and Favarger used their models to attempt to simulate the effects of hypothetical changes in tax and subsidy policies or economic and demographic

circumstances. In fact, Thalmann and Favarger make very simple assumptions regarding, for example, tax rates and house values and rents, which yield an identical user cost for owners and tenants. Their model is thus not suited to examine the effects of the tax system on the user cost of owning. Aebersold's specification of the user cost is simplified and, therefore, not adequate for simulation of policy alternatives. Neither of these two studies directly measures lenders' borrowing constraints. They also do not control for the endogeneity of income and wealth, both of which may be functions of the household's decision to purchase a home (Bourassa 2000).

The rest of this paper is structured as follows. In the second section, we review the institutional and economic context for tenure choice decisions in Switzerland, focusing on: taxes, subsidies, and regulations affecting rental housing; taxation of owner-occupied housing; house prices and rents; and financing of owner-occupied housing. Then we specify a model of tenure choice in the third section, paying particular attention to the user cost of owner-occupied housing. In the fourth section, we discuss the household survey and other data. We also present the results of our estimations and various simulations of policy and other changes. Among other simulations, we use the United States as a basis for a rough comparison by predicting the effects of changes that would make the Swiss situation somewhat more like that in the U.S. We offer some conclusions in the final section of the paper.

Institutional and Economic Context

Taxation, Subsidization, and Regulation of Rental Housing

As a federal state, taxes are levied in Switzerland at the national level and also at the cantonal (provincial) and communal (municipal) levels. Cantonal and communal taxes account for a large

fraction of taxes paid. Whereas the federal tax rules apply to the entire country, there is much variation in taxation across cantons and communes.

The variations in tax rules affect the taxation of rental and owner-occupied housing. There is no tax benefit to renters at the federal level. However, a deduction for rent is permitted in two of the cantons that are included in this study, Basel Landschaft and Vaud. In Vaud, the deduction is also allowed for homeowners' imputed rent.

The development of rental properties is promoted by government bodies in several ways. The aim is to facilitate construction of buildings whose units can be rented out at below-market rents. We will discuss here two of these means: loans and subsidies (see Cuennet et al. 2002 for a discussion of other means). The legal basis for these incentives is contained in federal legislation, but is complemented by cantonal and communal programs. A federal law aimed at encouraging housing construction and home ownership (*Loi encourageant la construction et l'accession à la propriété de logements*, or LCAP) was enacted in 1974. The ambiguous stand of Swiss authorities with respect to home ownership emerges as the same law deals with promoting investment in both rental properties and home ownership. We focus in this section on the rental sector.

One of the instruments included in this legislation provides for investors to be granted a loan (*Abaissement de base*, or "primary abatement") from the federal authorities so that rents can be set below market during the initial 15 years of operation. The law also makes it possible for landlords to receive subsidies to lower rents even further when units are occupied by very low income households (*abaissements supplémentaires*). Several communes and cantons (such as Basel Stadt) top up the federal subsidies. Note that shortly after 1998 the amounts of federal help were significantly reduced.

In our sample, Geneva and Vaud stand out as having well developed cantonal subsidy schemes. Tenants need to satisfy income requirements to occupy a subsidized apartment. Zurich has a cantonal scheme whereby rents can be reduced by the granting of loans to landlords at below market interest rates or even without interest. The variation in subsidy schemes across cantons is reflected in our survey data. In Geneva and Vaud, the proportions of households benefiting from these subsidies are 20.9% and 8.6%, respectively, whereas the proportion is only 3.4% for Zurich.[3] It is approximately 2.5% in the other cantons, reflecting the fact that only federal subsidies and possibly some limited top-ups were available.

Rental aid, in the form of subsidies paid directly to the tenant to cover part of the rent, is far less developed, although Geneva and Basel Stadt have cantonal programs. In the other cantons, the aid is limited to a few communes. Geneva stands out again with 3.4% of tenants benefiting from a rental aid, sometimes in addition to occupying a subsidized unit. The assistance rate for Basel Stadt is diluted as it is merged with Basel Landschaft for the purposes of our analysis: the combined proportion is 1.2%. In the other cantons, the proportion is virtually zero.

Regulation of the rental housing sector and protection of tenants constitutes a popular topic among Swiss politicians. Werczberger (1997) suggests that rent controls may help to explain Switzerland's low ownership rate; however, his interpretation reflects a focus on the demand side of the rental market, but not the supply side. In any case, rents can be adjusted only to reflect higher operating and maintenance costs, and interest rates. The rent can be challenged if the increase exceeds any change in these items, but also if it is considered that rents offer an "abnormal" return on equity. From 1970 to 1990, rents kept pace with the consumer price index

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[3] A much larger percentage in Zurich benefits from the implied subsidy in the form of reduced land rents for cooperatives.

(CPI), but increased quite sharply thereafter following increases in interest rates. As many tenants did not request a rent decrease when interest rates started to fall, the rent index was well above the CPI at the end of the 1990s. Overall, adjustments are still rather sluggish, possibly contributing to a length-of-tenure discount for sitting tenants (see also Thalmann 1987). In our sample, the discount per year of occupancy is in the 0.3% (Vaud) to 1.1% (Geneva) range. This is comparable with the figure reported by Thalmann for Lausanne (0.8%). The extent to which these discounts are due to rent controls versus normal market behavior is unclear.

Rental leases are in most cases one year renewable leases. Tenants are to some extent protected against evictions; exceptions are when the landlord needs the dwelling for his or her family or when the apartment must be vacated for a major renovation. If the tenant can document that an eviction would cause hardship for the tenant or the tenant's family, an extension of up to several years will in most cases be granted.

Taxation of Owner Occupied Housing

As is customary in many countries, an income tax, a property tax, and a capital gains tax are levied in Switzerland.[4] In addition, there is a wealth tax that is levied at the cantonal and communal levels only. Income taxes are federal, cantonal, and communal. Property taxes are cantonal or communal, but are not levied in all cantons. Capital gains taxes are cantonal and/or communal. Income and wealth taxes can in some cantons also include a church tax. As mentioned above, the bulk of taxation is at the cantonal and local level. In addition to the taxes which are discussed in this section, a large fraction of closing costs comprises transfer taxes

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[4] For an overview of taxation in Switzerland, see Bureau d'information fiscale (2006a).

(Bureau d'information fiscale 2003). The rate varies across cantons, but for the cantons in this study transfer taxes can be as high as 3% (Basel Stadt and Geneva).

