The Determinants of Homeownership across Europe: Panel Data Evidence

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Abstract

This paper exploits the panel structure of the ECHP micro data and uses fixed effects-specifications to identify the main determinants of equilibrium housing tenure outcomes across Europe between 1994 and 2001. The accommodation type which affects both the relative supply of and demand for owner-occupied housing has the strongest impact. Holding occupant and location characteristics (including preferences for homeownership) constant, a flat in a small apartment building has a roughly 40 percentage points lower probability of being owner-occupied than a detached house. Among the occupants' characteristics, only age has a quantitatively meaningful positive impact. At the regional level, the housing stock composition and the share of public rental housing are the main identifiable determinants of the vast homeownership rate differentials. Tax policy reforms have only had relatively minor effects on homeownership attainment and, counter to widespread perception, spatial differences in intergenerational cohesion do not explain homeownership rate differentials.

JEL classification: R21, R31.

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1 Introduction and Background

Homeownership rates differ vastly across Europe, ranging from over 80 percent in Spain and Ireland to around 40 percent in Germany and below 35 percent in Switzerland. Differences within countries and particularly within metropolitan areas span an even wider range. Yet, surprisingly little is known about the determinants of spatial differences in homeownership attainment across Europe. Even more surprisingly, given that many European countries directly or indirectly promote homeownership, very little direct evidence exists on the effectiveness of (tax) policies that aim to promote homeownership.

This paper aims to fill this gap in our knowledge by exploiting the panel structure of the European Consumer Household Panel (ECHP) micro data and using fixed effects-specifications to identify the main observable determinants of equilibrium housing tenure outcomes (i.e., owner-occupied versus renter-occupied) across Europe between 1994 and 2001 – both at the household and regional level.

When attempting to identify the determinants of homeownership, researchers have tended to focus on household characteristics and the demand side, that is, the decision of utility maximising households whether to buy or rent, taking into account the user cost of the two tenure modes. However, while demographic variables and socio-economic characteristics are crucial factors in explaining individual housing tenure choices (Gyourko and Linneman, 1996; Gyourko *et al.*, 1999; Gabriel and Rosenthal, 2005, among many others), it is quite obvious that differences in income, wealth and other household characteristics cannot fully explain the vast cross-country and cross-region differences in homeownership attainment. In fact, homeownership rates around the world tend to be higher in poorer countries. This stylized fact also broadly applies within Europe. As illustrated in Table 1, Southern European countries with typically lower income per capita, less wealthy residents and fewer children per household have higher homeownership rates than Central and Northern European countries, with the notable exception of Ireland. Income and wealth are expected to matter much more individually than across countries or regions. This is because the purchase power of residents in a particular place also affects house values. Hence countries and regions with high income per capita do not necessarily have more affordable owner-occupied housing.

Given these observations, the question arises; what other location specific observable factors can explain equilibrium homeownership outcomes? A few studies have attempted to explore this question in a cross-sectional setting. For example, Eilbott and Binkowski (1985) estimate a model of metropolitan-level homeownership rates using U.S. metro-level data for

1970. Their findings imply that income, house values, the size and age distribution of households, and the rate of population change in a metro area were significant determinants of tenure outcomes. However, metro areas with high house values also typically have commensurate rent levels (unless a metro area has strict rent control). Hence, house values alone are not a measure of the relative price of homeownership, which is the factor that one might expect to affect housing tenure decisions. Rather, the finding that high house values are negatively related to homeownership hints at the importance of the availability of mortgage finance. That is, even if the price-to-rent ratio were constant across space, areas with high house values can be expected to have lower homeownership rates because fewer households can afford to make the necessary down-payment, so they have to rent even though they might prefer to own. This is particularly true in 1970, when high loan-to-value mortgages were much harder to obtain than in the 1990s or the present decade.[1]

In a more recent study, Coulson (2002) explores the determinants of the regional and state variation in homeownership rates in the United States in 1998 using a standard probit model of the individual housing tenure decision where the micro-level observations are aggregated to the regional level. The main findings are that the relative price of owning versus renting, population density, and centre city location are the most important factors explaining regional differences. Demographic differences across regions are found to be less relevant, except for those describing variation in the immigrant population.

While the studies by Eilbott and Binkowski (1985) and Coulson (2002) provide important insights, their cross-sectional nature raises concerns related to omitted variable bias. In this context it should be noted that either house values or price-to-rent-ratios are the (endogenous) outcome of the relative demand for and supply of homeownership, so including house values, rents and/or the ratio of these measures in a reduced form equation is problematic, as it potentially causes biased estimates.[2] Cross-sectional studies also do not allow researchers to directly assess, for example, the impact of policy reforms on homeownership attainment. Lastly, the European institutional setting is quite different from the U.S. one (including the

[1] Recent evidence by Chiuri and Jappelli (2003) based on micro data on 14 OECD countries strongly suggests that the availability of mortgage finance – measured by down payment ratios – still is an important factor determining owner occupancy rates. While the present study cannot provide an estimate of the importance of spatial differences in down-payment constraints for homeownership outcomes (a consequence of the lack of country and year specific data on the availability of mortgage finance for the countries in the ECHP sample), it should be noted that the (likely) existence of such an effect does not bias the estimates of the remaining explanatory variables reported in this paper, as the mortgage finance availability-effect should be fully captured by the various fixed effects (household fixed effects, region fixed effects, and country-year fixed effects).

[2] In a reduced form estimating equation of the equilibrium housing tenure outcome only demand and supply shifters should be included but not the relative price of owning versus renting.

fact that Europe consists of numerous countries with vastly different homeownership policies), hence the findings for the U.S. may not be directly applicable to Europe.[3]

The empirical analysis below exploits both cross-sectional variation as well variation over time, using a very large household panel that spans 8 years (1994-2001); a time period, during which several countries reformed their tax systems, differentially affecting the treatment of homeownership compared to renting. One advantage of this empirical setup is the fact that fixed effects specifications allow one to control for all time-invariant unobserved characteristics at the household, region, and country level[4] (in addition to country-year fixed effects), substantially mitigating the potential issue of omitted variable bias. The setup with time-varying data also allows one to assess the impact of policy reforms on homeownership attainment. Finally, the dataset covers a large share of the surface area and population of Western Europe and therefore provides a reasonably representative sample, with which to study the determinants of homeownership outcomes across Western Europe.

In contrast to much of the previous research, where the focus has been on demographic and socioeconomic characteristics as determinants of equilibrium housing tenure outcomes (both at the individual and aggregate level), in this paper the spotlight is on other determinants, which are not household but location specific (of course controlling for demographics and socioeconomic factors). In particular, I explore the impact of the accommodation type (at the micro-level) or the local housing stock composition (at the aggregate level), neighbourhood characteristics (i.e., the presence of various neighbourhood externalities), the importance of public rental housing, and various policies (taxation of imputed rents, tax relief for mortgage interest payments, and capital gains taxes) that affect the relative user cost of homeownership. In the analysis that follows, in a first step empirically testable predictions are derived, how these location specific variables are expected to affect equilibrium housing tenure outcomes. In a second step, the empirical analysis provides evidence on the statistical and quantitative significance of the various effects.

Understanding the determinants of spatial differences in homeownership attainment across and within countries is important, not least, because homeownership has been *positively* linked to various social and economic outcome measures, such as the investment in

[3] For example, it is questionable whether differences in the immigrant population are equally relevant in Europe. In fact, the empirical findings below indicate that differences in the immigrant population – counter to the United States (Coulson, 2002) – are irrelevant for housing tenure outcomes across the surveyed ECHP membership countries.

[4] In the empirical analysis presented below, although country fixed effects are not included, the household fixed effects incorporate country fixed effects as the survey design is such that each household can only be part of one country survey. That is, time-invariant country-specific unobserved characteristics are part of the household fixed effects.

social capital (Rossi and Weber; 1996, DiPasquale and Glaeser, 1999; Hilber, 2007), funding of local public schools (Hilber and Mayer, 2006), the upbringing of children (Green and White, 1997) or the motivation to control local government (Fischel, 2001). Homeownership also prevents a so called 'rental externality', which arises from the fact that tenants do not face the social marginal cost of their utilization rates (Henderson and Ioannides, 1983). Put differently, tenants are unable to collect from a landlord for improvements made on the rental unit. In a similar vein, 'landlord-renter-equilibriums' are confronted with a moral hazard problem as tenants have fewer incentives to treat their housing units carefully. Galster (1983) provides empirical evidence consistent with this proposition. In a broader context, it has been suggested that house value maximizing voters (homeowners) ensure an efficient provision of local public services (e.g. Edelson, 1976; Sonstelie and Portney, 1978; Wildasin, 1979; Sprunger and Wilson, 1998), or that house price capitalization provides an incentive mechanism in an inter-temporal sense (e.g. Brueckner and Joo, 1991; Glaeser, 1996; Oates and Schwab, 1996 and 1998; Conley and Rangel, 2001; Rangel, 2005).

Consistent with the propositions that owner-occupation generates social benefits and an efficient provision of local services, Coulson *et al.* (2003a) find that high homeownership neighbourhoods have higher house prices, controlling for self-selection into homeownership, a number of observables, as well as unobserved individual and neighbourhood traits. Coulson *et al.* (2003b) attempt to quantify the total social benefits of owner-occupation. They find that the willingness to pay for 'neighbourhood homeownership' (i.e., a move from zero to about 80 percent homeownership) is quite large, amounting to about $5,000 per year.

Homeownership has also been associated with *negative* consequences. Most prominently, Oswald (1996) suggested that homeownership causes unemployment, since high transaction costs associated with the sale of properties reduce the mobility of households and thereby make them more prone to staying unemployed for longer spells. [5]

The crucial issue in this empirical literature on the economic and social consequences of homeownership is the question whether homeownership has a causal effect or whether causation may be reversed. By examining the spatial determinants of homeownership, this

[5] This so called 'Oswald hypothesis' has been much debated and the empirical evidence is mixed. For example, Munch *et al.* (2006) provide evidence in support of Oswald's claim that homeownership makes household immobile. However, they also demonstrated that homeowners are more likely to find local jobs (presumably because they are more willing to accept lower wages) and that the overall effect of homeownership on unemployment is negative, not positive. In a similar vein, van Leuvensteijn and Koning (2004) find evidence that homeownership makes households less vulnerable to unemployment. Their findings suggest that the causality is reversed; job commitment affects the housing tenure choice.

study provides a useful foundation for developing better identification strategies for the study of causal effects of homeownership on various social and economic outcomes.

Understanding the determinants of equilibrium homeownership outcomes and adjustment over time is also important from a policy perspective. A few studies have documented that housing policies that promote homeownership are associated with very high (opportunity) costs to society in the form of foregone tax income (e.g., Follain and Ling 1991; Bourassa and Grigsby 2000), offsetting the potential social benefits that are associated with higher homeownership rates. Hence, in order to assess the effectiveness of a particular policy that aims to promote homeownership, it is important to assess whether, and if so by how much, the policy is likely to increase homeownership attainment.

A number of studies have modelled how tax incentives differentially affect households with varying income within a country and then simulate the effects of the policy induced tax incentives on the relative user cost of owning and subsequently on homeownership (e.g., Rosen, 1979; Hendershott, 1980; Hendershott and Slemrod, 1983; Poterba, 1984; Bourassa and Hoesli 2006). However, so far no *direct* estimates exist of the impact of actual tax reforms or differential tax-treatments across countries on homeownership attainment. The empirical analysis below fills this gap by exploiting the variation in relevant tax policies induced by reforms in 6 EU countries; France, Germany, Greece, Italy, Spain and the UK.

The paper is structured as follows. Section 2 presents simple cost-benefit and supply-demand frameworks that can be used to analyse the effects of various household and location specific determinants on equilibrium housing tenure outcomes at the individual (household) and aggregate (regional) level. Next, empirically testable predictions are formulated. Section 3 discusses the data sources, formulates the empirical specifications and finally presents results. The main finding is that the accommodation type which affects both the relative supply of and demand for owner-occupied housing (and thereby the price of owning versus renting) has the strongest impact on equilibrium housing tenure outcomes. Holding occupant and location characteristics (including preferences for homeownership) constant, a flat in a small apartment building has a roughly 40 percentage points lower probability of being owner-occupied than a detached house. Similarly, at the regional level, the housing stock composition is the main identifiable determinant of the vast homeownership rate differentials across Europe, explaining roughly 30 percent of the variation in homeownership rates. Tax policy reforms have only had relatively minor effects on homeownership attainment. Conclusions are derived in Section 4.

2 Theoretical Framework and Predictions

2.1 A Simple Framework for the Analysis of Housing Tenure Outcomes

This section presents a simple cost-benefit framework of a household's tenure choice. Consider first the 'benefit side'. Households derive utility from consuming housing services. Conceptually, we can distinguish between 'basic housing services' and 'homeownership'. The utility derived from consuming 'basic housing services' can be assumed to be independent of the tenure mode. Hence, we can ignore this component for the purpose of this study. However, consuming the identical housing unit as an owner-occupied or as a renter-occupied dwelling is not the same for most households. Most households attach an intrinsic value to homeownership, deriving utility from the fact that they own rather than rent. This may be, for example, because they can paint the walls with whatever colour they wish, without having to ask their landlords for permission or because owning ones 'own four walls' provides a sense of 'security' or 'pride' or a hedge against rent risk (Sinai and Souleles, 2005). On the other hand, some households may prefer to rent, for example, because it allows them to outsource maintenance tasks or because it prevents worries about the cost of unforeseen repair work. It is reasonable to assume that some households have stronger idiosyncratic preferences for homeownership than others. Moreover, the intensity of the preferences is likely correlated with household characteristics, that is, the utility derived from homeownership depends on the life-cycle situation. For example, households with little children likely derive greater utility from owning than college students, even when ignoring the cost side.

The relative benefit of homeownership may also depend on the chosen accommodation type. A single family home arguably offers less exposure to negative externalities such as neighbourhood noise or a leaking ceiling caused by the flat above. Hence, single family homes may provide a greater sense of 'independence' and 'security' – the factors valued by potential homebuyers.

