



OECD Economics Department Working Papers No. 849

Drivers of Homeownership
Rates in Selected OECD
Countries

**Dan Andrews,
Aida Caldera Sánchez**

<https://dx.doi.org/10.1787/5kgg9mcwc7jf-en>

Unclassified

ECO/WKP(2011)18

Organisation de Coopération et de Développement Économiques
Organisation for Economic Co-operation and Development

18-Mar-2011

English - Or. English

ECONOMICS DEPARTMENT

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By Dan Andrews and Aida Caldera Sánchez

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ABSTRACT/RESUMÉ

Drivers of homeownership rates in selected OECD countries

Homeownership rates have increased significantly in many OECD countries over recent decades. Using micro-econometric decomposition techniques, this paper shows that part of this increase can be explained by changes in the characteristics of households, including age, household structure, incomes and education. Nevertheless, a significant portion of the change in homeownership rates remains unexplained by shifts in household characteristics, leaving a potential role for public policy in explaining developments in homeownership rates. Panel estimates suggest that the relaxation of down-payment constraints on mortgage loans has increased homeownership rates among credit-constrained households over recent decades, resulting in a rise in the aggregate homeownership rate that is comparable to the impact of population ageing. In countries where tax relief on mortgage debt financing is generous, however, the expansionary impact of mortgage market innovations on homeownership is smaller. This is consistent with the tendency for such housing tax reliefs to be capitalised into real house prices, which may crowd-out some financially constrained households from homeownership at the margin. The impact of housing policies regulating the functioning of the rental market, such as rent regulation and provisions for tenure security, on tenure choice is also explored.

JEL classification codes: R21; R31; G21; H24.

Keywords: Housing markets; homeownership; mortgage markets; financial regulation; taxation.

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Les déterminants du taux de propriété immobilière dans les pays de l'OCDE

Les taux d'accession à la propriété immobilière ont augmenté de façon significative dans de nombreux pays de l'OCDE au cours des dernières décennies. En utilisant des techniques micro-économétriques, cette étude montre qu'une partie de cette augmentation est expliquée par des changements dans les caractéristiques des ménages, y compris l'âge, la structure du ménage, les revenus et l'éducation. Néanmoins, une part importante de la variation des taux d'accession à la propriété ne s'explique pas par des changements dans les caractéristiques du ménage, ce qui laisse un rôle potentiel aux politiques publiques pour expliquer l'évolution des taux d'accession à la propriété. Des estimations de panel suggèrent que l'assouplissement des conditions d'apport pour les prêts hypothécaires a augmenté les taux d'accession à la propriété parmi les ménages en butte à des contraintes de crédits, entraînant un effet sur les taux d'accession à la propriété globale comparable à l'impact du vieillissement de la population. Dans les pays où des allègements d'impôt sur le financement de la dette hypothécaire sont généreux, cependant, l'effet expansionniste des innovations sur le marché hypothécaire sur l'accession à la propriété est moindre. Ceci est cohérent avec la tendance pour ces dégrèvements fiscaux à être capitalisées dans les prix réels des logements, ce qui peut évincer, à la marge, certains ménages en difficulté financièrement à l'accession à la propriété. L'impact des politiques du logement qui régissent le fonctionnement du marché locatif sur le mode d'occupation est également exploré.

Classification JEL : R21 ; R31 ; G21 ; H24.

Mots-clés : Marché du logement ; propriété immobilière ; marché du crédit hypothécaire ; réglementation financière ; fiscalité.

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TABLE OF CONTENTS

DRIVERS OF HOMEOWNERSHIP RATES IN SELECTED OECD COUNTRIES	5
1. Introduction and main findings	5
2. Homeownership and public policy in OECD countries	7
3. Evolution and potential drivers of homeownership rates in selected OECD countries	8
4. Empirical strategy	13
Non-policy influences on tenure choice	13
Policy influences on tenure choice	14
5. Empirical results: non-policy influences on tenure choice	16
Decomposing the change in aggregate homeownership rates	17
6. Empirical results: policy influences on tenure choice.....	20
Mortgage market innovations.....	21
Tax relief on mortgage debt financing	23
Rental market regulations.....	24
7. Conclusion	25
REFERENCES	26
APPENDIX A: DATA SOURCES	30
APPENDIX B: ADDITIONAL CHARTS	32
APPENDIX C: FAIRLIE NON-LINEAR DECOMPOSITION	34
APPENDIX D: EMPIRICAL TABLES	35
APPENDIX E: DEMOGRAPHIC AND SOCIO-ECONOMIC CHANGES.....	39
APPENDIX F: DETAILED DECOMPOSITION RESULTS	41

Tables

1. Aggregate homeownership rates in selected OECD countries	9
2. Contribution of household size and structure to the change in the aggregate homeownership rate	20
3. Panel estimation of homeownership rates.....	21
4. The effect of policies on tenure choice	25
D1. Logistic regression coefficients from tenure choice equation.....	35
D2. Marginal effects coefficients from tenure choice equation	37
E1. Sample means for explanatory variables	40