Income taxes are the most important type of tax. Taxable income is calculated somewhat differently for federal and cantonal purposes (Bureau d'information fiscale, 2005). Communal taxes are calculated as a percentage of cantonal taxes. In all cantons and for federal tax purposes, the imputed rent of owner-occupied housing is included as part of income. The method used to estimate the imputed rent varies across cantons (Commission intercantonale d'information fiscale 1999). It is in most cases calculated by comparison of market rents on rental properties, based on the house's characteristics, or as a percentage of the tax value of the property. Most cantons calculate a gross imputed rent (that is, the rent before any expense deductions). Only the canton of Geneva uses a net imputed rent.

Generally speaking, imputed rent lies well below market rent. The federal tax authorities aim to capture an imputed rent that is no less than 70% of market rent. Market rent is generally considered to be 5% of the value of the property. Except for Geneva, the federal tax authorities use the cantonal imputed rent as the federal imputed rent, but may apply an adjustment factor if they believe that imputed rent is less than 70% of market rent. For Geneva, the federal authorities do their own calculation of imputed rent. Of the cantons included in this study, we consider that the undervaluation of imputed rent is on average 30% in Vaud and Zurich, 40% in Berne, 33% in Basel Stadt, and 39% in Basel Land. In Geneva, the imputed rent is net of expenses and constitutes 3% of the tax value of the property, which is estimated to be 40% below market value.

There are also some housing deductions from income for tax purposes. All cantons and the federal authorities allow mortgage interest to be deducted. Except in Geneva, other expenses can also be deducted. These include maintenance costs, insurance premiums, property taxes, and

condominium fees. The taxpayer can choose whether to itemize these other expenses or use a set percentage of imputed rent. The set percentage for federal tax purposes as well as in some cantons is 10% for buildings up to 10 years of age and 20% thereafter. Given that an owner will itemize expenses if they exceed the amount calculated using the set percentage, we assume that the deduction amounts on average to 1% of the market value of a property. This percentage is the same as that assumed by banks when granting mortgage loans (see the section on financing owner-occupied housing below).

Compared to the U.S., where mortgage interest payments and property taxes can be deducted with no taxation of imputed rent (Bourassa and Grigsby 2000), income tax rules in Switzerland seem less favorable to home ownership. Nevertheless, in 1993, 59% of Swiss voters rejected by referendum a suggested change in law which, among other things, would have significantly lowered the amount of imputed rent in the first 10 years after the purchase of a building and used a very conservative imputed rent calculation method thereafter. This outcome is probably not surprising, given that two-thirds of Swiss households are renters. There has also been discussion about removing all items related to home ownership (imputed rent and the mortgage interest and expense deductions) from the income tax system. As the imputed rent is on average slightly lower than the deductions, one would expect such a change to have a negative impact on the home ownership rate.

Tenure choice has an impact on wealth taxation as the tax value of a property is in almost all cases below market value. We assume the underestimation of value to be identical to that for imputed rent. Valuation methods vary substantially across cantons. Some cantons use sales of comparable properties to determine the tax value, while others use the income capitalization

approach or a combination of the two methods. The depreciated cost method is also used in some cases.[5]

Property taxes are cantonal or communal, but do not exist in all cantons. In cantons where property taxes are communal, the canton grants the commune the right but not the obligation to levy a tax. In our sample of cantons, property taxes are cantonal in Geneva and communal in Berne and Vaud. Zurich and Basel Landschaft do not have a property tax. In Basel Stadt, a property tax is levied only if the tax amount is greater than the sum of income and wealth taxes. In contrast to the U.S., where effective property taxes average about 1% of value, nominal property tax rates in Switzerland are in the 0.1-0.15% range. The percentage is applied to the tax value which is, as discussed above, substantially less than market value in most cases, making the effective percentage very small.

There is also a capital gains tax (Commission intercantonale d'information fiscale 2000). Rates increase with the magnitude of the capital gains in Zurich, Basel Landschaft, and Berne, but not in Basel Stadt, Vaud, and Geneva. However, capital gains tax rates always bear an inverse relationship with the holding period. In Geneva, for instance, the rate is 50% if the property is sold within two years. There is no tax if the property is held for more than 25 years. In all cantons, the tax liability is postponed if the proceeds of a sale are used to purchase another property (with some restrictions).

House Prices and Rents

Residential real estate prices dropped dramatically in Switzerland during the 1990s. Condominiums have only recently returned to their pre-bust levels, while single-family houses

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[5] More details about the wealth tax are available in Bureau d'information fiscale (2006b).

and rental apartment buildings still have some way to go to return to their late-1980s and early-1990s peaks, respectively. According to the Swiss National Bank (2006a), from peak to trough, single-family houses fell by 33% and owner-occupied apartments fell by 20%.

In spite of these declines, residential real estate prices in Switzerland are high relative to household incomes. The two reasons commonly given for this are the scarcity of land in general and of buildable land in particular, as well as high construction quality standards. Credit Suisse (2005), for instance, estimate that the ratio of average single-family house prices to average household income (averaged across all households) fluctuated between approximately 7 and 8.5 over the period 1985 to 2004, while the ratio was between 3.7 and 5 for condominiums.[6] In comparison, the ratio of median value to median household income was about 3.4 in the U.S. in 2003 (U.S. Census Bureau 2004).

According to the Office fédéral de la statistique (2007), rents in Switzerland rose consistently between 1982 and 2006, with an average annual rate of increase of 3.2% in the 1980s, 7.6% from 1990 to 1993, 0.7% for the balance of the 1990s, and 1.5% between 2000 and 2006. In 1998, according to our survey data, rents averaged about 18% of renters' household incomes. This compares with about 28% for the U.S. in 2003 (U.S. Census Bureau 2004). Generally, these data indicate that the prices of dwellings, particularly single-family houses, are much higher relative to average household incomes in Switzerland than in the U.S., while rents as a percentage of renters' incomes are lower.

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[6] The ratio for single-family house prices may be more relevant to tenure choice than the condominium ratio, as most buyers prefer single-family houses. Of owning households in our sample, 74% occupy single-family houses.

Financing Owner-Occupied Housing

Mortgage underwriting criteria in Switzerland are quite stringent. Generally speaking, banks will not finance more than 80% of the value of a property. Prior to the real estate crash of the early 1990s, which led to numerous foreclosures, the percentage was 90%. As closing costs constitute on average 4% of the value of a property, the wealth of a household must typically amount to a minimum of 24% of the value of the property.