Finally, arguably, the relative benefit of owning is also affected by location-specific[6] characteristics such as the demographic and socioeconomic composition of the relevant market or the structure of the local housing stock. For example, while households may derive a greater relative benefit from owning if their occupied unit is a single family house, they may

[6] Location can stand here for neighbourhood, local jurisdiction, relevant 'housing market', or broader region. The restricted use ECHP micro-data, only provides relatively crude geographical identifiers (NUTS 1 and NUTS 2 regions) plus a number of household specific assessments of the neighbourhood, albeit, without revealing the neighbourhood location. The empirical analysis below is confined to the available data.

at the same time prefer to own in a more densely populated area with a significant share of low and high-rise buildings.

Let us denote the *relative benefit of owning* (compared to renting) as ΔB_{it}^{O} for household i at time period t .The term ΔB_{it}^{O} can be positive or negative, depending on whether the relative utility associated with homeownership is positive or not (holding costs constant). Summarising the above discussion, ΔB_{it}^{O} can be expressed as:

$$\Delta B_{ilt}^{O} = \Delta B_{it}^{O}\left(x_{it}, a_{it}, D(i)_{i}, (X_{lt})_{it}, (A_{lt})_{it}\right), \tag{1}$$

where the vector of variables x_{it} denotes the demographic and socioeconomic characteristics of household i at time t, a_{it} denotes the accommodation type that household i occupies at time t , $D(i)_{i}$ represents the vector of household fixed effects, which captures the idiosyncratic (time-invariant) preferences of household i for homeownership, X_{lt} denotes the demographic and socioeconomic characteristics of household i's place of residence l at time t, and A_{lt} represents the corresponding local housing stock composition.

Next consider the (user) 'cost side'. Locations and accommodation types can vary substantially in their relative cost of homeownership. Four cost components can be distinguished:

(1) *Tax induced differences in the relative user costs*: This component is typically country and owner specific. Tax systems often treat homeownership favourably whereas the benefits depend crucially on the income situation of the owners. Some European countries put a cap on tax benefits, so lower income households potentially benefit more in relative terms. The U.S. tax system on the other hand strongly favours higher incomes. Owners of principally owner-occupied dwellings (POODs) can often deduct mortgage interest from their income taxes whereas the tax benefits depend on the marginal income tax rate and thereby the household income. Owners of POODs also in most countries do not have to pay taxes on imputed rental income, while landlords are typically not exempt from taxation on rental income. In the literature, the differential tax treatment is described as differences in the 'relative user cost' of owner-occupied housing (defined as the relative cost to an owner-occupier of one Euro's worth of housing in the rental market). The term 'user cost' is somewhat misleading as the differential tax treatment formally applies to the owners of (investors in) housing (homeowners and landlords) rather than the users (homeowners and tenants). However, assuming competitive rental markets, the latter group will be indirectly

affected by the differential tax treatment as the higher relative tax cost incurred by the landlords is passed on to the renters.[7]

(2) *Differences in production and maintenance costs:* This cost component differs again strongly between the two tenure modes and depends on the particular accommodation type and location. Apartment buildings have a greater landlord production and maintenance cost efficiency compared to single detached or attached houses (Linneman, 1985). Initial production costs are sunk for existing buildings but maintenance costs still accrue. Apartment buildings have a higher landlord maintenance efficiency because it is much easier for a landlord to manage several units in one building than having to manage several properties at some distance from each other.[8] Managing an apartment building also offers economies of scales (reduction in maintenance and renovation costs) and, importantly, reduces coordination costs and free-rider problems. In this context, even within the same accommodation type category each housing unit may differ in the relative landlord maintenance efficiency. Production and maintenance costs also potentially depend on other location specific factors, such as the local population density, transportation infrastructure etc.

(3) *Housing tenure-dependent costs associated with the change of occupants:* We can distinguish between direct moving costs that are independent of the tenure mode and property transaction costs, which are tenure mode specific. Property transaction costs only accrue when homeowners relocate but not when tenants move (landlords do not have to sell the housing unit in order to replace the tenant). Property transaction costs affect both the relative supply of and demand for owner-occupied housing. On the supply side, one significant cost advantage of renter-occupied properties is the fact that the change of an occupant does not trigger property transaction costs, which are mainly country and region specific. Of course renter-occupied properties can also change hands; however, such transactions are rather infrequent and, importantly, unrelated to changes of tenants. On the demand side, the existence of property transaction costs implies that households with short expected durations in a particular location (e.g., students) have a lower relative willingness-to-pay for owner-occupied units, increasing the relative local demand for renter-occupied housing. This is

[7] The same logic applies to capital gains. Homeowners can capture capital gains by selling the property and pocketing the proceeds. The same is true however for landlords. In a competitive rental market, the capital gains should be passed on to renters (see also Linneman 1985, 232, for a similar argument). Capital gains merely matter if the tax system treats capital gains from POODs and from housing units hold by landlords differently. This is in fact the case for some European countries (see Table 3 for details).

[8] Hence, population density may also matter for housing tenure outcomes. The location specific population density, regrettably, is not available from the ECHP. However, the effect of density should be captured by the region fixed effects.

because their annualized property transaction cost burden associated with homeownership is higher.

(4) *Spatial differences in investment risk and the corresponding costs of inadequate portfolio diversification for homeowners:* In contrast to corporate and institutional investors into direct real estate (owners of renter-occupied space by default), single owner-occupiers often cannot adequately diversity housing investment risk (i.e., house price volatility), implying costs associated with inadequate portfolio diversification, which are proportional to the location specific housing investment risk (Hilber 2005). Hence, theory suggests that places with greater housing investment risk should have higher relative costs of homeownership implying, all else equal, a lower homeownership rate.[9]

Summing up the above discussion, the relative cost advantage of owning, ΔC^{O}_{inlct}, of household i in neighbourhood n, location l, country c, and at time t can be expressed as:

$$\Delta C^{O}_{inlct} = \Delta C^{O}_{it}\left(x_{it}, D(i)_{i}, a_{it}, n_{int}, D(l)_{ilt}, (policy_{ct})_{it}\right), \tag{2}$$

where the vector of household specific characteristics x_{it} and the household fixed effects $D(i)_{i}$[10] capture the households' expected duration in the property as well as the tax induced relative user cost of homeownership, the accommodation type a_{it} proxies for the relative landlord production and maintenance efficiency advantages, n_{int} proxies for neighbourhood specific costs associated with inadequate portfolio diversification for homeowners[11], the location fixed effects $D(l)_{ilt}$ capture location-specific time-invariant characteristics (such as, in the case of regional dummies, the regional availability of mortgage finance or the level of

[9] See Henderson and Ioannides (1983), Brueckner (1997) and Ortalo-Magné and Rady (2002) for a further exposition of the theoretical argument.

[10] Household fixed effects capture time-invariant characteristics of the households, for example, whether a person is by nature 'rooted' or 'restless'.

[11] Hilber (2005) uses the standard deviation of four neighbourhood externality variables over a 15 year period as direct measures of neighbourhood externality risk, a major component of investment risk, to test its impact on the homeownership status of properties. Because the ECHP 'follows the household' (unlike the American Housing Survey, AHS, which 'follows the unit') and because neighbourhood identifiers are not available, direct measures of neighbourhood externality risk can not be computed for the ECHP. However, as computations from the AHS demonstrate, the various neighbourhood externality level measures are reasonably strongly positively correlated with the corresponding risk measures, hence, the level measures should be reasonably good proxies for neighbourhood specific housing investment risk. Similarly, direct measures of time-varying house price risk at the metro area level as utilized by Turner (2003) and Turner and Seo (2007) are not available from the ECHP or other sources. However, the regional fixed effects used in the empirical specifications reported below should capture the less localized forms of housing investment risk.

property transaction costs). Finally, $policy_{ct}$ denotes household i's country specific policies at time t related to the relative tax treatment of owning relative to renting.

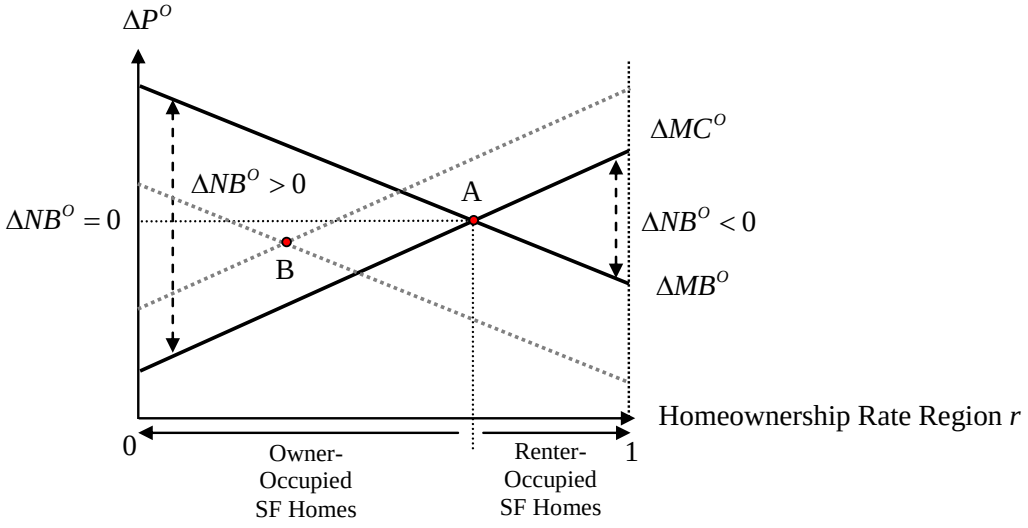
Combining equations (1) and (2), we can express household i's relative net benefit of homeownership at time t in reduced form as:

$$\Delta NB^{O}_{inlct} = \Delta B^{O}_{ilt} - \Delta C^{O}_{inlct} = \Delta NB^{O}_{inlct}\left(x_{it}, a_{it}, D(i)_i, (X_{lt})_{it}, (A_{lt})_{it}, n_{int}, D(l)_{ilt}, (policy_{ct})_{it}\right). \quad (3)$$

The equilibrium housing tenure outcome of household i at time t should be 'owning' if $\Delta NB^{O}_{inlct} > 0$, otherwise the outcome should be 'renting'. These simple cost-benefit considerations allow us to make predictions with respect to the determinants of *individual* equilibrium housing tenure outcomes.

The above considerations imply that each household's relative benefit and cost of homeownership differ depending on household and location specific characteristics, whereas the vector of household characteristics x_{it} is the only set of variables that is not location dependent. At the aggregate level, these considerations imply that some households will have a higher willingness-to-pay for homeownership than others suggesting a downward sloping 'relative' demand curve for homeownership. Similarly, housing units differ in their relative cost of homeownership, implying an upward sloping 'relative' supply curve. The equilibrium outcome (relative marginal benefit of owning equals the relative marginal cost) determines the homeownership rate. These considerations are illustrated in Figure 1.

Figure 1: Equilibrium Homeownership Rates in Region r



The solid lines in Figure 1 show the relative demand (ΔMB^{O}) for and supply (ΔMC^{O}) of owner-occupied housing in a particular region r for the submarket of single family homes.

At Point A, the equilibrium homeownership rate in the market for single family homes, the relative net benefit of owning (ΔNB^O) of the marginal home buyer is exactly 0. The doted lines illustrate the corresponding relative demand and supply curves for the submarket of flats in apartment buildings. At any price premium for homeownership, ΔP^O, the relative demand for owning flats is lower (lower willingness-to-pay) as is the relative supply of owner-occupied housing (the landlord production and maintenance efficiency is greater for apartment buildings, making it comparably less profitable for existing landlords to sell to single owner-occupiers). The result is a lower equilibrium homeownership rate (point B) in the submarket for flats. The graphical framework illustrated in Figure 1 can also be used for comparative static analysis. For example, a tax reform that leads to a more favourable treatment of POODs should shift the supply curves of both accommodation types to the right, leading to an increase in homeownership rates in both submarkets.

2.2 Testable Predictions

Demographics

Demographic variables such as age, marital status or having children control for 'tastes' for owner-occupation and for the expected duration in the property, which are both life-cycle dependent. The expected duration in a property is important for housing tenure choices because the duration in the property determines the expected annualized property transaction costs (see the discussion above). For households with a short duration, buying a house is not a sensible choice because the property transaction costs usually far exceed the potential benefits of owner-occupation in the short-term. Numerous empirical studies demonstrate that demographic variables are important in determining individual tenure choices (e.g., Gyourko *et al*., 1996, Painter *et al.*, 2001, among many others). A study by Haurin and Gill (2002) looks directly at the effect of expected duration on housing tenure outcomes: Using a military sample where individuals are assigned to bases (so their expected duration is known)[12], the authors find that an increase in the expected stay by 1 year increases the probability of homeownership by 3 percentage points.[13]

Another interesting proposition with respect to demographics is that cohabitation of young adults with their parents should increase homeownership rates, as younger households living on their own typically rent, while middle aged and older households typically own.

[12] The same, regrettably, is not the case for representative samples of households such as the ECHP.

[13] The implied transaction costs are estimated as 3 percent of house values plus 4 percent of household earnings.

Stronger family ties (as proxied by intergenerational cohabitation) should also increase the likelihood that young adults may inherit owner-occupied housing from their grandparents. In this context, it is a widespread believe, but a so far untested proposition, that closer family ties and intergenerational cohabitation in Southern European countries can explain the very high homeownership rates in those countries. Manacorda and Moretti (2006) demonstrate that in fact young adult men aged between 18 and 30 in Italy are much more likely to live with their parents than in other countries.[14] A further analysis of the ECHP sample, which provides detailed information on intergenerational cohabitation, demonstrates that the phenomenon is not just confined to Italy but more broadly to Southern Europe (see Table 2 for details). One implication of this is that a high regional share of young adults living in cohabitation with their parents and/or grandparents should have a positive effect on regional homeownership attainment. With respect to the other demographic variables, the predictions are that variables that are positively correlated with 'tastes' for homeownership and with the expected duration in the property should have a positive effect, while the variables that are negatively correlated should have a negative effect.

Citizenship Status and Race/Ethnicity

Numerous empirical studies in the U.S. have demonstrated that ethnicity or race are important determinants in explaining individual homeownership outcomes. At the aggregated level, Coulson (2002) provides evidence that the immigrant population can explain spatial differences in homeownership rates. The 'racial homeownership gap' has sometimes been linked to discrimination, for example, to discrimination in the mortgage market (see for example Kain and Quigley, 1972; Munnell *et al.*, 1996; Ladd, 1998).[15] In Europe discrimination may be less confined to race per se but rather to immigrants from certain countries (depending on the sensitivities of the populations of the respective countries).[16] Recent immigrants likely have shorter durations in their properties and are therefore expected

[14] Manacorda and Moretti (2006) provide evidence consistent with the notion that the remarkably high rate of cohabitation in Italy is due to parents' tastes for co-residence.