Mortgage financing is usually granted through a first mortgage covering up to 65% of the value of the property. First-time buyers with limited equity may also finance up to an additional 15% of the value with a second mortgage. As the default risk on the second mortgage is greater, the interest rate for second mortgages is typically 100 basis points higher than the rate on first mortgages. Banks usually do not require any amortization of the first mortgage. The second mortgage must be amortized over 15 years (implying amortization of 1% of the purchase price each year). Some banks require that it be fully amortized by the time the borrower turns 60. The bulk of mortgages have a variable interest rate or a rate that is fixed for a limited number of years only (typically three to five years).

Another feature of the Swiss mortgage market is that loans can be amortized "indirectly" through a tax exempt retirement account. This retirement savings plan is called the *Troisième pilier* ("third pillar") as it supplements retirement income from the state pension plan (*Premier pilier*) and the employer pension plan (*Deuxième pilier*). Rather than amortizing the loan, a borrower will pay the equivalent amount into the *Troisième pilier*, with the bank having a preferred claim on the accumulated savings. There is a cap, however, on the annual contribution into a *Troisième pilier*, which varies with employment status (self-employed or not).

Banks also use an income criterion to determine whether a household can afford to buy a property. The annual cost of owning a house must not exceed 33% of gross household income. The first component of the annual cost is the mortgage interest payment, which is typically calculated using an average of historical mortgage interest rates. The reference interest rate is in most cases 5%, although some banks will consider a rate of 5% for the first mortgage and a rate of 6% for the second mortgage. The annual cost also includes loan amortization and an allocation for expenses. The cost related to each of these two items is calculated at 1% of the value of the property, so 2% in total.

The wealth and income constraints restrict many households from purchasing a property. The LCAP provides for some measures to alleviate these constraints. The primary abatement, which is also available to purchasers of income-producing properties as discussed above, is a loan that must be paid back with interest. Such a loan makes it possible to reduce the cost burden in the initial years of ownership. The annual cost of ownership will then rise but it is expected that income will increase as well, offsetting the increase. Additional subsidies are possible as for rental properties. The home buyer can also apply for a federal guarantee that will allow a lower interest rate and/or a loan-to-value ratio up to 90%. This measure thus reduces the wealth constraint. Thalmann (1999) reports that federal support helped fewer than 10% of buyers, and that half of them would have purchased a property in any case.

Another means for overcoming the wealth constraint is to use part of one's retirement funds to reach the 24% that is needed to acquire a property. This is possible through the *Deuxième pilier* (since 1985) and the *Troisième pilier* (since 1990), provided that the monies are used to purchase a primary residence. These funds can also be used as collateral for a mortgage loan or to amortize an existing mortgage loan. The Office fédéral du logement (2004) estimates that one purchase out of five in 1998 was made using *Deuxième pilier* funds. While *Deuxième*

pilier funds were mostly used by households in intermediate income brackets, *Troisième pilier* funds were used by high income households.

Contrary to what is the case in some other countries, such as France and Germany, preferred tax exempt savings accounts specifically for house purchase are usually not available in Switzerland. The Basel Landschaft and Geneva tax rules, however, provide for such savings accounts.

Tenure Choice Model

Modeling the Probability of Home Ownership

Housing tenure choice is modeled as a function of the relative cost of owning and renting, the borrowing constraint gap, household after-tax permanent income, and several demographic characteristics of households. Note that household income enters the model both directly (because the preference for owner-occupation may increase with income) and indirectly through variables measuring the relative cost of owning and renting (the user cost of owner-occupied housing is a function of income in part because it depends on the household's income tax bracket) and borrowing constraints (which are a function of income). We control for the possible endogeneity of income and, particularly, wealth by substituting estimated values in place of the actual measures when calculating relative cost ratios, borrowing constraints, and after-tax household income. The demographic variables include the marital status and age of the household head, and the number of dependent children in the household.

The tenure choice model is:

$$\Pr\left(OWN\right) = f\left(RELCOST_j, GAP_j, Y_{AT,j}, d_j\right) \tag{1}$$

where $\Pr(OWN)$ refers to the probability of ownership; $RELCOST_j$ is household j's annual cost of owning a standard house divided by the annual cost of renting a standard house in the household's canton (that is, the ratio of the price and annual rent for a standard house multiplied by the ratio of the household's annual user cost per dollar of house value and its annual cost per dollar of rent); GAP_j is equal to the magnitude of the gap between the household's predicted house value and the maximum value it can afford given its income and wealth; $Y_{AT,j}$ is the household's after-tax income as an owner (including imputed rental income); and d_j is a vector of the demographic variables listed above. The model is estimated using a logistic regression procedure.

Relative Cost of Owning and Renting

The relative cost ratio is the price for a standard dwelling in the household's canton, $P_{STD,l}$, multiplied by the household's annual user cost per dollar of investment in home ownership, $u_{OWN,j}$, and divided by the annual rent for a standard dwelling in the household's canton, $R_{STD,l}$, multiplied by the household's cost per dollar of rent paid, $u_{RENT,j}$:

$$RELCOST = \frac{P_{STD} \cdot u_{OWN}}{R_{STD} \cdot u_{RENT}} \tag{2}$$

where the household and locational subscripts (*j* and *l*, respectively) are omitted (henceforth we will omit these subscripts from all equations). The standard prices and rents for each canton are calculated from hedonic equations, holding the dwelling characteristics constant.[7]

The user cost of owner occupied housing in Switzerland is:

$$u_{OWN} = (1-\tau_Y)(1-v_{UA}^*)i_E + (1-\tau_Y)(v_{UA}^* + v_{IA}^*)i_F + (1-\tau_Y)\mu + \tau_Y\eta + (1-\phi)\tau_W$$
$$- (1-\tau_K^*)(\pi-r)$$

(3)

where u_{OWN} is the annual user cost per dollar of investment in an owner-occupied house; τ_Y is the household's tenure choice income tax rate taking into account federal, cantonal, and communal rates; i_E is the rate of return that could be earned on alternative investments of the equity; v_{UA}^* is the present-value equivalent of the declining unamortized loan-to-value (LTV) ratios over the expected holding period;[8] v_{IA}^* is the present-value equivalent of the indirectly amortized LTV ratios over the expected holding period;[9] i_F is the mortgage interest rate (which we assume here to be the same for first and second mortgages); μ is housing costs other than mortgage interest, which are defined here to include maintenance, property taxes, and insurance premiums; η is imputed rent as a fraction of house price; ϕ is the proportion by which house

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[7] Further details about the hedonic and other estimations not reported here are available from the first author.

[8] Assuming no inflation in house prices, a 10-year holding period, a discount rate of 3%, and amortization of 1% of the value of the house each year, $v_{UA}^* = v_{UA} - 0.53$, where v_{UA} is the current unamortized LTV ratio.

[9] For households that amortize only indirectly, $v_{IA}^* = v_{IA} + 0.053$, given the same assumptions as for v_{UA}^* (see footnote 8). For households that amortize both directly and indirectly, the present value adjustment factor is multiplied by the proportion amortized indirectly.

value is underestimated for purposes of wealth or property taxation; τ_W is the household's tenure choice wealth tax rate; τ_K^* is the annualized capital gains tax rate; π is the expected rate of capital gains in housing (net of depreciation); and r is a risk adjustment to expected capital gains. The tenure choice income and wealth tax rates measure the tax advantage of owning relative to renting; they are defined in more detail in the Appendix.

The first term on the right-hand side of Eq. (3) is the opportunity cost of equity, which is after-tax because the returns to alternative investments would generally be taxed. The second term is the after-tax (because it is deductible) cost of mortgage interest. Note that in the case of indirect amortization ($v_{IA}^* > 0$), the household continues to pay interest on both the unamortized part of the mortgage and the indirectly amortized part. The third term refers to housing expenses, which are all assumed to be deductible. The fourth, fifth, and sixth terms in Eq. (3) refer to the imputed rent tax, the wealth tax adjusted for the undervaluation of housing wealth, and the after-tax risk-adjusted expected capital gains rate, respectively.[10]

Focusing now on the cost of rental housing, the annual user cost per dollar of market rent paid, u_{RENT}, equals 1, with two exceptions. As noted above, rent is partially deductible from income for tax purposes in the cantons of Vaud and Basel Landschaft. In addition to the Vaud and Basel Landschaft deductions, rents may be subsidized in all cantons for households that meet certain criteria. Therefore, the rental user cost is:

$$u_{RENT} = (1-\theta)(1-\tau_{Y,C}\rho), \tag{4}$$

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[10] We assume that households' *Troisième pilier* contributions are independent of tenure choice and, therefore, that indirect amortization does not affect the user cost of ownership except with respect to mortgage interest payments.

where θ is the proportion of the rent that is subsidized, $t_{Y,C}$ is the household's cantonal and

communal marginal income tax rate, and ρ is the amount of rent that can be deducted, expressed

here as a proportion of the rent paid.

Borrowing Constraints

Mortgage underwriters impose both a wealth and an income constraint on borrowers. Previous

research has documented the impacts of borrowing constraints on home ownership rates

(Linneman and Wachter 1989; Haurin et al. 1997; Chiuri and Jappelli 2003). The wealth

constraint is defined as:

$$W \geq 0.24\, H \tag{5}$$

where W is the household's liquid wealth and H is the value of the house the household desires to

purchase. This constraint requires a minimum 20% of the value of the house in equity, plus an

additional 4% of the value for closing costs, consisting mainly of transfer taxes. The income

constraint is defined as follows:

$$0.33Y \geq 0.05\left(1.04\, H - W\right) + 0.02\, H \tag{6}$$

where Y is household income and the other terms are as defined above. As noted previously, this

assumes a 5% interest rate on the mortgage, amortization of 1% per year, and other housing

expenses (maintenance, property taxes, insurance, and so forth) of 1% per year.[11] The

borrowing constraint gap is then defined for the purposes of estimating the tenure choice

equation as the maximum of the wealth and income constraint gaps, based on the household's

optimal or predicted house value ($\hat{H}$), predicted liquid wealth ($\hat{W}$), and permanent income ($\hat{Y}$):

$$GAP = \max\left(0.24\hat{H} - \hat{W}, 0.05\left(1.04\hat{H} - \hat{W}\right) + 0.02\hat{H} - 0.33\hat{Y}\right). \tag{7}$$

Household Income and Other Variables

In addition to the relative cost ratio and borrowing constraint gap variables, the tenure choice

equation also includes a variable measuring after-tax income calculated as if each household

were an owner. This is hypothesized to have an effect on tenure choice independent of the other

two economic variables because the taste for privacy and control over domestic space may be a

function of income. This variable is income as an owner as calculated for the purposes of the

tenure choice income tax rate less the taxes that would be paid as an owner (see the Appendix for

further details on the calculation of these tax payments).

Demographic characteristics included in the model are marital status and age of the

household reference person and the number of dependent children in the household.[12] Marital

status is specified as a series of dummy variables for single, divorced, and widowed persons,

with married being the default. The hypothesis is that married persons are most likely to be

homeowners and single persons least likely. The probabilities for divorced and widowed persons

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[11] The income constraint as defined here is a blend of the criteria of the two main mortgage lenders in Switzerland,
Credit Suisse and UBS.

[12] We initially also included the gender of the household head, but this was not statistically significant.

should be between those for single and married persons. Age is also specified as a series of dummy variables, in this case for four age groups, of which the youngest is the default. The probability of ownership should increase with age, as individuals become more settled in their careers and personal lives. Also, the addition of children to a household implies greater stability and a desire for additional indoor and outdoor space that may be associated with ownership.

Endogeneity Issues

Bourassa (2000) shows that current income and wealth can be endogenous in a model of tenure choice. Households may work more hours and save more if they decide to purchase a home. Also, amortizing a mortgage builds up wealth in the form of home equity. For the latter reason, it would seem that endogeneity would be particularly likely to be a problem with respect to current wealth. In fact, we find that in Switzerland current liquid wealth for owners averages nearly five times that for renters, while fitted or predicted liquid wealth from a regression of current liquid wealth on selected household characteristics averages only twice as high for owners as for renters. In contrast, current household income averages about 40% higher for owners, while permanent household income (the fitted value from a regression of current household income on household characteristics) averages about 30% higher. Thus it appears that current liquid wealth is more likely to be endogenous than is current income.

To avoid potential endogeneity problems, we use predicted liquid wealth and permanent household income to calculate the borrowing constraint gap (see Haurin et al. 1997 for another example of this approach). We also use these variables to estimate and predict optimal house values and we use permanent income in the optimal rent equation estimated for Vaud and Basel. The optimal house values are used when calculating the borrowing constraint gap and loan-to-

value ratios. We use permanent *salary* income to predict *Deuxième* and *Troisième pilier* contributions, and predicted liquid wealth in the calculation of LTV ratios. Predicted liquid wealth is also the basis for our tenure choice wealth tax rate calculations.