[15] Hilber and Liu (2007) suggest that the gap can be partly explained by racial differences in location choices: African American households are more likely to live in larger cities with a larger share of apartment buildings and greater housing investment risk.[15] In fact, Hilber and Liu (2007) find that the racial homeownership gap disappears when differences in own and parental wealth as well as in the macro-location type are accounted for.

[16] The ECHP does not provide information on race. In Switzerland there are also legal hurdles for foreigners to acquire residential real estate. However, Switzerland has not been an ECHP membership country between 1994 and 2001, so it is not part of the regression sample.

to be less likely to own. The testable prediction is that foreigners, all else equal, should have a lower homeownership propensity.[17]

Socio-Economic Characteristics

Household income and household (and perhaps parental) wealth are expected to have a significant impact on individual homeownership outcomes. This is because income and wealth help overcome barriers to homeownership. Two types of barriers can be distinguished: credit constraints and downpayment constraints. Various empirical studies for the United States, have demonstrated that these constraints matter for homeownership attainment (see for example, Linneman and Wachter,1989). The ECHP only provides information on household income but not on household wealth. However, income and age along with household fixed effects should proxy reasonably well for household wealth.

The effect of income on homeownership is expected to be non-linear; increasing at a decreasing rate. This is because once income becomes sufficiently high, barriers to homeownership become less relevant.[18] Household income may also matter for a second distinct reason. User costs of owner-occupied and renter-occupied housing differ because tax systems treat homeowners and other investors – often differently. And the relative user costs are often income dependent (see the discussion on tax treatment of homeownership below).

Accommodation Type

Apartment buildings have a higher relative landlord production and maintenance efficiency compared to single detached or attached houses (see the discussion above in Section 2.1). Hence, a household living in an apartment building should have a lower homeownership propensity than an identical household living in a single family home. Finally, to the extent that the value of the 'good' homeownership is positively related to having a sense of 'independence' and 'security', detached houses can be expected to have a higher implicit value associated with homeownership than flats in apartment buildings.

[17] The ECHP only provides information on the citizenship status of the survey respondents in the United Kingdom from 1997 onwards. Since the UK provides a large number of regional observations adding the citizenship variable reduces the regional sample size substantially. In order to address this issue, the empirical models are estimated for samples with and without the citizenship variable. The results are qualitatively very similar. The citizenship variable itself has no statistically significant impact in any of the estimated specifications. See the empirical section and, in particular, Table 7 and Table A2.

[18] A few other studies link measures of income uncertainty to housing tenure. Haurin (1991) and Robst *et al.* (1999) find that income uncertainty reduces the likelihood of households owning their homes. The empirical analysis below estimates a fixed effects specification with 8 years of data. One could construct an income uncertainty measure as the standard deviation over 8 years but this measure would then not provide any variation over-time. Hence, unfortunately, the effect of income uncertainty cannot be estimated using ECHP data. It should be noted, however, that the effect of income uncertainty, which can be assumed to be relatively time-invariant, is captured by the household fixed effects.

Relative Tax Treatment of Homeownership and the Role of Tax Reforms

The tax treatment of homeownership differs strongly across countries and some countries have carried out relevant tax reforms during the ECHP sample period between 1994 and 2001. Generally, one can distinguish three major forms of tax subsidies that affect POODs and renter-occupied housing differently:

(1) *No income taxation of imputed rents for POODs:* In virtually all countries landlords have to pay income taxes on rental income, while owners of POODs often are exempt from paying income taxes on imputed rents. A neutral tax system would tax (true) imputed rents at the same rate as rental income from renter-occupied properties.

(2) *Deductibility of mortgage interest from income taxes for POODs:* Similarly, in many countries, owners of POODs can deduct mortgage interest from income taxes.

(3) *No capital gains tax on gains from the disposal of POODs:* Owners of POODs are often exempt from capital gains taxes, while landlords are fully exposed to such taxes. In some countries investors (other than owner-occupiers) face minimum holding periods 'for speculative gains' during which they are not exempt from capital gains taxes.

Rosen (1979), focusing on the U.S. tax system, highlights the fact that tax benefits increase with income because higher income households face higher marginal tax rates.[19] The same is not true for all European countries however. Each country has its own (complex) income tax system and deductibility of mortgage interest is often limited in absolute terms, so the tax-subsidy induced effect of income on homeownership propensities is ambiguous.

Fortunately, six of the fifteen ECHP countries (France, Germany, Greece, Italy, Spain and the United Kingdom) have passed major housing policy reforms between 1994 and 2001 that differentially affected owner-occupiers and landlords and therefore potentially affected homeownership propensities. Details on the tax reforms are provided in Table 3. These policy reforms – which generated variation in the explanatory variables over time – permit estimation of the effects of the policies with a fixed effects model specification.

One empirical difficulty that affects all of these policy reforms is the fact that the present value of tax subsidies or other forms of differential treatment is affected by the reform before

[19] On a related note, Poterba (1984) clarifies that the subsidy also (positively) depends on inflation and Rosen *et al.* (1984) construct and estimate a model of tenure choice that allows for the effects of uncertainty of user costs. Their results suggest that the previous work which ignored uncertainty has overstated the effect of the income tax system on the tenure choice. More specifically, they use national time series data from 1956 to 1979 and provide evidence that volatility in the relative price of housing services has a negative effect on the aggregate proportion of homeowners.

its due date (because most policies have durable effects). For example, consider a mortgage interest tax relief scheme for principally owner-occupied dwellings. An owner-occupier household with an expected duration of 10 years in a property and mortgage financing can expect to benefit from a 10 year stream of tax subsidies, lowering the relative cost of homeownership (since landlords are excluded from the tax relief). If the tax relief scheme is abolished in 5 years time this will affect the owner-occupier's present value of the tax relief today and consequently reduces the relative cost advantages of homeownership today. Hence, to the extent that developers and investors anticipate such reforms, the effects of these reforms will be gradual.

Public Rental Housing

At a first glance, including the share of public rental housing (which is essentially determined by governments) in an equation that estimates the homeownership rate might not seem to be particularly sensible. However it is not per se clear what the equilibrium effect of a change in the share of the public rental sector on the private sector is. At the aggregate level, including the measure allows one to assess whether an increase in the share of the strongly subsidised public rental housing sector encourages some homeowners to rent or whether it only implies that households move from the private into the public rental sector (crowding-out of the private rental sector). In the latter case, the coefficient on the variable 'share public rental housing' should be zero. A value smaller than zero implies that crowding-out is incomplete. A value of -1 would imply that no crowding-out takes place (i.e., the share of the private rental sector is unaffected by the increase in the share of the public rental sector).[20]

One 'issue' when modelling the housing tenure outcomes in Europe is the fact that the public rental sector is quite important, at least in some countries. Governments – in contrast to private agents – usually do not adjust the tenure status of their housing stock when revenue/benefit or cost streams change. Hence, one could make a case that the tenure status of public rental housing is predetermined and that one should focus on explaining differences in the 'private' homeownership rate that excludes public rental housing. This is of course not to say that a transformation of public-rental housing to owner-occupied housing is impossible, as Margaret Thatcher's 'Right to Buy' policy has strikingly demonstrated, however, such changes are driven by political considerations rather than utility and asset price maximisation-considerations. Also, even if public rental units are strongly subsidized, households still have

[20] The proposition of crowding-out is consistent with the housing statistics for the Netherlands, which consists of a very large public rental sector (32.3 percent of the total housing stock in 2001, according to the ECHP) and a very small private rental sector (6.6 percent in 2001, again according to the ECHP).

a choice whether to own, rent privately or rent public housing. Hence, a plausible alternative view is that one should include the public rental housing stock. As a sensitivity test, both specifications – including and excluding public rental housing – will be estimated in the empirical analysis below.

Controlling for Unobserved Characteristics

A few factors that are expected to affect equilibrium housing tenure outcomes are typically unobservable, either because the factors are hard to quantify (e.g., 'cultural factors' or the 'strictness' of rent control[21]) or because it is not practically feasible to collect the relevant data (e.g., it is not feasible to collect reliable and consistent data on the 'availability of mortgage finance' on an annual basis[22] for all countries in the ECHP between 1994 and 2001). Other factors may affect homeownership, however, the effect is not known to researchers. The existence of any unobserved explanatory variable raises concerns relating to omitted variable bias. The potential issue can be mitigated, however, with the use of fixed effects since they control for unobserved time-invariant heterogeneity.

Specifically, the fixed effects specifications reported in the empirical section below control for the main known (as well as unknown) unobserved explanatory variables such as preferences for homeownership, the efficiency of mortgage markets[23] (including the availability of mortgage finance), rent control[24], 'cultural factors'[25], or transaction costs. For

[21] An EU-wide collection of relevant country-specific information on rent control is not available. Moreover, significant changes in the restrictiveness of rent control could not be identified for any ECHP member country between 1994 and 2001, preventing the estimation of the effect of rent control in a fixed effects specification.

[22] Note that any explanatory variable which does not vary across time will be perfectly collinear with the fixed effects. Hence it cannot be included in the model (nor can its effect be estimated).

[23] The efficiency of mortgage markets is determined by the efficiency and reliability of application procedures, the leniency of down-payment requirements, the underlying securitization of loans, or, generally, the availability of mortgage finance. Arguably, efficient mortgage markets should make it easier for households to qualify for mortgages and attain owner-occupied housing. Crude measures of market performance can be collected from various sources. However, all these measures are time-invariant and country-specific and therefore cannot be used in fixed effects models. Also, in countries with poorly operating mortgage markets, alternative institutions – such as inheritance of owner-occupied housing from grandparents – may have formed over time to overcome the lack of available credit. Hence, the overall effect of the 'efficiency' of mortgage markets on homeownership attainment is unclear.

[24] An isolated analysis of the housing tenure choices of households – without taking into consideration the supply side – would predict that rent control decreases homeownership rates as it increases the relative price of homeownership. However, this partial view ignores the supply side and dynamic general equilibrium adjustments. Rent control indeed increases the relative demand for renter-occupied properties. At the same time, rent control reduces the present value of an existing landlord's investment, providing incentives, at the margin, to convert existing rental units into condominiums. Similarly, rent control reduces a private developer's incentives to invest into rental properties and thereby discourages a developer from providing new (and an existing landlord from renovating existing) rental space. Future increases in overall demand for housing will then likely lead to an increase in owner-occupied housing. Overall, the short term effect of introducing rent-control is ambiguous, while in the long-run, in a growing economy, rent control may lead to an increase rather than a decrease in the equilibrium homeownership rate. Countries with strict rent control policies typically have lower homeownership rates. However, this is not necessarily a causal effect; voters in countries with low homeownership rates (such as

example, household fixed effects control for household specific time-invariant preferences for homeownership (and all other household specific time-invariant determinants of homeownership). Similarly, region fixed effects control for time-invariant regional preferences for homeownership. Hence, while one could make the argument that preferences for homeownership determine the type of housing constructed, by including the fixed effects, regional (and individual) differences in the preferences for homeownership are controlled for. Region fixed effects also control for other region specific unobserved time-invariant factors such as regional differences, for example, in 'cultural factors', in the strictness of rent-control, or in the availability of mortgage finance. Moreover, to the extent that rent-control and the availability of mortgage finance are invariant within a country but may change over time, they are captured by the country-year fixed effects.

3 Empirical Analysis

3.1 The Data

The data is derived from several sources but the main source is the ECHP, more precisely, the restricted-use ECHP micro-data.[26] The ECHP is a survey based on a standardised questionnaire that involves annual interviewing of a representative[27] panel of households and individuals in each country, covering a wide range of topics including housing, demographics and socio-economic characteristics of the households. The longitudinal or panel design, in which information on the same set of households and persons is gathered over time, provides the perfect laboratory to study changes over time at the micro level. Importantly, the database also includes some regional identifiers; namely, NUTS 1 and/or NUTS2 level information (depending on the country). These regional identifiers

Germany or Switzerland) may be more likely to approve strict rent control measures. Similarly, renter alliances may be able to lobby successfully for strict rent control measures.

[25] Some observers of the vast homeownership rate differentials across Europe have suggested that they may be the result of 'cultural factors'. While in the empirical specification, cultural differences are captured by region fixed effects, it is worth noting that an investigation of border regions in France can shed some direct light on the assertion. If cultural factors were important, French regions bordering to the South should be more similar in terms of homeownership attainment to Italy and Spain, while regions bordering to the East should be more similar to Germany or Switzerland. However, the ECHP data does not support the proposition that 'cultural factors' are important. For example, while occupants of flats in larger apartment buildings in the region 'Mediterranee' have a marginally higher likelihood of owning than the French average (33.9 percent versus 26.3 percent), in Italy and Spain between 70 and 80 percent of comparable flats are owner-occupied.

[26] The data is stored at Eurostat in the ECHP users' database (UDB). A more detailed description of the database is given in the CIRCA library under "ECHP/ECHP users' database documents. The web link is http://circa.europa.eu/Public/irc/dsis/echpanel/library?l=/user_db&vm=detailed&sb=Title.

[27] The ECHP is designed to provide representative cross-sectional pictures over time by constant renewal of the sample through appropriate follow-up rules. The country specific summary statistics reported in Tables 1 and 2 can therefore be considered representative of the countries populations.

provide the additional possibility to study changes over time at the regional level (albeit not at the neighbourhood level). The list of all NUTS 1 and NUTS 2 regions in the ECHP sample are listed in Appendix Table A3. The total duration of the ECHP is 8 years, running from 1994 to 2001. In the first wave, a sample of roughly 60,000 nationally represented households were interviewed in the then 12 Member States. Austria (1995) and Finland (1996) have joined the project since then. Data for Sweden is available as of 1997, and has been derived from the Swedish Living Conditions Survey and transformed into ECHP format. One important feature of the ECHP is that methodology and procedures are standardised yielding uniquely comparable information across countries.

Information on housing policies have been derived from various sources, most importantly, the European Tax Handbook. See Table 3 for details.