We use a somewhat different approach for calculating the tenure choice income tax rates that are part of the user cost in the numerator of the relative cost ratio and for after-tax income as an owner. Here, because endogeneity is not likely to be as much of an issue, we start out with actual incomes but use predicted house values and LTV ratios to estimate how households' incomes would differ if they owned rather than rented. As discussed in the Appendix, for current owners we convert income as an owner to income as a renter by adding an estimate of the actual return to home equity. Then, to obtain income as an owner, we subtract the return from home equity—calculated using optimal (predicted) house values and predicted LTV ratios—from income as a renter.

The multi-stage estimation process that we implement in response to the potential endogeneity problems raises questions about identification and standard errors. We rely on functional form (logit versus OLS) to insure that the structural tenure choice equation is identified. We use bootstrapping to calculate more accurate standard errors. Bootstrapping involves repeated sampling with replacement from a sample of data to produce a distribution of estimates which can then be used to calculate standard errors and other statistics (Efron and Tibshirani 1993; Mooney and Duval 1993). The multi-stage estimation process used here may result in standard errors that are too small, particularly with respect to the borrowing constraint gap variable, the calculation of which depends directly on the results of other estimations. Consequently, we bootstrap the entire system of equations that feed into the borrowing constraint gap and report the resulting standard errors rather than the ones from the non-bootstrapped tenure choice estimation.

Data and Analysis

Data

Our primary data source is the 1998 *Enquête sur les revenus et la consommation*. Of the 9,295 households participating in the survey nationwide, 3,588 were located in the cantons we focus on here, had sufficient data for analysis, and satisfied our requirement that the household reference person be of working age (between 18 and 65) and in the labor force. The survey provides detailed information about household revenues and their sources as well as details regarding household expenses and household characteristics.

The survey does not document household wealth, although it does provide indirect information about wealth by recording details about income from wealth. Here we use income from selected sources to impute liquid wealth, using i_E as a discount rate. Also, no information is provided about the value of owner-occupied dwellings. However, characteristics of the dwellings are provided, and we were able to obtain hedonic estimates of the dwellings' values from the Centre d'Information et de Formation Immobilières SA (CIFI), a commercial property valuation firm in Zurich.

Means for the variables in the tenure choice equations are shown in Table 2. The data for Basel are weighted averages for the two Basel half-cantons. Compared to the sample as a whole, ownership rates are relatively high in Berne and low in Geneva. After-tax income is fairly comparable across locations, but the relative cost of owning and renting is high in Zurich and Geneva and low in Berne. The borrowing constraint gap is low in Berne, Basel, and Vaud, and high in Zurich and Geneva. Demographic characteristics are fairly constant across cantons, although household reference persons in Berne and Vaud are more likely to be married and to

have children, while household reference persons in Zurich and Geneva are more likely to be in the youngest and oldest age groups.

[Table 2 here]

The last two columns of Table 2 compare owners with renters. Owners have higher incomes and lower relative cost ratios than renters. On average, owners have a negative borrowing constraint gap (that is, the average household has more liquid wealth than needed to purchase the optimal house), while renters have a positive gap. Owners are much more likely than renters to be married and much less likely to be in the youngest age group. Owners also have more children on average.

Table 3 provides additional details about the relative cost ratios calculated for all households (current owners and renters) in the sample. Geneva, which has the highest average relative cost ratio, also has the highest standard house value and price-rent ratio. On the other hand, it has the lowest average user cost of owner-occupied housing, due to high income tax rates and low imputed rents.[13] Geneva households also have by far the lowest rental cost factor, due to the fact that they are much more likely to receive rental subsidies. These subsidies would reduce average rents by nearly 7%.[14] Rent deductions from income for taxation purposes that are available in Basel and Vaud reduce rental costs there by about 8% and 10%, respectively.[15]

[Table 3 here]

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[13] The Swiss user costs are similar in magnitude to those reported by Himmelberg et al. (2005) for U.S. cities in 2004.

[14] We estimated a logit model to predict the probability of receiving a rental subsidy, and the likelihood of receiving rental subsidies is so low in the other cantons that the model predicts that none of the households in our sample in those cantons would receive such a subsidy.

[15] The mean reduction for Basel is the weighted average deduction after applying the rules for Basel Landschaft (which allows a deduction) and Basel Stadt (which does not).

In addition to the user cost variables and parameters listed in Table 3, Eq. (3) includes

two interest rates and a risk-adjusted expected capital gains rate. The rate of interest that would

be earned on alternative investments of home equity, i_E, is set at 0.03, which is the rate for

medium-term bank notes issued by large banks as reported by the Swiss National Bank (2006b)

for 1998. The mortgage interest rate, i_F, set at 0.04, is also based on Swiss National Bank

(2006b) statistics. We assume that the risk-adjusted capital gains rate, $\pi - r$, is 0, given that

there was considerable uncertainty about future house price movements in 1998.

Geneva also stands out in the statistics on borrowing constraints (Table 4). In addition to

having by far the largest borrowing constraint gap, it also has the highest mean optimal house

value and the highest percentage of households that are either wealth or income constrained. In

contrast, in Berne, where house prices are relatively low, households are much less likely to be

either wealth or income constrained.

[Table 4 here]

Optimal House Value and Rent Estimations

The optimal house value equation is estimated for current owners by regressing hedonic

estimates of their dwelling values on the user cost of owner-occupied housing, permanent

household income, predicted liquid wealth, the number of children in the household, and dummy

variables for the cantons. The user cost is identical to the user cost in Eq. (3), except for the fact

that marginal tax rates are substituted for tenure choice tax rates. We then use this equation to

predict optimal house values for the entire sample.[16] These values are then used to estimate LTV

ratios, user costs, relative cost ratios, and borrowing constraint gaps, which are in turn used to

estimate the tenure choice equation. The user cost was not significant, so it was omitted from the

final estimation.

A simple optimal rent equation was estimated for Basel and Vaud for the purposes of

calculating ρ, the rent deduction as a proportion of optimal rent. The dependent variable is the

actual annual rent paid by current renters, and the independent variables are permanent income

and the number of children. This equation is then used to predict optimal rents for all households

in Vaud and Basel.

Loan-to-Value Ratio Estimations

We model LTV ratios as a function of a hypothetical LTV ratio that assumes that all liquid

wealth is invested in the home before investing in any other asset (v_{HYP}) plus a variable

measuring the amount of the annual *Troisième pilier* contribution (TP_{CON}). Our estimation of the

LTV ratio equation shows that the actual LTV ratio is virtually the same as the hypothetical ratio

except when the household contributes to a *Troisième pilier*:

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[16] Following Haurin et al. (1997), Green and Vandell (1999), and others, we initially applied Heckman's (1979) two-

stage sample selection bias method to address the fact that we are using estimations based on owners to make

predictions about renters. It was evident, however, that the inverse Mills ratio calculated from the first stage tenure

choice equation was collinear with variables in the optimal house value, optimal rent, and loan-to-value ratio

equations. As pointed out by a referee, the same variables that explain tenure choice are also likely relevant to these

other factors, thus calling into question the appropriateness of the two-stage technique in these cases. Note that

Haurin et al. (1997) concluded that there was no sample selection bias in their study. In any case, controlling for

sample selection bias has only a trivial impact on the tenure choice estimates and simulation results.

$$v = \underset{0.010}{1.011} v_{HYP} + \underset{0.106 \times 10^{-5}}{1.369 \times 10^{-5}} TP_{CON},$$

$$Adj. R^2 = 0.788, n = 996.$$

(8)

Here $v = v_{UA} + v_{IA}$, where v_{UA} and v_{IA} are the current unamortized and indirectly amortized LTV

ratios. We deliberately omit the constant term from this model. We use this model to predict $\hat{v}$

for all households, but use predicted liquid wealth and optimal house values to calculate $\hat{v}_{HYP}$ and

predictions from an OLS regression to calculate $\overline{TP}_{CON}$. Then $\hat{v}_{UA} = 1.011 \hat{v}_{HYP}$ and $\hat{v}_{IA} = \hat{v} - \hat{v}_{UA}$.

Tenure Choice Estimations

The tenure choice estimates are shown in Table 5. As noted above, the reported standard errors

are bootstrapped.[17] The results are as expected, with all but one of the estimates (the dummy

variable for widowed persons) significant at better than the 0.01% level. The probability of

ownership is positively related to after-tax income as an owner and negatively related to the

relative cost of owning and renting and to the borrowing constraint gap. Single household

reference persons are least likely to be owners, followed by divorced and widowed persons. The

likelihood of ownership increases with age and with the number of children in the household.

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[17] Generally, bootstrapping has a small impact on the standard errors, although the bootstrapped standard error for

the gap variable is somewhat higher than the non-bootstrapped standard error (0.460×10^{-6} versus 0.289×10^{-6}).

The bootstrapped results are based on 100 random samples with replacement of the same size as the original sample

($n = 3,588$).

The estimates shown in Table 5 are then used together with modified variable values for the

purposes of simulating hypothetical changes.

[Table 5 here]

Simulation of Changes in Tax Policy, Underwriting Standards, and Price Levels

We simulate a number of hypothetical changes as a means for answering the question posed by

the title of this article (Table 6). These simulations are partial in the sense that we do not attempt

to model general equilibrium effects.[18] We report bootstrapped confidence intervals around the

simulated ownership rates; in all cases these are fairly narrow and in all but one case (elimination

of rent subsidies) they suggest that the hypothetical change in ownership rates is statistically

significant.[19]

We first simulate the impacts of relaxing wealth and income constraints, both separately

and together. Reducing the down payment constraint from 24% to 14% (10% plus 4% closing

costs) or 9% would in each case increase the ownership rate by about 1 percentage point (from

26.9% to 28.0%), reflecting the fact that these constraints would continue to be binding for many

households. Relaxing the income constraint to allow mortgage principal, interest, and other

expenses to be as much as 40% of gross income rather than 33% has a similarly small impact.

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[18] A similar approach is used to simulate impacts of hypothetical changes in tax and subsidy policies on home

ownership in the U.S. in Bourassa and Yin (2006; 2008).

[19] To bootstrap each simulated ownership rate we take 1,000 random samples with replacement of the same size as

the original sample. The bootstrapped distribution is then centered on our simulated ownership rate and the

estimated ownership rates corresponding to cumulative probabilities 0.025 and 0.975 are the lower and upper

bounds, respectively, of the 95% confidence interval.

However, relaxing the down payment constraint to 14% while also relaxing the income constraint to 40% would raise the ownership rate by about 3 percentage points.

[Table 6 here]

We next simulate the effects of eliminating the tax on imputed rent with and without also removing the deductions for mortgage interest and other housing expenses. Removing the imputed rent tax while retaining the deductions increases the ownership rate by 9 percentage points. Removing both the tax and the deductions reduces the ownership rate by about 1 percentage point, reflecting the fact that mortgage interest and other housing expenses on average exceed imputed rent.

As mentioned above, eliminating rent subsidies ($\theta = 0$) would have virtually no impact on the ownership rate, although eliminating rent controls would increase the ownership rate by over 2 percentage points by making renting less attractive relative to owning. We simulate the elimination of rent controls by setting the duration of tenancy variable in the hedonic rent models to zero (rather than to its mean) for the purposes of calculating the standard rent (R_{STD}) for each canton. This assumes that initial rents are at market and that rent controls operate mainly to limit rent increases after a dwelling is occupied. General equilibrium effects would be smaller than our results suggest if the supply of rental housing expanded and market rents dropped due to elimination of rent controls. Also, part of the discount due to duration of tenancy may be due to normal market functioning (it is cheaper to retain a good tenant than to search for a new one). Again, this suggests that we may be overestimating the impacts of rent controls. If we eliminate all benefits to renters—including subsidies, controls, and income tax deductions—our partial analysis suggests that the ownership rate increases by less than 3 points, although general equilibrium analysis would probably find a smaller effect.

The last set of simulations involves changes in price levels and price-rent ratios. If prices and price-rent ratios drop by 10%, the ownership rate increases by 6 points. If this change is combined with relaxation of the down payment constraint to 14% and the income constraint to 40%, then the ownership rate increases by about 10 points. We then simulate a more dramatic change in prices and price-rent ratios by dropping prices by 20%, which is the approximate difference between the mean price-rent ratios in Geneva and Berne (note that our standard house price for Geneva is nearly 50% greater than that in Berne). This 20% drop in prices and ratios results in about a 13 percentage point increase in the ownership rate, to over 40%.