Summary statistics of the ECHP sample at the country and household level are provided in Tables 1 to 4. To begin with, Table 1 reports country-level summary statistics of homeownership rates, based on official statistics and based on the ECHP sample, both including and excluding public rental housing units from the denominator. With the important exception of Ireland, homeownership rates tend to be higher in Southern Europe than in Continental Europe and – as Table 2 reveals – tend to increase during the sample period (with the exceptions of Finland and Sweden). The by far lowest homeownership propensity is found in Germany, independent of whether the former DDR is excluded or not. The Netherlands is an interesting case. It has a comparably low homeownership rate if public rental housing is included (61.1 percent). However, ignoring public rental housing, almost all private units are owner-occupied (93.4 percent). Only Ireland has an even higher 'private' homeownership rate. Some countries (including Greece and Spain) have virtually no public rental housing but many countries have a sizeable stock, exceeding 10 percent. Table 1 also reports statistics of transitions into and out of owner-occupied housing, both for all households and a sample of young households. The comparison of the statistics for the two samples provides insights into whether the dynamics of transitions is changing. Overall the summary statistics provide little evidence that homeownership rates are converging. For example, Germany observes the fewest transitions into homeownership (both among the total sample and the sample of the young), while the high homeownership rate-countries also observe the greatest percentages of transitions into homeownership.

Table 2 provides summary statistics by country for 1994 (or the earliest available year) and for 2001 for some of the key explanatory variables. This table provides some interesting insights. For example, Ireland, the country with the highest 'private' homeownership rate

(i.e., excl. public rental units) also has by far the largest share of detached and semi-detached houses (more than 97% in both years). Germany has a very low share but so do Greece and particularly Italy and Spain.[28] Table 2 also reports the share of young adults aged between 18 and 30 still living with their parents and/or grandparents. Not surprisingly the Southern European countries (Italy, Spain, Portugal and Greece) have extremely high shares around 80 to 90 percent. The other extreme is Sweden with shares below 30 percent. Table 3 lists details on tax reforms in 6 countries that altered the tax treatment of homeownership during the ECHP sample period between 1994 and 2001. Four of these reforms were favourable to homeownership, three were allegedly unfavourable. Table 4 provides summary statistics of the household-level regression sample. The sample excludes households that live in 'other accommodations' (e.g., military caserns) or for which the location information (NUTS 1 or NUTS 2 region is not known). Finally, Table 8 provides the corresponding summary statistics at the aggregate regional level.

3.2 Empirical Specifications

In order to empirically assess the determinants of equilibrium housing tenure outcomes across Europe, I first estimate *household level* specifications, using a standard fixed effects linear model.[29] The underlying model makes use of the available geographical identifiers and information provided by the ECHP (i.e., regional identifiers plus information on the household's neighbourhood and accommodation type). The model assumes that household, accommodation, and location characteristics determine the individual demand for homeownership, while accommodation and location characteristics determine the relative cost of owning versus renting (see previous section). In equilibrium, the housing tenure status, should both maximise the utility of the consumers and the profit (or utility) of the unit owners.[30] In a subsequent step the micro-level observations are aggregated to the *regional level* in order to explore the determinants of regional homeownership rates, again, employing a linear fixed effects model.

[28] A more detailed analysis (not reported in Table 3 due to space constraints but available from the author upon request) reveals that the units in apartment buildings always have a lower probability of being owner-occupied than detached or semi-detached houses. However, the discrepancy is quite small in Italy and Spain, whilst it is very large in Germany

[29] Linear random effects models were also estimated but Hausman tests suggest they are not appropriate. Fixed and random effects *logit* models and random effects *probit* models did not converge within a reasonable time frame (over an extended weekend using a powerful dual core computer with 4GB of RAM).

[30] In the case of an owner-occupier equilibrium, of course, consumer and owner are identical, while in the case of a tenant-landlord equilibrium the two are different economic agents.

Consider first the *household-level fixed effects-model*, which controls for time-invariant unobserved heterogeneity across households (such as differences in idiosyncratic preferences for homeownership). The within-household variation arises from two sources. Firstly, some household characteristics such as age, income or marital status change over time because the household itself changes (e.g., a couple gets married, a child is born). Secondly, households sometimes relocate and thereby possibly change the accommodation type, neighbourhood, and region, generating variation along those dimensions. Following equation (3), in reduced form, the probability that household i at time t owns can be expressed as:

$$\begin{aligned}\Pr\left(own_{irct}\right) = \alpha_0 + \alpha_1 x_{it} + \alpha_2 a_{it} + \alpha_3 n_{it} + \alpha_4 D(i)_i + \alpha_5 \left(policy_{ct}\right)_{it} + \alpha_6 D(c\times t)_{it} + \\ \alpha_7 \left(X_{rt}\right)_{it} + \alpha_8 \left(A_{rt}\right)_{it} + \alpha_9 \left(PuR_{rt}\right)_{it} + \alpha_{10} D(r)_{irt} + \varepsilon_{it} \quad ,\end{aligned} \tag{4}$$

where x_{it}, a_{it}, n_{it} denote household i's demographic and socioeconomic characteristics[31], the chosen accommodation type, and the characteristics of household i's chosen neighbourhood at time t. The term $D(i)_i$ denotes a vector of household fixed effects.[32] The remaining variables describe region and country-specific factors that apply for household i at time t: $policy_{ct}$ represents a vector of country-specific and time-varying policies that differentially affect the relative tax treatment of owning compared to renting (tax relief for interest payments, taxation of capital gains, taxation of imputed rents); $D(c\times t)$ denotes the vector of country × year-dummies, which capture country and time dependent unobserved developments that may affect the relative cost of owning; X_{rt} and A_{rt} indicate vectors of the regional demographic and socioeconomic conditions and of the regional housing stock composition at time t; PuR_{rt} denotes the regional share of public rental units at time t (i.e., the share of units with predetermined housing tenure status)[33]; $D(r)$ represents a vector of region fixed effects; and ε_{it} denotes the household and time varying error term.

The empirical model from equation (4) can be described as the *full model*, which ideally one would want to estimate using panel data and using the geographical identifiers that are available from the ECHP. However, household assessments of the neighbourhood are not

[31] The characteristics x_{it} capture life-cycle dependent preferences for homeownership, the expected duration in the property, and individual benefits derived from various tax policies.

[32] These fixed effects capture all time-invariant idiosyncratic characteristics of household i such as idiosyncratic preferences for homeownership.

[33] The share of public rental units in the housing market of household i's choice proxies for the likelihood that household i qualifies for public rental housing. If the public rental housing stock is large, then household i should be more likely to qualify for public rental housing, reducing the probability of homeownership.

available for Germany, Luxemburg, and Sweden and in the UK the data is only available from 1996 onwards. Similarly, data on the citizenship status of households is not available for the UK from 1994 to 1996. Hence, data availability generates a trade-off between sample size (and number of included countries and regions) on the one hand and number of explanatory variables on the other hand. In order to address this issue, various specifications are estimated and a sensitivity analysis is carried out. The results are reported in Tables 5 to 7 and in Appendix Table A2. The next sub-section describes the results in detail.

Next, turn to the *region-level fixed effects-model*. This model essentially follows from the household-level one. Using the same annotation as for equation (4), the regional homeownership rate HOR_{rt} can be estimated as:

$$HOR_{rct} = \beta_0 + \beta_1 X_{rt} + \beta_2 A_{rt} + \beta_3 PuR_{rt} + \beta_4 D(r)_r + \beta_5 \left(policy_{ct} \right)_{rt} + \beta_6 D(c \times t)_{rt} + \mu_{rt} . \quad (5)$$

Similar to the micro-level model, here the region fixed effects capture all unobserved time-invariant factors at the regional level. The vector X_{rt} includes one additional variable that was not included in the household-level specification, namely, the share of young adults aged between 18 and 30 that live in cohabitation with their parents and/or grandparents. The longer young adults (who typically rent) live with their parents in a particular region, all else equal, the higher potentially is the regional homeownership rate. The variable also proxies for the strength of family ties and the likelihood that young adults move directly from their parents home to a home inherited by their grandparents. Results for the *full model* outlined in equation (5) are reported in Table 9. The next sub-section describes the results in detail.

3.3 Regression Results

To begin with, Table 5 reports household fixed-effects specifications for the sample that *includes* public rental units as a tenure choice. The dependent variable is a dummy variable, which is 1 if the household owns the principal accommodation and 0 otherwise. Column (1) of Table 5 reports results for a specification that only includes household specific explanatory variables (demographics and socio-economic characteristics) plus the accommodation type of the unit occupied by the household. Results are as expected. All variables have the expected sign and are statistically significant. The coefficients of the accommodation type variables are not only statistically significant but the implied effects are highly meaningful economically. For example, the estimates suggest that the move of a household from a single detached house to a flat in a small apartment building, holding household characteristics constant and

controlling for time-invariant preferences for homeownership, reduces the probability of homeownership by 41 percentage points. The quantitative effects of the demographics and socioeconomic characteristics are significantly less meaningful, with the exception of the variable that measures the age of the oldest household member: If the oldest household member is 'between 30 to 39 years' the probability of owning is 12 percentage points higher than if he or she belongs to the age group 'below 30 years'. For households with retired members, the implied homeownership propensity gap to the category 'below 30 years' is even greater with 23 percentage points.

Colum (2) of Table 5 adds the tax policy reform variables (see Table 3 for a description of the relevant reforms) and the 'country × year' fixed effects, capturing country and time-specific determinants of equilibrium housing tenure outcomes. At first, the coefficients on the household and accommodation type variables are virtually unchanged if the time-varying country controls are added. The reforms that favoured homeownership all had the predicted effects, and quantitative effects are plausible. For example, the abolition of the taxation of imputed rents in Spain (in 1999) and Italy (in 2000) increased the individual homeownership propensity by 5.6 and 4 percentage points in the two countries. In the case of the two reforms in Germany, the quantitative effects of both reforms were very limited in economic terms. However, the reforms in France, Greece and the UK that allegedly should have reduced homeownership propensities, actually increased them. In the case of the UK the effect is not statistically significant but in the case of France and Greece, the effects are statistically significant and economically reasonably meaningful. The post-reform ownership propensity was about 4 percentage points higher in the two countries, holding everything else constant. One plausible (partial) explanation for this finding is that owners of properties that observed the change of an occupier anticipated the reform and adjusted the optimal choice prior to the actual reform date (although this does not explain the phenomenon of 'overshooting').

Colum (3) of Table 5 adds the various region-specific controls, that is, the regional demographic and socioeconomic characteristics, the regional housing stock composition, and the region fixed effects, which control for all time-invariant unobserved regional heterogeneity such as regional tastes for homeownership. The coefficients on the control variables are reported in Appendix Table A1.[34] Quantitative effects are reported in Table 10.

[34] With respect to the regional controls, noteworthy are merely two findings. Firstly, while single family homes are much more likely to be owner-occupied than flats in apartment buildings, holding household and region characteristics constant, controlling for the individual accommodation type households are actually less likely to own in regions that have a higher share of single family units. So, while households prefer to own single family units, living in an 'ocean of single family homes' actually reduces their appetite for owning. On the other

Reassuringly, when adding the various regional controls including the fixed effects, the coefficients on the other explanatory variables are again hardly changed. In fact, the quantitative significance of the effect of the accommodation type on tenure outcomes marginally increases. Importantly, as one would predict, the share of public rental units in the region of residence (which measures the ease, with which households can qualify for public rental housing) has a negative and statistically significant impact on the probability that a household owns. This implies that public rental housing, which in most European countries is strongly subsidised, encourages some households that otherwise might want to own, to choose public rental housing instead.

Table 6 reports results for specifications that are identical to those in Table 5 except that the regression sample now *excludes* public rental units. Hence, the dependent variable is a dummy variable, which is 1 if the household owns and 0 if the household rents a *private* unit. Overall, results are qualitatively quite similar to those obtained in Table 5 with one obvious exception. The effect of the share of public rental units on the individual housing tenure outcome is no longer negative and statistically significant but becomes completely statistically insignificant (with a positive sign). This suggests that the public rental market does not affect *private* tenure decisions, at least not at the individual level.[35]

Table 7 reports results with and without additional neighbourhood controls. As discussed in the previous sub-section, adding these controls reduces the sample size and cross-country induced variation substantially (completely removing households from Germany, Luxemburg, and Sweden from the regression sample). However, it allows one to test (a) whether neighbourhood controls are import determinants of equilibrium housing tenure outcomes and (b) whether adding these controls affects the coefficients on the other explanatory variables. Specifically, one concern is that the accommodation type – in the absence of neighbourhood controls – rather than just measuring the independent impact of the accommodation type on housing tenure outcomes, also proxies for the impact of the neighbourhood. The specifications estimated in columns (1) and (3) of Table 7 are identical to those reported in column (3) of Table 5 and column (3) of Table 6. However, the sample size is limited to those survey respondents who self-assess their neighbourhood. The remaining two columns in Table 7 (columns 2 and 4) add the neighbourhood controls. Three main results are worth

hand, households are more likely to own if they are surrounded by a large share of married couples (perhaps because the measure is positively associated with house price stability).

[35] At the aggregate level one would expect the share of public rental units to affect the private homeownership rate. In the extreme, if a strongly subsidised public rental market is large enough and almost all households that prefer to rent are housed in the public sector, the private homeownership rate should be very high. This rationale is consistent with the region-level results presented in Table 9.

pointing out. Firstly, the neighbourhood controls (neighbourhood and outside noise; crime or vandalism; pollution, grime or other environmental problem caused by traffic or industry) themselves all negatively affect equilibrium housing tenure outcomes, consistent with the proposition that single owner-occupiers prefer to purchase their homes in better (and arguably less risky) neighbourhoods. Secondly, qualitatively the results for the smaller sample size (with significantly reduced cross-country variation) are overall similar to those reported in Tables 5 and 6 for the large sample size. The main exception is the positive coefficient on the 'share public rental units in region' variable in columns (3) and (4) of Table 7, which is now statistically significant, in contrast to column (3) of Table 6, where it is also positive but statistically insignificant. Thirdly, and most reassuringly, adding the neighbourhood controls (in columns 2 and 4) has virtually no effect on the coefficients of the other control variables (holding the sample size constant), suggesting that, for example, the estimated coefficients on the accommodation type variables are unaffected by the inclusion or omission of neighbourhood controls.