Finally, we simulate a combination of changes designed to make the Swiss situation somewhat more like that in the U.S. (in 1998). Prices and price-rent ratios drop by 20%, the imputed rent tax is eliminated, and the wealth constraint is relaxed to 9% (5% down payment plus 4% closing costs). When eliminating the imputed rent tax, we retain the mortgage interest deduction and the deduction for other housing expenses, which is worth about as much in Switzerland as the property tax deduction is worth in the U.S. (about 1% of house value). This combination of changes results in a nearly 23 point increase in the ownership rate, to 49.5%. Given the individual results for reducing prices, eliminating the imputed rent tax, and relaxing the wealth constraint, this result is due primarily to the reduction in prices. Elimination of the tax on imputed rent is responsible for most of the balance of the change, with only a small impact due to the reduction in the wealth constraint.

Conclusions

Switzerland's low rate of home ownership is attributable to the fact that prices are very high

relative to household incomes and wealth. Another important factor is the tax on imputed rent;

however, if the deductions for mortgage interest and other housing expenses were removed along

with the imputed rent tax, the effect would be to reduce, rather than increase, the ownership rate.

A combination of lower prices (and price-rent ratios), elimination of the imputed rent tax, and

reduction in the wealth constraint to 9% of house value would raise the ownership rate for the

Swiss cantons studied here to nearly 50%.

Swiss-style house prices and home ownership rates can certainly be found in the more

costly parts of other countries, including the U.S. To use one of that country's most expensive

cities as an example, the 2000 U.S. census reports that median house prices in the City of San

Francisco were $396,400, or about SFr. 574,500 (using the 1998 exchange rate), which is

comparable to our standard price for Geneva. San Francisco's home ownership rate in 2000 was

35%, while the national rate was about 66%. Glaeser and Gyourko (2003) show that San

Francisco has the highest land costs in the nation, and they attribute that largely to land use

constraints, although topography is obviously also a factor.

Similarly, house prices are high in Switzerland mainly because land prices are high.

Land prices are high because there is relatively little developable land, both for topographical

reasons and because the Swiss attach considerable importance to conservation of both

agricultural landscapes and urban heritage. Although a large majority of households would

prefer home ownership in Switzerland, the country has a tradition of long-term rental tenancy. It

seems unlikely that the Swiss would support a substantial expansion of the ownership rate if that

came at the expense of environmental quality or the current system of supports for renters.

Consequently, it seems likely that Swiss ownership rates will remain low into the foreseeable future.

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Appendix: Tenure Choice Tax Rates

The tenure choice income tax rate measures the tax advantage (or disadvantage) of owning relative to renting and is an average rather than a marginal rate (Hendershott and Slemrod 1983). In the case of Switzerland, it is generally defined as:

$$\tau_Y = \frac{T_{Y,RENT} - T_{Y,OWN}}{\hat{H}\left(\left(1 - v_{UA}^*\right) i_E + \left(v_{UA}^* + v_{IA}^*\right)i_F + \mu - \eta\right)} \tag{A1}$$

where $T_{Y,RENT}$ is the federal and cantonal (including communal and church) income tax a household would pay if it rented; $T_{Y,OWN}$ is the income tax it would pay if it owned a dwelling of value H; and the other terms are as defined previously. The denominator in Eq. (A1) is the change in taxable income when a household shifts from renting to owning.

The procedure for calculating the tenure choice tax rate is as follows. In the case of current owners, taxable income as a renter is calculated by adding the return to actual home equity, $H\left(1 - v_{UA}\right)i_E$, to actual income. Here H is the value of each homeowner's house and v_{UA} is the homeowner's current unamortized LTV ratio. Taxable income as an owner is then calculated for renters and recalculated for owners as taxable income as a renter less a predicted return to home equity, $\hat{H}\left(1 - \hat{v}_{UA}\right)i_E$, where $\hat{H}$ is the household's "optimal" house value and $\hat{v}_{UA}$ is the predicted current LTV ratio. Then all of the applicable housing and other deductions are applied to income as a renter and as an owner before calculating the tax payments $T_{Y,RENT}$ and $T_{Y,OWN}$, which are then inserted into Eq. (A1).

As noted above, the denominator in Eq. (A1) represents the change in taxable income if

the household rented rather than owned. Additions to taxable income are the return to home equity, deductible mortgage interest payments, and maintenance and other deductible housing expenses. Imputed rent is a reduction from taxable income. For households in Vaud, where imputed rent is partially deductible, only the nondeductible portion of η affects cantonal tax liability. In the case of Geneva, expenses are not deductible at the cantonal level, so μ enters into Eq. (A1) only to the extent that it affects federal income tax liability. For households in Vaud and Basel Landschaft, where rent is at least partly deductible from income for cantonal income tax purposes, the difference in taxable income also takes into account the deductible portion of rent paid.

Similar considerations apply to the wealth tax rate:

$$\tau_W = \frac{T_{W,RENT} - T_{W,OWN}}{\hat{H}\phi} \tag{A2}$$

where $T_{W,RENT}$ and $T_{W,OWN}$ are the wealth taxes the household would pay as a renter and as an owner, respectively. Here the denominator is the increase in the wealth tax base if the household rents rather than owns, which is due to the fact that housing wealth is undervalued for tax purposes.

Table 1 Ownership rates for selected European, North American, and Australasian countries

Country	%	Country	%
Romania	91.6	New Zealand	67.8
Hungary	90.9	United States	66.2
Lithuania	84.9	Luxembourg	66.1
Spain	82.1	Canada	66.1
Slovenia	81.5	Finland	63.5
Ireland	76.9	Belgium	63.1
Norway	76.7	Latvia	59.6
Portugal	74.8	Poland	58.9
Slovakia	73.6	France	54.7
Estonia	72.2	Netherlands	50.4
Greece	71.7	Austria	48.7
Italy	71.2	Liechtenstein	48.1
Australia	69.5	Czech Republic	47.1
United Kingdom	68.0	Germany	42.0
Cyprus	68.0	Switzerland	33.6

Sources: European Commission (http://epp.eurostat.ec.europa.eu); Australian Bureau of Statistics (http://www.abs.gov.au); Statistics Canada (http://www.statcan.ca); Statistics New Zealand (http://www.stats.govt.nz); and United States Bureau of the Census (http://www.census.gov). Data are from the most recent census prior to 2002.