Similar to the sensitivity analysis outlined in Table 7, I also estimated specifications that additionally include a citizenship status control and the regional share of foreigners in a region (variables that are not available for the UK from 1994 to 1996). Results are reported in Appendix Table A2. The estimated coefficients clearly reject the hypothesis that (all else equal) the citizenship status or the share of foreigners has a significant impact on equilibrium housing tenure outcomes across Europe. Interestingly, this contrasts Coulson's (2002) findings for the United States. The results also demonstrate that the addition of the controls does not notably alter the coefficients of the other explanatory variables. Hence, the decision was taken not to include the two controls in the main tables (Tables 5 to 7; Table 9).

Next turn to the region-level fixed effects specifications. Summary statistics of the regional sample are documented in Table 8. Regression results are reported in Table 9. Overall the results are qualitatively quite similar to those reported in Tables 5 to 7. Columns (1) and (2) of Table 9 report results for specifications, where the dependent variable is the homeownership rate including public rental units. The latter two columns (3) and (4) report results for the homeownership rate that excludes public rental units. Columns (2) and (4) additionally contain a control variable for the share of public rental units in the region, while columns (1) and (3) omit this control. Moreover, all specifications include the 'share of young adults living with parents or grandparents' as an additional explanatory variable. The main findings are as follows. The share of public rental units has a negative effect on the 'conventional' homeownership rate that includes public rental units. The results reported in

column (2) suggest that an increase in the share of public rental units by 10 percentage points, reduces the homeownership rate by 2.9 percent, implying partial crowding-out of the private rental sector through the subsidised public rental sector. The results reported in column (4) reveal that the share of public rental units is strongly positively related to the 'private' homeownership rate that excludes the share of public rental units (coefficient of +0.37), providing further support for the proposition that the public rental sector indeed partially crowds out the private rental sector. Regional demographics and socioeconomic characteristics have the expected effects, although some of the coefficients are not statistically significant. Of all the household composition variables only the age variables have a statistically significant *and* economically reasonably meaningful impact on regional homeownership rates. Simulations based on the estimated coefficients suggest that the region with the most favourable age composition for homeownership attainment in 2001 (the Algarve, Portugal), all else equal, has an implied homeownership rate, which is 6.6 percentage points higher than the region with the least favourable age composition (Uusimaa, Finland). Interestingly and counter to widespread perception, spatial differences in intergenerational cohesion – proxied by the share of young adults living with their parents or grandparents – do not explain homeownership rate differentials.

The other location specific (non-household specific) explanatory variables are all statistically significant and, generally, quite meaningful economically. Two effects are quantitatively much more meaningful than all others: the composition of the housing stock and the share of public rental units explain a significant share of the variation in homeownership rates across Europe's regions. Specifically, the implied homeownership rate of the region with the most 'favourable' housing stock composition in 2001 (Dublin, Ireland), all else equal, is 30.4 percentage points higher than that of the region with the least 'favourable' composition (Berlin, Germany). Similarly, the region with highest share of public rental units in 2001 (41 percent in Meckenburg-Vorpommern, Germany) has an implied homeownership rate, all else equal, which is 11.9 percentage points lower than that of those regions – located in Greece, Luxembourg and Sweden – with no public rental housing. Quantitative effects for all other variables are reported in Table 10 based on the results reported in column (2) of Table 9. Note that the quantitative effects are not particularly sensitive to the chosen specification (both at the household level and aggregated regional level). Appendix Table A3 reports the predicted homeownership rates based on the specification reported in column (2) of Table 9. When fixed effects are utilized for the predictions, the implied homeownership rates are quite accurate for all regions. The average

prediction deviates only 1.3 percent from the actual homeownership rate. Without fixed effects, the average prediction deviates 8.6 percent; while the predictions are reasonably good for the majority of regions, homeownership rates for German regions are consistently and strongly over-predicted, while homeownership rates for Italian and Spanish regions are strongly under-predicted. Future work may shed light on this so far unexplained variation.

4 Conclusions

This paper explores the main determinants of equilibrium homeownership outcomes across Europe. The ECHP micro data provides an excellent laboratory to study this question. The panel structure of the dataset and the fact that households move across locations (generating variation in location specific factors), allows one to examine not only the role of household specific characteristics in determining equilibrium homeownership outcomes but also the role of location specific factors. The empirical findings suggest that household specific characteristics – with the exception of age – are of relatively minor importance in explaining equilibrium housing tenure outcomes. Interestingly, intergenerational cohesion (proxied by intergenerational cohabitation), which is often alleged to explain the high homeownership rates in Southern European countries such as Italy or Spain, have no effect at all. While the ECHP provides strong support for the proposition that young households in Southern European countries live longer with their parents or grandparents (and supposedly are more likely to inherit the house of their grandparents), the effect of the share of young adults living in intergenerational cohabitation on homeownership is completely statistically insignificant (typically with a negative sign, not with a positive one as one might predict).

Much more relevant are other non-household specific factors. At the household level, by far the most important determinant of equilibrium housing tenure outcomes in Europe is the accommodation type. At the regional level, the main determinant of homeownership rates is the (corresponding) composition of the housing stock. Holding occupant and location characteristics constant (including household and region-specific preferences for homeownership), a move from a small apartment building to a single family detached house increases the probability of owner-occupation by roughly 40 percentage points. The corresponding quantitative effects at the aggregate (regional) level are commensurate.

The composition of the housing stock is partly the result of market forces: attractive locations with greater land scarcity will have a higher capital-to-land ratio in equilibrium, implying a larger share of housing units in low-rise or high rise apartment buildings. However, the composition of the housing stock is also – and probably increasingly so – the

result of government interventions in the form of zoning, or, more generally, land use controls. The empirical findings of this study imply that countries which designate vast amounts of residential land as zones that only allow the construction of single family homes, will have higher homeownership rates, all else equal. It is therefore perhaps no surprise that countries with taste for densification (Germany and Switzerland) have extremely low homeownership rates, measured by international standards. Of course the observation that zoning affects homeownership rates, does not necessarily imply that governments should designate more zones for single family housing, even if in fact homeownership has important positive net effects on social and economic outcomes. Densification may have other important advantages (e.g., efficient use of space, environmental benefits).

Among the tax policies, the non-taxation of imputed rents appears to have the strongest and most clear-cut positive effect on homeownership attainment. This is not surprising, given the high marginal income tax rates in Europe the implied tax subsidy is quite substantial. However, most ECHP countries – with the notable exceptions of Belgium, Greece, Luxembourg and the Netherlands – already abstain from taxing imputed rents, leaving no further leeway. Moreover, taxation of imputed rents is the neutral (non-distorting) tax policy, so from an 'optimal taxation theory' point of view, taxation of imputed rents may be preferable as it limits distortions. One last option for some countries (especially the Netherlands, which has by far the largest public rental housing sector) would be to privatise the public rental housing stock at discounted prices, following the example of Margaret Thatcher's 'Right to Buy' policy in the early 1980s. However, privatising the usually strongly subsidised public rental housing stock may in turn revive the private rental sector, thereby 'crowding-out' the effects of the privatisation policy.[36]

Overall, the findings presented in this paper support the view that the European integration has not, at least not so far, triggered a conversion of homeownership rates across Europe. Moreover, there is no strong reason to suspect that this is likely to happen in the near future. Large spatial differences in homeownership outcomes are largely the result of market forces (demand and supply side factors) and may be optimal from a welfare point of view. In this sense, further policy interventions with the intent to reduce spatial homeownership gaps might do more harm than good.

[36] It has – to the knowledge of the author of this paper – not been investigated yet, whether such crowding-out took place in the UK during the 1980s. Moreover, relatively little is known to date about the economic and social consequences of these privatisation policies. Future research may be able to close this information gap by providing direct empirical evidence using historical data.

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Summary Statistics and Regression Tables

TABLE 1
Homeownership Rates and Housing Tenure Transitions between 1994 and 2001

Sample	Official [i]	Restricted use ECHP Micro Data												
Country	HOR 2000	HOR 2001 (incl. Public Rental) in %	HOR 2001 Region with lowest HOR	HOR 2001 Region with highest HOR	% Public Rental	HOR 2001 (excl. Public Rental)	Pr (Own 2001 | Pr. Rent 1994)		Pr (Own 2001 | Publ. Rent 1994)		Pr (Publ. Rent 2001 | Own 1994)		Pr (Publ. Rent 2001 | Own 1994)	
Sub-Sample	*All*	*All*	*All*	*All*	*All*	*All*	*All*	*Young (30-39)*	*All*	*Young (30-39)*	*All*	*Young (30-39)*	*All*	*Young (30-39)*
AUS	58.8 [ii]	61.1	53.8	68.1	11.2	72.3	NA	NA	NA	NA	NA	NA	NA	NA
BEL	68.7 [ii]	73.5	60.5	76.8	5.4	78.9	43.5	65.7	2.3	0.79	2.4	4.7	0.38	0.9
DEN	53.7	66.2	NA	NA	14.5	80.7	49.5	68.8	14.4	22.4	5.1	5.9	4.4	3.5
FIN	65.2	67.4	64.0	69.6	11.5	78.9	NA	NA	NA	NA	NA	NA	NA	NA
FRA	58.5	61.2	54.4	65.5	10.3	71.5	39.7	56.5	7.7	12.2	4.8	6.2	0.90	3.7
GER	45/34 [ii], [iii]	39.0	11.9	54.9	7.9	46.8	23.8	35.1	3.3	3.7	6.0	8.1	0.34	2.3
GRE	78.7	83.5	77.5	88.3	0.4	83.9	48.6	53.3	0.32	0	4.2	10.5	0.037	0
IRL	83.0	87.3	86.9	87.4	7.4	94.7	52.0	66.7	19.1	19.0	1.1	1.3	0.52	1.3
ITA	73.1 [iv]	77.7	69.4	84.7	3.6	81.3	44.0	56.8	4.4	2.8	3.3	8.8	0.32	0
LUX	72.9 [v]	75.1	NA	NA	NA	75.1	NA	NA	NA	NA	NA	NA	NA	NA
NL	53.0	61.1	NA	NA	32.3	93.4	48.6	67.6	20.3	51.6	1.1	0.0	3.9	3.4
POR	78.1 [vi]	73.3	62.1	83.5	2.1	75.4	29.3	46.6	1.1	5.3	3.5	6.1	0.12	2.0
SPA	89.4	85.0	75.3	88.6	0.6	85.5	53.0	59.4	3.9	2.1	3.0	8.0	0.063	0
SWE	54.1	66.6	60.1	74.1	NA	66.6	NA	NA	NA	NA	NA	NA	NA	NA
UK	69.0	73.9	61.5	83.5	15.3	89.2	56.8	78.0	12.7	15.7	2.3	5.4	1.9	3.6

Notes: ECHP-sample excludes accommodation type "other accommodation", observations with missing regional information and missing accommodation type information. Transitions into and out of homeownership are calculated using all households in sample with available housing tenure information for the two years 1994 and 2001. [i] Official statistic from the Danish National Agency for Enterprise and Housing (2003) 'Housing Statistics in the European Union 2003'. Homeownership rates calculated excluding 'other tenure' both from numerator and denominator. [ii] Based on year 2002. [iii] Germany excluding Ex-DDR / Ex-DDR. [iv] Based on year 1991. [v] Based on year 2001. [vi] Based on year 1999.

TABLE 2
Demographics and Housing Market Characteristics by Country for 1994 (or Earliest Year) and 2001

		Demographics and Socioeconomic Characteristics						Housing Stock Composition			
Country	Year	% Owned	% Married Couple	Av. No. of Kids	Av. Age of Oldest Householder	% 18-30 y. with 'Elder'	Av. Net HH Income (PPP adjusted)	% SF Detached	% SF Semi-Detached or Terraced	% Apartment Small	%Apartment Large
AUS	*1995*	*58.2*	*61.7*	*0.57*	*52.7*	79.8	*16470*	*51.4*	*4.8*	*13.0*	*30.7*
	2001	61.1	61.4	0.47	55.7	83.9	19249	55.2	6.2	12.4	26.2
BEL	1994	70.4	59.5	0.61	51.7	80.1	15301	36.5	44.8	10.9	7.8
	2001	73.5	52.5	0.59	52.7	75.6	19727	36.9	44.3	10.4	8.4
DEN	1994	62.0	43.2	0.48	50.2	54.7	13231	52.7	13.6	13.3	20.5
	2001	66.2	45.4	0.54	49.6	46.2	19412	52.7	13.2	14.3	19.8
FIN	*1996*	*75.3*	*58.4*	*0.68*	*49.2*	71.7	*21492*	*49.0*	*18.7*	*2.0*	*30.2*
	2001	67.4	48.9	0.57	47.1	44.8	23403	42.0	16.8	5.2	36.0
FRA	1994	56.3	56.0	0.60	50.8	68.9	15310	38.7	22.1	13.6	25.6
	2001	61.2	53.1	0.55	52.4	69.4	19212	41.8	22.9	12.9	22.4
GER	1994	35.7	58.9	0.59	47.8	63.8	17479	27.7	16.5	37.7	18.1
	2001	39.0	55.8	0.55	48.9	65.7	19542	30.0	16.2	35.8	18.0
GRE	1994	73.3	72.2	0.60	55.6	83.1	8873	30.1	18.9	30.5	20.5
	2001	83.5	73.4	0.47	59.9	91.1	11889	37.8	19.8	27.6	14.9
IRL	1994	85.6	66.4	1.03	53.0	88.1	15722	52.1	45.0	2.2	0.8
	2001	87.3	61.0	0.80	56.0	90.0	20116	54.4	43.6	1.1	0.9
ITA	1994	72.9	75.8	0.57	54.2	90.9	13956	21.3	12.8	40.2	25.7
	2001	77.7	72.1	0.48	55.6	87.9	15924	23.9	14.3	38.8	23.0
LUX	*1995*	*73.4*	*58.4*	*0.47*	*53.6*	79.9	*25905*	*39.2*	*33.4*	*27.4*	*0.0*
	2001	75.1	59.4	0.54	52.3	74.3	30744	38.4	31.0	30.6	0.0
NL	1994	51.0	58.9	0.60	48.4	53.3	13914	14.5	59.0	4.6	21.9
	2001	61.1	55.6	0.59	50.9	60.3	18261	16.7	59.1	5.4	18.8
POR	1994	68.2	73.3	0.60	57.5	95.3	9030	52.8	26.8	14.9	5.5
	2001	73.3	70.9	0.47	58.0	88.0	12244	50.6	27.7	14.6	7.1
SPA	1994	79.6	73.2	0.64	55.8	90.9	11221	16.9	18.8	19.2	45.2
	2001	85.0	68.6	0.43	56.6	82.2	15832	19.8	19.6	19.4	41.1
SWE	*1997*	*66.8*	*46.4*	*0.50*	*47.5*	29.4	*12641*	*50.1*	*9.6*	*8.4*	*31.9*
	2001	66.6	45.1	0.49	48.3	21.9	14423	39.5	30.7	29.8	0.0
UK	1994	69.6	46.9	0.59	50.1	64.4	13131	21.7	59.3	17.9	1.1
	2001	73.9	45.7	0.58	51.0	63.9	19924	23.1	61.1	15.1	0.7

Notes: ECHP-sample excludes accommodation type "other accommodation", observations with missing regional information and missing accommodation type information.