Table 2 Tenure choice variable means

Variable	Zurich	Berne	Basel	Vaud	Geneva	Full sample	Owners	Renters
Owner (%)	24.9	35.5	25.7	26.5	10.3	26.9	100.0	0.0
After-tax income as an owner (Y_{AT}) (SFr.)	94,614	79,151	87,641	92,157	86,364	88,368	112,404	79,538
Relative cost ratio (*RELCOST*)	1.27	1.07	1.14	1.14	1.38	1.18	1.14	1.20
Borrowing constraint gap (*GAP*) (SFr.)	152,259	–40,325	67,546	20,269	200,995	68,635	–108,452	133,697
Marital status of reference person (%)								
Married	50.2	57.3	52.2	58.9	49.9	54.0	83.2	43.3
Single	35.5	28.8	32.6	27.5	36.0	31.8	7.5	40.8
Divorced	12.9	12.0	13.0	12.0	12.8	12.5	6.8	14.6
Widowed	1.4	1.9	2.2	1.6	1.3	1.7	2.5	1.3
Age of reference person (%)								
18 to 35	38.2	35.7	33.1	36.4	41.0	36.8	11.3	46.2
36 to 45	27.8	28.5	30.3	30.1	24.1	28.4	34.5	26.1
46 to 55	21.5	24.1	25.5	21.7	21.1	22.7	33.3	18.8
56 to 65	12.5	11.7	11.1	11.8	13.8	12.1	20.9	8.9
Number of children	0.58	0.68	0.54	0.72	0.58	0.63	0.94	0.51
Sample size	*1,237*	*1,015*	*452*	*605*	*279*	*3,588*	*998*	*2,590*

All sample data are weighted so that they more accurately reflect the populations from which they are drawn.

We use household weights calculated by the Swiss Statistical Office. In 1998, SFr. 1.00 ≈ US$ 0.69.

Table 3 Relative cost ratio variable means and parameters

Variable	Zurich	Berne	Basel	Vaud	Geneva	Full sample
Relative cost ratio ($RELCOST$)	1.27	1.07	1.14	1.14	1.38	1.18
Standard house value (P_{STD}) (SFr.)	510,617	364,962	455,457	392,252	542,210	444,382
Standard annual rent (R_{STD}) (SFr.)	18,613	15,268	18,634	16,431	18,810	17,303
Price-rent ratio (P_{STD}/R_{STD})	27.4	23.9	24.4	23.9	28.8	25.6
User cost (u_{OWN})	0.046	0.045	0.046	0.047	0.044	0.046
Tenure choice income tax rates						
Combined (τ_Y)	0.245	0.286	0.280	0.240	0.307	0.265
Federal ($\tau_{Y,F}$)	0.059	0.048	0.055	0.053	0.054	0.054
Cantonal ($\tau_{Y,C}$)	0.187	0.238	0.226	0.187	0.253	0.211
Tenure choice wealth tax rate (τ_W)	0.001	0.002	0.002	0.003	0.002	0.002
Unamortized LTV (v_{UA}^*)	0.743	0.657	0.714	0.697	0.757	0.709
Indirectly amortized LTV (v_{IA}^*)	0.041	0.049	0.045	0.046	0.039	0.044
Cantonal taxable imputed rent as a proportion of house value (η)	0.035	0.030	0.032	0.035	0.018	0.032
Cantonal wealth tax discount (ϕ)	0.300	0.400	0.360	0.300	0.400	0.344
Rental cost (u_{RENT})	1.000	1.000	0.982	0.993	0.933	0.990
Subsidy as a proportion of rent (θ)	0.000	0.000	0.000	0.000	0.067	0.006
Cantonal income tax deduction as a proportion of rent (ρ)	0.000	0.000	0.082	0.102	0.000	0.030

Cantonal tax rates include communal and church rates.

Table 4 Borrowing constraint gap variable means

Variable	Zurich	Berne	Basel	Vaud	Geneva	Full sample
Borrowing constraint gap (GAP) (SFr.)	152,259	–40,325	67,546	20,269	200,995	68,635
Optimal house value ($\hat{H}$) (SFr.)	605,444	421,406	523,032	454,701	654,789	520,844
Predicted liquid wealth ($\hat{W}$) (SFr.)	134,858	137,231	134,961	128,173	134,762	134,213
Permanent household income ($\hat{Y}$) (SFr.)	104,823	105,645	104,793	103,875	105,003	104,875
Wealth constrained (%)	62.2	40.2	53.3	48.2	61.5	52.4
Income constrained (%)	61.2	16.7	37.9	24.5	71.0	40.1
Either wealth or income constrained (%)	64.9	40.2	53.7	48.2	72.9	54.3

Table 5 Tenure choice estimation

Variable	Estimate	Standard error	Significance
Constant	0.869	0.561	0.001
After-tax income as an owner	8.038×10^{-6}	1.667×10^{-6}	0.000
Relative cost ratio	-2.844	0.461	0.000
Borrowing constraint gap	-1.564×10^{-6}	0.460×10^{-6}	0.002
Single	-1.114	0.165	0.000
Divorced	-0.711	0.187	0.000
Widowed	-0.286	0.312	0.417
Age 36 to 45	0.843	0.163	0.000
Age 46 to 55	1.038	0.174	0.000
Age 56 to 65	1.294	0.203	0.000
Children	0.338	0.055	0.000

Log likelihood function = -1,581

Chi-squared = 1,014

Significance = 0.000

Sample size = 3,588

Standard errors are bootstrapped (see text for discussion).

Table 6 Simulation results

Simulation	Simulated ownership rate (%)	Bootstrapped 95% confidence intervals
Relax down payment constraint to 14% (10% plus closing costs)	28.0	27.2–28.7
Relax down payment constraint to 9% (5% plus closing costs)	28.0	27.3–28.8
Relax income constraint to 40%	28.1	27.4–28.9
Relax down payment constraint to 14% and income constraint to 40%	30.3	29.5–31.1
Eliminate tax on imputed rent	36.2	35.3–37.1
Eliminate tax on imputed rent and mortgage interest and housing expense deductions	25.8	25.0–26.6
Eliminate rent subsidies ($\theta = 0$)	27.1	26.4–27.8*
Eliminate rent controls	29.0	28.2–29.9
Eliminate rent subsidies ($\theta = 0$), rent controls, and rent deductions ($\rho = 0$)	29.4	28.6–30.2
House prices and price-rent ratios drop by 10%	33.3	32.5–34.1
House prices and price-rent ratios drop by 10%, down payment constraint is relaxed to 14%, and income constraint is relaxed to 40%	36.8	35.9–37.7
House prices and price-rent ratios drop by 20%	40.1	39.2–41.1
House prices and price-rent ratios drop by 20%, imputed rent tax is eliminated, and down payment constraint is relaxed to 9%	49.5	48.6–50.5

* The actual (weighted) ownership rate in the sample (26.9%) is within the confidence interval.