TABLE 3
Major Tax Reforms in EU Countries between 1994 and 2001
with Differential Effects on Homeowners and Landlords

Country	Year	Reform Subject	Description	Expected Effect on Homeownership
France	1998	Tax relief for interest payments	Tax credit for mortgage-related interest payments for home-buyers abolished	Negative
Germany	1996	Tax relief	A taxpayer acquiring or constructing a new owner-occupied dwelling receives an annual cash-grant up to 5% of the construction or acquisition costs for eight years. The annual payment cannot exceed 1278.23 Euros and only taxpayers with less than 122710.05 Euros annual (single) income qualify.	Positive
Germany	1999	Taxation of capital gains	The minimum holding period for speculative gains from the disposal of dwellings is increased from two to ten years. Capital gains are taxed if the dwelling is sold within this period. Principal dwellings are always exempt from taxation.	Positive
Greece	1996	Taxation of capital gains	From 9th of November 1995 onwards capital gains from disposal of immovable property are no longer subject to taxation. Under the old regime gains from the disposal of the principle dwelling were exempt if reinvested within 3 years.	Negative
Italy	2000	Imputed rents	The taxation of imputed rents for principal owner-occupied properties was informally abolished in 2000. Taxation of imputed rents still exists formally but deduction reduces it to zero.	Positive
Spain	1999	Imputed rents	Taxation of imputed rent abolished due to high compliance and administrative costs.	Positive
UK	1994 / 2000	Tax relief for interest payments	Owner-occupation was originally favoured by full deductibility of mortgage interest via Mortgage Interest Relief at Source (MIRAS). Deductibility was reduced during the 1990s and finally abolished in April 2000.	Negative

Sources: European Central Bank (2003), International Bureau of Fiscal Documentation (1994, 1996, 1998, 2000 and 2002), Haffner (2002), Joumard (2001), OECD (1994).

TABLE 4
Variable List and Means for Household-Level Estimates (all 8 Years)

Variable	Obs.	Mean	Std. Dev.	Min.	Max.
Accommodation is owner-occupied	463012	.68	.47	0	1
Accommodation is rented from public municipal, voluntary, or non-profit agency	463012	.11	.31	0	1
Household contains married couples	463012	.58	.49	0	1
Household has 1 child (below 16)	463012	.15	.36	0	1
Household has 2 or more children (below 16)	463012	.18	.38	0	1
Age of oldest HH member	463012	52.7	17.2	18	92
Age of oldest HH member is younger than 30 (omitted category)	463012	.085	.28	0	1
Age of oldest HH member is between 30-39 years	463012	.19	.39	0	1
Age of oldest HH member is between 40-49 years	463012	.19	.40	0	1
Age of oldest HH member is between 50-64 years	463012	.25	.43	0	1
Age of oldest HH member is older than 64 years	463012	.28	.45	0	1
Net HH income from work in '000 Ecu/Euro; PPP converted	463012	15752	18006	0	1857344
Accommodation is a detached single family house	463012	.35	.48	0	1
Accommodation is a semi-detached or terraced single family house (omitted category)	463012	.27	.45	0	1
Accommodation is flat in building with <10 dwellings	463012	.19	.39	0	1
Accommodation is flat in building with 10+ dwellings	463012	.19	.40	0	1
Share public rental units in region, where respondent lives	463012	.11	.11	0	.68
Accommodation has noise from neighbours or outside	372998	.24	.43	0	1
Crime or vandalism in the area	372998	.15	.36	0	1
Pollution, grime or other environmental problem caused by traffic or industry	372998	.13	.34	0	1
All household members are foreigners	368051	.010	.10	0	1
Share of households in region that only consist of foreigners	368051	.011	.016	0	.15

Data Source: Restricted-use ECHP micro data. *Notes:* Households that do not report the region of residence or live in "other accommodations" (e.g. military caserns or barracks) are dropped from the sample. The sample size of 463,012 observations is based on the specifications reported in Table 5. The sample size of 372,998 observations is based on the specifications reported in columns (1) and (2) of Table 7. The sample size of 368,051 observations is based on the specifications reported in columns (1) and (2) of Appendix Table A2.

Household Level Fixed Effects-Models

TABLE 5
Determinants of Equilibrium Housing Tenure Outcomes—*Including Public Rental*

Dependent variable:	Dummy 'respondent owns principal accommodation'		
Explanatory variables:	(1)	(2)	(3)
Accommodation is a detached single family house	0.16 **	0.16 **	0.16 **
	(0.022)	(0.022)	(0.023)
Accommodation is flat in building with	-0.25 **	-0.25 **	-0.25 **
<10 dwellings	(0.030)	(0.030)	(0.030)
Accommodation is flat in building with	-0.28 **	-0.28 **	-0.29 **
10+ dwellings	(0.044)	(0.051)	(0.051)
Household contains married couple	0.027 *	0.034 **	0.034 **
	(0.010)	(0.010)	(0.010)
Household has 1 child	0.020 **	0.022 **	0.022 **
	(0.0048)	(0.0040)	(0.0040)
Household has 2 or more children	0.039 **	0.042 **	0.042 **
	(0.0086)	(0.0071)	(0.0070)
Age of oldest HH member is between	0.12 **	0.11 **	0.11 **
30-39 years	(0.012)	(0.014)	(0.014)
Age of oldest HH member is between	0.18 **	0.16 **	0.16 **
40-49 years	(0.016)	(0.022)	(0.022)
Age of oldest HH member is between	0.22 **	0.20 **	0.19 **
50-64 years	(0.023)	(0.034)	(0.034)
Age of oldest HH member is	0.23 **	0.20 **	0.20 **
65 years or above	(0.025)	(0.040)	(0.040)
Net HH income from work in '000 Ecu/Euro;	0.0015 **	0.0014 **	0.0014 **
PPP converted	(0.00039)	(0.00041)	(0.00041)
PPP-converted net HH income in '000 squared	-0.0000011 *	-0.0000011 *	-0.0000011 *
	(0.00000049)	(0.00000047)	(0.00000047)
No taxation of imputed rents x Italy		0.040 **	0.038 **
		(0.0053)	(0.010)
No taxation of imputed rents x Spain		0.056 **	0.037 **
		(0.0053)	(0.011)
Deductibility of mortgage interest x Germany		0.024 **	0.021 **
		(0.0038)	(0.0049)
Deductibility of mortgage interest x France		-0.039 **	-0.045 **
		(0.0091)	(0.011)
Deductibility of mortgage interest x UK		-0.0061	-0.0080
		(0.0076)	(0.011)
No capital gains tax x Germany		0.0071 **	0.0093 **
		(0.0015)	(0.0021)
No capital gains tax x Greece		-0.044 **	-0.043 **
		(0.0055)	(0.014)
Share public rental units in region			-0.15 **
			(0.035)
Regional housing stock composition controls [a)]	No	No	Yes
Regional demographic & socioeconomic controls [b)]	No	No	Yes
Region fixed effects	No	No	Yes
Country x year fixed effects	No	Yes	Yes
Household fixed effects	Yes	Yes	Yes
Constant	0.50 **	0.51 **	0.41 **
	(0.022)	(0.025)	(0.056)
Observations	463012	463012	463012
Number of households in panel (fixed effects)	85798	85798	85798
R-squared within / between / overall	0.15 / 0.23 / 0.19	0.15 / 0.23 / 0.19	0.15 / 0.18 / 0.16

Notes: Robust standard errors (clustered by country) in parentheses. ** significant at 1%; * significant at 5%; (*) significant at 10%. a) Regional controls include: % detached single family units, % units in buildings with <10 dwellings, % units in buildings with 10+ dwellings. b) Regional controls include: %married, %households with 1 child, %households with 2 or more children, %households in specific age categories, average net household income from work, household income squared.

TABLE 6
Determinants of Equilibrium Housing Tenure Outcomes—*Excluding Public Rental*

Dependent variable:	Dummy 'respondent owns principal accommodation'		
Explanatory variables:	(1)	(2)	(3)
Accommodation is a detached single family house	0.13 **	0.12 **	0.12 **
	(0.023)	(0.020)	(0.020)
Accommodation is flat in building with <10 dwellings	-0.27 **	-0.27 **	-0.27 **
	(0.033)	(0.034)	(0.034)
Accommodation is flat in building with 10+ dwellings	-0.29 **	-0.30 **	-0.30 **
	(0.055)	(0.064)	(0.064)
Household contains married couple	0.019 (*)	0.025 *	0.025 *
	(0.010)	(0.011)	(0.011)
Household has 1 child	0.019 **	0.021 **	0.021 **
	(0.0046)	(0.0038)	(0.0038)
Household has 2 or more children	0.041 **	0.043 **	0.043 **
	(0.0088)	(0.0072)	(0.0072)
Age of oldest HH member is between 30-39 years	0.13 **	0.12 **	0.12 **
	(0.011)	(0.012)	(0.013)
Age of oldest HH member is between 40-49 years	0.18 **	0.17 **	0.17 **
	(0.015)	(0.020)	(0.019)
Age of oldest HH member is between 50-64 years	0.22 **	0.21 **	0.21 **
	(0.022)	(0.032)	(0.031)
Age of oldest HH member is 65 years or above	0.23 **	0.21 **	0.21 **
	(0.023)	(0.037)	(0.037)
Net HH income from work in '000 Ecu/Euro; PPP converted	0.0013 **	0.0012 *	0.0013 *
	(0.00042)	(0.00044)	(0.00045)
PPP-converted net HH income in '000 squared	-0.0000010 *	-0.00000094 (*)	-0.00000095 (*)
	(0.00000045)	(0.00000045)	(0.00000045)
No taxation of imputed rents *x* Italy		0.045 **	0.045 **
		(0.0061)	(0.012)
No taxation of imputed rents *x* Spain		0.049 **	0.044 *
		(0.0066)	(0.017)
Deductibility of mortgage interest *x* Germany		0.025 **	0.026 **
		(0.0035)	(0.0055)
Deductibility of mortgage interest *x* France		-0.038 **	-0.046 **
		(0.0090)	(0.011)
Deductibility of mortgage interest *x* UK		0.012	0.0033
		(0.007)	(0.010)
No capital gains tax *x* Germany		0.021 **	0.023 **
		(0.0043)	(0.0073)
No capital gains tax *x* Greece		-0.044 **	-0.026 (*)
		(0.0055)	(0.013)
Share public rental units in region			0.018
			(0.061)
Regional housing stock composition controls [a)]	No	No	Yes
Regional demographic & socioeconomic controls [b)]	No	No	Yes
Region fixed effects	No	No	Yes
Country x year fixed effects	No	Yes	Yes
Household fixed effects	Yes	Yes	Yes
Constant	0.58 **	0.59 **	0.52 **
	(0.022)	(0.024)	(0.048)
Observations	411715	411715	411715
Number of households in panel (fixed effects)	78501	78501	78501
R-squared within	0.14	0.14	0.15
R-squared between	0.20	0.20	0.12
R-squared overall	0.15	0.15	0.090

Notes: Robust standard errors (clustered by country) in parentheses. ** significant at 1%; * significant at 5%; (*) significant at 10%. [a) / b)] Regional controls as listed in Table 5.

TABLE 7
Determinants of Equilibrium Housing Tenure Outcomes—*With Neighbourhood Controls*

Dependent variable:	Dummy 'respondent owns principal accommodation'			
	Including public rental units		Excluding public rental units	
Explanatory variables:	(1)	(2)	(3)	(4)
Accommodation is a detached single family house	0.16 **	0.16 **	0.097 *	0.096 *
	(0.045)	(0.045)	(0.034)	(0.033)
Accommodation is flat in building with <10 dwellings	-0.21 **	-0.21 **	-0.22 **	-0.22 **
	(0.029)	(0.029)	(0.036)	(0.036)
Accommodation is flat in building with 10+ dwellings	-0.20 **	-0.20 **	-0.17 **	-0.16 **
	(0.037)	(0.036)	(0.033)	(0.033)
Dummy: accommodation has noise from neighbours or outside		-0.015 **		-0.013 **
		(0.0026)		(0.0022)
Dummy: crime or vandalism in the area		-0.0055 *		-0.00049
		(0.0020)		(0.0013)
Dummy: pollution, grime or other environmental problem caused by traffic or industry		-0.0052 (*)		-0.0081 **
		(0.0026)		(0.0018)
Household contains married couple	0.048 **	0.048 **	0.040 **	0.040 **
	(0.0073)	(0.0073)	(0.0076)	(0.0076)
Household has 1 child	0.020 **	0.020 **	0.018 **	0.018 **
	(0.0046)	(0.0046)	(0.0043)	(0.0043)
Household has 2 or more children	0.036 **	0.036 **	0.035 **	0.035 **
	(0.0076)	(0.0076)	(0.0081)	(0.0081)
Age of oldest HH member is between 30-39 years	0.11 **	0.11 **	0.12 **	0.12 **
	(0.012)	(0.012)	(0.013)	(0.013)
Age of oldest HH member is between 40-49 years	0.15 **	0.15 **	0.15 **	0.15 **
	(0.018)	(0.018)	(0.017)	(0.017)
Age of oldest HH member is between 50-64 years	0.16 **	0.16 **	0.16 **	0.16 **
	(0.022)	(0.021)	(0.020)	(0.020)
Age of oldest HH member is 65 years or above	0.15 **	0.15 **	0.16 **	0.16 **
	(0.024)	(0.024)	(0.021)	(0.021)
Net HH income from work in '000 Ecu/Euro; PPP converted	0.00099 **	0.00099 **	0.00078 **	0.00078 **
	(0.00018)	(0.00018)	(0.00012)	(0.00012)
PPP-converted net HH income in '000 squared	-0.00000073 *	-0.00000072 *	-0.00000057 *	-0.00000057 *
	(0.00000026)	(0.00000026)	(0.00000019)	(0.00000019)
Share public rental units in region	-0.12 **	-0.11 **	0.14 **	0.14 **
	(0.031)	(0.031)	(0.032)	(0.033)
Regional housing stock composition controls [a)]	Yes	Yes	Yes	Yes
Regional demographic & socioeconomic controls [b)]	Yes	Yes	Yes	Yes
Region fixed effects	Yes	Yes	Yes	Yes
Country-specific housing policy reform controls [c)]	Yes	Yes	Yes	Yes
Country x year fixed effects	Yes	Yes	Yes	Yes
Household fixed effects	Yes	Yes	Yes	Yes
Constant	0.45 **	0.44 **	0.45 **	0.45 **
	(0.077)	(0.078)	(0.073)	(0.074)
Observations	372998	372998	330590	330590
Number of households in panel (fixed effects)	69212	69212	62750	62750
R-squared within	0.089	0.090	0.067	0.067
R-squared between	0.14	0.14	0.068	0.069
R-squared overall	0.11	0.11	0.037	0.038

Notes: Robust standard errors (clustered by country) in parentheses. ** significant at 1%; * significant at 5%; (*) significant at 10%. [a) / b)] Regional controls as listed in Table 5. [c)] Includes controls for all reforms relating to taxation of imputed rents, deductibility of mortgage interest and capital gains taxation.

TABLE 8
Summary Statistics of Regional Sample
(Regions are NUTS-Level 1 and 2, 1994-2001)

Variable	Obs	Mean	Std. Dev.	Min	Max
Homeownership rate excl. public rental units	833	.76	.16	.16	1
Homeownership rate incl. public rental units	833	.66	.17	.088	.90
Share of units that are public rental units	833	.14	.12	0	.68
Share HH that contain married couples	833	.57	.12	.30	.83
Average number of children (16 or younger)	833	.56	.12	.20	1.1
Share of households with one child	833	.16	.039	.045	.33
Share of households with 2 or more children	833	.17	.047	.022	.37
Average age of oldest household member	833	51.7	4.1	37.2	62.5
Share of HH with age of oldest member being below 30 *(=omitted category)*	833	.10	.058	.0081	.42
between 30-39 y.	833	.19	.051	.072	.43
between 40-49 y.	833	.19	.033	.065	.28
between 50-64 y.	833	.24	.039	.088	.36
65 years or above	833	.27	.082	.054	.52
Average PPP-converted net HH inc. from work	833	15432	3897	6095	30906
Share of private accommodations that are detached single family home	833	.31	.16	.024	.82
Share of private accommodations that are semidetached or terraced *(=omitted category)*	833	.33	.24	.0053	.87
Share of private accommodations that are small apartment buildings	833	.20	.14	.0076	.62
Share of private accommodations that are large apartment buildings	833	.16	.17	0	.84
Share of young adults (18-30) living with parents (incl. step/foster/in-laws) and/or grandparents	833	.70	.17	.16	.98

Region Level Fixed Effects-Models

TABLE 9
Determinants of Regional Homeownership Rates

Dependent variable:	Homeownership rate in region (including or excluding public rental units)			
	(1)	(2)	(3)	(4)
Explanatory variables:	HOR—*All*	HOR—*All*	HOR—*Private*	HOR—*Private*
Share public rental units in region		-0.29 *		0.37 **
		(0.12)		(0.060)
Share of detached single family	-0.082	-0.087	-0.15	-0.14
units as % of all housing units	(0.059)	(0.078)	(0.13)	(0.10)
Share of flats in building with	-0.43 **	-0.34 **	-0.37 **	-0.47 **
<10 dwellings as % of all units	(0.10)	(0.086)	(0.12)	(0.12)
Share of flats in building with	-0.41 **	-0.36 **	-0.41 **	-0.47 **
10+ dwellings as % of all units	(0.11)	(0.099)	(0.12)	(0.12)
Share of married couples in region	0.078	0.11	0.15	0.11
	(0.053)	(0.069)	(0.12)	(0.11)
Share of households with one child	-0.022	0.023	0.14	0.078
	(0.073)	(0.066)	(0.12)	(0.12)
Share of households with two or	0.0019	0.096	0.25 **	0.13
more children	(0.12)	(0.093)	(0.076)	(0.094)
Share of HH with age of oldest	0.21 **	0.12 **	0.076	0.18 *
member being between 30-39 y.	(0.028)	(0.037)	(0.069)	(0.071)
Share of HH with age of oldest	0.23 *	0.075	0.021	0.21 (*)
member being between 40-49 y.	(0.098)	(0.085)	(0.071)	(0.11)
Share of HH with age of oldest	0.23 *	0.12	0.17 *	0.32 *
member being between 50-64 y.	(0.10)	(0.073)	(0.065)	(0.14)
Share of HH with age of oldest	0.31 *	0.23 (*)	0.25 (*)	0.35 *
member being 65 years or above	(0.11)	(0.12)	(0.12)	(0.13)
Share of young adults (18-30)	-0.050	-0.015	0.032	-0.012
living with parents or grandparents	(0.033)	(0.038)	(0.042)	(0.047)
PPP-converted av. net HH income	0.010 *	0.0061 (*)	0.0041	0.0090 *
from work in '000 Ecu/Euro	(0.0038)	(0.0031)	(0.0044)	(0.0040)
PPP-converted average net HH	-0.00020	-0.00011	-0.000070	-0.00018
income in '000 squared	(0.00012)	(0.00010)	(0.00013)	(0.00012)
No taxation of imputed rents *x* Italy	0.019 **	0.025 **	0.032 **	0.024 **
	(0.0060)	(0.0061)	(0.0084)	(0.0066)
No taxation of imputed rents *x*	0.012	0.021 **	0.036 **	0.024 **
Spain	(0.0080)	(0.0066)	(0.0074)	(0.0064)
Deductibility of mortgage interest *x*	-0.0019	-0.0016	0.0069 **	0.0065 **
Germany	(0.0026)	(0.0038)	(0.0015)	(0.0021)
Deductibility of mortgage interest *x*	-0.020 **	-0.023 **	-0.025 *	-0.021 *
France	(0.0045)	(0.0060)	(0.0089)	(0.0087)
Deductibility of mortgage interest *x*	-0.0072	-0.0081	0.011	0.013
UK	(0.0068)	(0.0065)	(0.0086)	(0.010)
No capital gains tax *x* Germany	0.019 **	0.012*	0.017 **	0.026 **
	(0.0021)	(0.0045)	(0.0058)	(0.0087)
No capital gains tax *x* Greece	-0.054 **	-0.058 **	-0.058 **	-0.053 **
	(0.0039)	(0.0035)	(0.0046)	(0.0044)
Country x year fixed effects	Yes	Yes	Yes	Yes
Region fixed effects	Yes	Yes	Yes	Yes
Constant	0.50 **	0.58 **	0.59 **	0.48 **
	(0.095)	(0.099)	(0.12)	(0.098)
Observations	833	833	833	833
Number of NUTS regions	109	109	109	109
R-sq within	0.67	0.71	0.49	0.56
R-sq between	0.28	0.57	0.47	0.30
R-sq overall	0.29	0.58	0.47	0.30

Notes: Robust standard errors are clustered by country. ** significant at 1%; * significant at 5%; (*) significant at 10%.

TABLE 10
Quantitative Effects

Individual Level-Fixed Effects Specification (Based on Column (3) of Table 5)	
Change in Explanatory Variable	Quantitative Effect
	Change in probability that household owns (incl. choice of public rental)
Demographic and Socioeconomic Characteristics	
Change of marital status to married	+3.4%
Change from no child to one child	+2.2%
Change of age group from below 30 to 30-39 years	+11.0%
Net household income increases by 1 std. dev. (+18,006 Ecu/Euro)	+2.4%
Location specific determinants	
Move from small apartment building to detached single family house	+41%
Formal or informal abolition of taxation of imputed rents (average ITA & SP)	+3.8%
Increase of share public rental units in region by 1 std. dev. (+11%)	-1.6%
Regional Level Fixed Effects Specification (Based on Column (2) of Table 9)	
	Change / difference in homeownership rate (incl. public rental)
Demographic and socioeconomic composition of region	
Share married households increases by 1 std. dev. (+12%)	[+1.3%]
Max. cross-sectional diff. in 2001 (Hamburg (GER): 29.7%, Sicilia (ITA): 79.1%)	[$\Delta = 5.4\%$]
Share households with one child increases by 1 std. dev. (+3.9%) [a)]	[+0.090%]
Maximum difference in implied effect of fertility on homeownership rate, 2001	
Least favourable: Bremen (Germany) (share 1 child: 11.1%, share 2+ children: 4.4%)	[$\Delta = 2.1\%$]
Most favourable: Lancashire (UK) (15.1%, 25.6%)	
Share of age group between 30 to 39 increases by 1 std. dev. (+5.1%) [a)]	+0.61%
Maximum difference in effect of age composition on homeownership rate, 2001	
Least favourable: Uusimaa (FIN) (30-39:19.2%, 40-49:20.4%, 50-64:27.4%, 65+:13%)	$\Delta = 6.6\%$ [b)]
Most favourable: Algarve (POR) (9.2%, 13.4%, 21.7%, 52.3%)	$\Delta = 7.8\%$ [c)]
Average household income increases by 1 std. dev. (+3897 Ecu/Euro)	+0.83% [d)]
Least favourable: Algarve (POR) (9083 Euro)	
Most favourable: Uusimaa (FIN) (30906 Euro)	$\Delta = 3.7\%$ [d)]
Share of young adults living with parents/grandparents increases by 1 std. dev. (+17%)	[-0.26%]
Max. cross-sectional diff. in 2001 (Madeira (POR): 94.8%, Stockholm (SWE): 16.0%)	[$\Delta = 1.2\%$]
Other location specific characteristics	
Share of units in small apartment buildings increases by 1 std. dev. (+14%) [a)]	-4.8%
Maximum difference in effect of housing stock composition on ownership rate, 2001	
Least favourable: Berlin (det.: 6.7%, semi: 2.6%, apt. small: 28.9, apt. large: 61.9%)	$\Delta = 30.4\%$ [b)]
Most favourable: Dublin [b)] (11.1%, 85.2%, 0.8%, 2.8%) /	$\Delta = 31.6\%$ [c)]
Ireland, rest [c)] (68.0%, 30.5%, 1.2%, 2.6%)	
Formal or informal abolition of taxation of imputed rents (average ITA & SP)	+2.3%
Increase of share public rental units in region by 1 std. dev. (+12%)	-3.5%
Maximum difference in effect of share public rental units on homeownership rate, 2001	
Least favourable: Mecklenburg-Vorpommern (GER) (share public rental: 41%)	$\Delta = 11.9\%$
Most favourable: Regions in GRE, LUX, SWE (share public rental: 0%)	

Notes: Quantitative effects of non-linear effects (income squared) are measured at the sample mean. Brackets [ ] indicate that quantitative effects are not statistically significant. [a)] Omitted category (semi-detached or terraced) decreases by the same amount to compensate the effect. [b)] Includes effects of statistically insignificant variables. [c)] Excludes effects of statistically insignificant variables. [d)] Includes effect of statistically insignificant quadratic income term. Quantitative effects are virtually unchanged if the effect of the quadratic term is dropped.

Appendix

APPENDIX TABLE A1
Effects of Housing Stock Composition and Other Regional Controls on Individual Tenure

Dependent variable:	Dummy 'respondent owns principal accommodation'			
Housing stock composition and regional demographic and socioeconomic controls:	Table 5 Column (3)	Table 6 Column (3)	Table 7 Column (2)	Table 7 Column (4)
Share of detached single family units as % of all housing units	-0.16 **	-0.10 (*)	-0.15 *	-0.12 (*)
	(0.039)	(0.048)	(0.056)	(0.062)
Share of flats in building with <10 dwellings as % of all units	0.041	0.038	0.069	0.021
	(0.057)	(0.051)	(0.051)	(0.066)
Share of flats in building with 10+ dwellings as % of all units	0.041	0.064	0.061	-0.0088
	(0.040)	(0.040)	(0.060)	(0.064)
Share of married couples in region	0.12 **	0.13 **	0.092 (*)	0.089 (*)
	(0.034)	(0.040)	(0.043)	(0.043)
Share of households with one child	-0.074	-0.097 (*)	-0.013	-0.025
	(0.048)	(0.054)	(0.035)	(0.029)
Share of households with two or more children	0.0083	0.016	0.14 **	0.15 **
	(0.068)	(0.064)	(0.037)	(0.039)
Share of HH with age of oldest member being between 30-39 y.	0.073 (*)	0.018	0.086	0.062
	(0.041)	(0.061)	(0.080)	(0.096)
Share of HH with age of oldest member being between 40-49 y.	-0.068	-0.094	-0.064	-0.063
	(0.061)	(0.067)	(0.083)	(0.088)
Share of HH with age of oldest member being between 50-64 y.	-0.092	-0.13 (*)	-0.073	-0.097
	(0.070)	(0.073)	(0.095)	(0.094)
Share of HH with age of oldest member being 65 years or above	0.087	0.063	0.14 (*)	0.10
	(0.056)	(0.074)	(0.066)	(0.079)
PPP-converted av. net HH income from work in '000 Ecu/Euro	0.00032	0.00090	0.0024	0.0020
	(0.0022)	(0.0023)	(0.0023)	(0.0021)
PPP-converted average net HH income in '000 squared	0.0000041	-0.000016	0.000065	0.000052
	(0.000069)	(0.000071)	(0.000057)	(0.000056)

APPENDIX TABLE A2

Determinants of Equilibrium Housing Tenure Outcomes—*With Citizenship Status Controls*

Dependent variable:	Dummy 'respondent owns principal accommodation'			
	Including public rental units		Excluding public rental units	
Explanatory variables:	(1)	(2)	(3)	(4)
All household members are foreigners		0.0052		-0.0025
		(0.011)		(0.011)
Share of households in region that only consist of foreigners		-0.079		-0.079
		(0.089)		(0.099)
Accommodation is a detached single family house	0.16 **	0.16 **	0.10 *	0.099 *
	(0.045)	(0.045)	(0.033)	(0.033)
Accommodation is flat in building with <10 dwellings	-0.22 **	-0.21 **	-0.22 **	-0.22 **
	(0.029)	(0.029)	(0.037)	(0.037)
Accommodation is flat in building with 10+ dwellings	-0.20 **	-0.20 **	-0.17 **	-0.16 **
	(0.037)	(0.037)	(0.033)	(0.033)
Household contains married couple	0.047 **	0.047 **	0.039 **	0.039 **
	(0.0074)	(0.0075)	(0.0076)	(0.0076)
Household has 1 child	0.020 **	0.020 **	0.018 **	0.018 **
	(0.0047)	(0.0047)	(0.0043)	(0.0043)
Household has 2 or more children	0.036 **	0.036 **	0.034 **	0.034 **
	(0.0077)	(0.0077)	(0.0081)	(0.0081)
Age of oldest HH member is between 30-39 years	0.12 **	0.12 **	0.12 **	0.12 **
	(0.011)	(0.011)	(0.012)	(0.012)
Age of oldest HH member is between 40-49 years	0.15 **	0.15 **	0.15 **	0.15 **
	(0.016)	(0.016)	(0.015)	(0.015)
Age of oldest HH member is between 50-64 years	0.16 **	0.16 **	0.16 **	0.16 **
	(0.020)	(0.020)	(0.018)	(0.018)
Age of oldest HH member is 65 years or above	0.16 **	0.16 **	0.16 **	0.16 **
	(0.022)	(0.022)	(0.019)	(0.019)
Net HH income from work in '000 Ecu/Euro; PPP converted	0.00099 **	0.00098 **	0.00078 **	0.00077 **
	(0.00018)	(0.00018)	(0.00013)	(0.00013)
PPP-converted net HH income in '000 squared	-0.00000073 *	-0.00000072 *	-0.00000057 *	-0.00000057 *
	(0.00000026)	(0.00000026)	(0.00000019)	(0.00000019)
Share public rental units in region	-0.072 *	-0.070 *	0.17 **	0.17 **
	(0.025)	(0.025)	(0.039)	(0.040)
Neighbourhood controls	No	Yes	No	Yes
Regional housing stock composition controls [a)]	Yes	Yes	Yes	Yes
Regional demographic & socioeconomic controls [b)]	Yes	Yes	Yes	Yes
Region fixed effects	Yes	Yes	Yes	Yes
Country-specific housing policy reform controls [c)]	Yes	Yes	Yes	Yes
Country x year fixed effects	Yes	Yes	Yes	Yes
Household fixed effects	Yes	Yes	Yes	Yes
Constant	0.432 **	0.423 **	0.409 **	0.405 **
	(0.070)	(0.070)	(0.069)	(0.068)
Observations	368051	368051	326586	326586
Number of households in panel (fixed effects)	68997	68997	62576	62576
R-squared within	0.090	0.091	0.067	0.069
R-squared between	0.15	0.15	0.069	0.071
R-squared overall	0.12	0.12	0.039	0.039

Notes: Robust standard errors (clustered by country) in parentheses. ** significant at 1%; * significant at 5%; (*) significant at 10%. [a) / b)] Regional controls as listed in Table 5. [c)] Includes controls for all reforms relating to taxation of imputed rents, deductibility of mortgage interest and capital gains taxation.

APPENDIX TABLE A3
Region-Level Homeownership Rates for 2001: Actual and Predicted—*Based on Table 9(2)*

Country	Code	Count	NUTS Region Name	Actual HOR	Predict w FE	Δ	Predict w/o FE	Δ
Austria	AT1	972	Ostösterreich	53.8	52.9	-0.9	59.2	5.4
	AT2	593	Südösterreich	68.1	68.7	0.6	67.5	-0.6
	AT3	698	Westösterreich	65.2	65.6	0.4	67.2	2.0
Belgium	BE1	258	Région Bruxelles	60.5	58.0	-2.5	65.5	5.0
	BE2	997	Vlaams Gewest	76.8	78.4	1.6	81.1	4.3
	BE3	985	Région Wallonne	73.6	74.5	0.9	80.0	6.4
Germany	DE1	652	Baden-Württemberg	38.7	40.7	2.0	63.3	24.6
	DE2	657	Bayern	48.9	47.0	-1.9	65.9	17.0
	DE3	194	Berlin	11.9	12.2	0.3	37.4	25.5
	DE4	129	Brandenburg	24.8	29.2	4.4	49.2	24.4
	DE5	45	Bremen	40.0	37.3	-2.7	54.7	14.7
	DE6	64	Hamburg	18.8	19.7	0.9	43.4	24.6
	DE7	354	Hessen	37.3	36.5	-0.8	60.0	22.7
	DE8	100	Mecklenburg-Vorpommern	27.0	27.4	0.4	45.4	18.4
	DE9	412	Niedersachsen	48.5	47.7	-0.8	65.9	17.4
	DEA	1038	Nordrhein-Westfalen	37.3	36.2	-1.1	60.4	23.1
	DED	252	Sachsen	29.0	31.0	2.0	53.5	24.5
	DEE	152	Sachsen-Anhalt	31.6	31.7	0.1	49.5	17.9
	DEF	113	Schleswig-Holstein	54.9	53.6	-1.3	69.9	15.0
	DEG	157	Thüringen	36.3	35.4	-0.9	51.5	15.2
	DEX	297	Rheinland-Pfalz + Saarland	52.2	51.3	-0.9	70.3	18.1
Denmark	DK0	2075	Denmark	66.2	66.2	0.0	63.6	-2.6
Spain	ES1	682	Noroeste	86.1	84.8	-1.3	71.6	-14.5
	ES2	685	Noreste	88.6	90.1	1.5	62.8	-25.8
	ES3	433	Comunidad de Madrid	83.6	83.8	0.2	58.9	-24.7
	ES4	840	Centro (E)	85.2	84.4	-0.8	72.4	-12.8
	ES5	1012	Este	83.2	83.1	-0.1	64.9	-18.3
	ES6	927	Sur	86.7	86.3	-0.4	71.1	-15.6
	ES7	287	Canarias (ES)	75.3	76.2	0.9	72.1	-3.2
Finland	FI11	755	Uusimaa	64.0	61.6	-2.4	52.6	-11.4
	FI12	1051	Etelä-Suomi (incl. Åland)	68.9	68.6	-0.3	58.3	-10.6
	FI13	438	Itä-Suomi	68.5	68.6	0.1	60.2	-8.3
	FI14	411	Väli-Suomi	69.6	69.6	0.0	63.1	-6.5
	FI15	233	Pohjois-Suomi	66.1	68.7	2.6	61.2	-4.9
France	FR1	741	Île de France	54.4	52.1	-2.3	53.4	-1.0
	FR2	952	Bassin Parisien	62.1	62.0	-0.1	66.3	4.2
	FR3	354	Nord - Pas-de-Calais	60.2	62.3	2.1	71.2	11.0
	FR4	491	Est	57.4	59.4	2.0	66.3	8.9
	FR5	812	Ouest	65.5	66.4	0.9	68.4	2.9
	FR6	614	Sud-Ouest	64.7	65.4	0.7	70.2	5.5
	FR7	578	Centre-Est	60.9	59.3	-1.6	63.1	2.2
	FR8	580	Méditerranée	63.1	61.3	-1.8	65.5	2.4
Greece	GR1	1333	Voreia Ellada	85.0	85.5	0.5	69.9	-15.1
	GR2	1028	Kentriki Ellada	88.3	86.7	-1.6	73.9	-14.4
	GR3	896	Attiki	77.5	77.0	-0.5	62.8	-14.7
	GR4	506	Nisia Aigaiou, Kriti	80.6	82.2	1.6	75.4	-5.2
Ireland	IE1	1142	Ireland, excluding Dublin	87.4	87.4	0.0	81.9	-5.5
	IE2	359	Dublin	86.9	86.9	0.0	85.1	-1.8
Italy	IT1	437	Nord Ovest	77.3	74.2	-3.1	65.8	-11.5
	IT2	545	Lombardia	77.4	76.2	-1.2	66.5	-10.9
	IT3	564	Nord Est	80.5	78.5	-2.0	69.4	-11.1
	IT4	289	Emilia-Romagna	73.7	72.4	-1.3	64.9	-8.8
	IT5	560	Centro (I)	83.6	81.7	-1.9	67.9	-15.7

APPENDIX TABLE A3—*Continued*
Region-Level Homeownership Rates for 2001: Actual and Predicted—*Based on Table 9(2)*

Country	Code	Count	NUTS Region Name	Actual HOR	Predict w FE	Δ	Predict w/o FE	Δ
Italy (Cont.)	IT6	268	Lazio	71.6	74.0	2.4	57.2	-14.4
	IT7	320	Abruzzo-Molise	84.7	85.2	0.5	64.1	-20.6
	IT8	529	Campania	69.4	71.4	2.0	63.0	-6.4
	IT9	736	Sud	75.4	77.4	2.0	62.1	-13.3
	ITA	478	Sicilia	78.5	80.2	1.7	64.3	-14.2
	ITB	364	Sardegna	82.7	83.6	0.9	71.4	-11.3
Luxembourg	LU	2219	Luxembourg	75.1	75.1	0.0	75.9	0.8
Netherlands	NL	4149	Netherlands	61.1	61.1	0.0	71.6	10.5
Portugal	PT11	818	Norte	62.1	60.4	-1.7	77.3	15.2
	PT12	942	Centro (P)	83.5	85.3	1.8	81.5	-2.0
	PT13	450	Lisboa e Vale do Tejo	64.0	62.3	-1.7	67.5	3.5
	PT14	430	Alentejo	66.7	64.7	-2.0	84.2	17.5
	PT15	543	Algarve	71.8	73.1	1.3	78.4	6.6
	PT2	606	Açores (PT)	81.5	84.4	2.9	88.2	6.7
	PT3	523	Madeira (PT)	77.8	77.4	-0.4	80.4	2.6
Sweden	SE01	1057	Stockholm	60.1	59.6	-0.5	61.3	1.2
	SE02	965	Östra Mellansverige	67.9	66.0	-1.9	62.7	-5.2
	SE04	812	Sydsverige	66.4	67.3	0.9	62.4	-4.0
	SE06	550	Norra Mellansverige	67.6	67.9	0.3	61.9	-5.7
	SE07	247	Mellersta Norrland	68.4	72.4	4.0	63.2	-5.2
	SE08	348	Övre Norrland	74.1	73.0	-1.1	64.1	-10.0
	SE09	481	Småland med öarna	71.7	70.4	-1.3	65.6	-6.1
	SE0A	1148	Västsverige	66.2	65.8	-0.4	63.8	-2.4
UK	UK11	99	Cleveland, Durham	76.8	74.6	-2.2	76.2	-0.6
	UK12	67	Cumbria	73.1	76.8	3.7	76.5	3.4
	UK13	115	Northumberland, Tyne and Wear	67.0	65.4	-1.6	70.4	3.4
	UK21	78	Humberside	82.1	81.8	-0.3	78.3	-3.8
	UK22	73	North Yorkshire	75.3	73.6	-1.7	72.1	-3.2
	UK23	122	South Yorkshire	75.4	75.2	-0.2	75.4	0.0
	UK24	143	West Yorkshire	61.5	64.8	3.3	69.6	8.1
	UK31	221	Derbyshire, Nottinghamshire	69.7	68.0	-1.7	72.2	2.5
	UK32	100	Leicestershire, Northamptonshire	74.0	74.1	0.1	73.8	-0.2
	UK33	46	Lincolnshire	67.4	67.9	0.5	72.3	4.9
	UK40	191	East Anlia	73.3	76.0	2.7	75.0	1.7
	UK51	82	Bedfordshire, Hertfordshire	75.6	76.8	1.2	72.3	-3.3
	UK52	203	Berkshire, Buckinghamshire, Oxfordshire	81.8	81.4	-0.4	76.7	-5.1
	UK53	183	Surrey, East-West Sussex	78.1	76.6	-1.5	71.7	-6.4
	UK54	121	Essex	83.5	82.9	-0.6	77.7	-5.8
	UK55	385	Greater London	67.8	68.0	0.2	65.6	-2.2
	UK56	137	Hampshire, Isle of Wight	70.8	75.2	4.4	70.3	-0.5
	UK57	100	Kent	79.0	77.4	-1.6	74.5	-4.5
	UK61	189	Avon, Gloucestershire, Wiltshire	76.2	76.8	0.6	75.8	-0.4
	UK62	65	Cornwall, Devon	73.8	69.1	-4.7	69.9	-3.9
	UK63	135	Dorset, Somerset	83.0	83.3	0.3	74.2	-8.8
	UK71	81	Hereford and Worcester, Warwickshire	80.2	83.8	3.6	75.8	-4.4
	UK72	157	Shropshire, Staffordshire	78.3	76.3	-2.0	75.3	-3.0
	UK73	149	West Midlands (County)	75.8	73.4	-2.4	72.1	-3.7
	UK81	100	Cheshire	78.0	77.2	-0.8	74.7	-3.3
	UK82	174	Greater Manchester	72.4	71.3	-1.1	72.5	0.1
	UK83	86	Lancashire	74.4	76.8	2.4	75.5	1.1
	UK84	92	Merseyside	69.6	69.9	0.3	70.3	0.7
	UK91	101	Clwyd, Dyfed, Gwynedd, Powys	76.2	75.6	-0.6	76.1	-0.1
	UK92	144	Gwent, Mid-South-West Glamorgan	76.4	77.0	0.6	73.0	-3.4
	UKA1	205	Borders-Central-Fife-Lothian-Tayside	72.2	73.6	1.4	62.4	-9.8
	UKA2	150	Dumfries and Galloway, Strathclyde	62.0	62.8	0.8	65.2	3.2
	UKA4	45	Grampian	68.9	66.1	-2.8	60.9	-8.0