Figures

1. Homeownership rates by age group.....	10
2. Homeownership rates by household disposable income quartile	11
3. Tax relief on debt financing cost of homeownership.....	12
4. Impact of a 10 percent increase in household disposable income on the probability of being a homeowner.....	17
5. The contribution of ageing to the change in the aggregate homeownership rate.....	19
6. Homeownership, financial deregulation and housing tax relief.....	22
7. Who benefits from the home mortgage interest deduction?	24
B1. Homeownership rate by age group.....	32
B2. Homeownership rate by income quartile.....	33
F1. Detailed decompositions – countries with rising homeownership rates	41
F2. Detailed decompositions – countries with stable or declining homeownership rates.....	42

DRIVERS OF HOMEOWNERSHIP RATES IN SELECTED OECD COUNTRIES

By Dan Andrews and Aida Caldera Sánchez¹

1. Introduction and main findings

1. Aggregate homeownership rates have increased significantly in many OECD countries over recent decades. A deeper understanding of the factors driving these trends is useful, given the potential consequences of homeownership for economic performance. On the one hand, homeownership has been linked to better educational outcomes – and, thus, future income prospects – for resident children (Haurin *et al.* 2002), as well as broader societal benefits such as a more active and informed citizenry (Di Pasquale and Glaeser, 1999). On the other hand, rates of residential mobility tend to be lower among homeowners than renters – possibly reflecting the higher moving costs associated with owner-occupied housing – which may make homeowners more susceptible to spells of unemployment (Oswald, 1996).

2. Even if the broader net effects of homeownership are unclear, it is still important to understand the factors driving homeownership rates to the extent that public policy in OECD countries is generally geared to enhancing homeownership, whether through the preferential tax treatment of housing investment or broader changes in financial markets that have alleviated credit constraints.² While it is tempting to conclude that such factors have underpinned a shift towards homeownership as the preferred mode of tenure in many OECD countries, part of the increase in homeownership rates over this period could simply reflect demographic and socio-economic influences. For example, the tendency for homeownership rates to rise with age implies that aggregate homeownership rates would have increased in OECD countries over recent decades – even if nothing else changed – due to population ageing.

3. Accordingly, this paper explores the extent to which trends in homeownership rates in a sub-set of OECD countries reflect changing household characteristics – including age, household structure, incomes and education – and policy influences such mortgage market innovations and tax reliefs on mortgage debt financing.

4. Some key findings include:

- A household's tenure choice decision is influenced by its demographic and socio-economic characteristics. Results show that the probability of homeownership increases with age and couple households are more likely to be homeowners than single-person households. All else equal, households with higher levels of income and education are more likely to be homeowners,

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² See Andrews, Caldera Sánchez and Johansson (2011) for a discussion of the tax treatment of housing investment and mortgage market developments.

although the impact of income varies considerably across countries. Finally, homeownership tends to be lower amongst immigrant households and those affected by health problems.

- Overall, changes in household characteristics can account for around three-quarters of the increase in aggregate homeownership rates in Austria and the United Kingdom over the decade from mid-1990s to mid-2000s, but only around one-third of the increase in Canada, Germany, Spain, Switzerland and the United States. In Australia and particularly Italy, other factors appear to have played a particularly important role in shaping homeownership patterns.
- On average, population ageing has boosted the aggregate homeownership rate by $\frac{3}{4}$ -1 percentage point among the countries analysed, with the effect being particularly noticeable in Switzerland, Germany, Denmark and Canada. Changes in real household incomes have had more varied impacts, boosting aggregate homeownership rates by more than $1\frac{1}{2}$ percentage point in Canada, Denmark, and Finland, while having negligible effects on the evolution of homeownership rates in Germany and other continental European countries. In comparison, shifts in household size and structure have – on average – exerted a modest downward influence on aggregate homeownership rates, although this effect varies somewhat across the countries studied. Finally, an increase in the share of immigrant (and ethnic minority) households has tempered the rise in aggregate homeownership rates in some countries.
- A significant proportion of the change in aggregate homeownership rates is, however, not explained by changes in the characteristics of the population signalling a possible shift in the relative attractiveness of owner-occupied housing over recent decades and the possible influence of public policy settings:
 - The relaxation of down-payment constraints on mortgage loans has increased homeownership rates among credit-constrained, lower income households. The estimated contribution of such mortgage market innovations to the change in aggregate homeownership rates is broadly comparable with the impact of population ageing.
 - Policies such as mortgage interest deductibility tend to be regressive since the probability of homeownership rises with income. The results indicate that such tax relief may distort the impact of other policies and potentially crowd-out financially constrained households from homeownership via house price capitalisation effects.
 - Rent regulations and provisions for tenure security implicitly impact homeownership by making renting more attractive. Nevertheless, rental market regulations may impose costs, to the extent that they are capitalised into housing costs and increase rigidity in the housing market, with possible adverse consequences for residential mobility.

5. The remainder of the paper is structured as follows. Section 2 discusses the link between homeownership and public policy in OECD countries, while Section 3 documents trends in homeownership rates in selected OECD countries and discusses some potential drivers of these trends. Section 4 outlines the empirical strategies used in the paper. It first describes the decomposition technique adopted to isolate the contribution of shifts in household characteristics to the change in aggregate homeownership rates. It then outlines the cross-country panel framework used to analyse the effect of mortgage market innovations and tax policies on homeownership rates. It finally specifies the cross-sectional model used to investigate the potential link between rental market regulations and tenure choice. Section 5 discusses the results of the effects of non-policy factors in homeownership rates, while Section 6 discusses the results on the influence of public policy on homeownership rates. The last section concludes.

2. Homeownership and public policy in OECD countries

6. Public policy in OECD countries tends to favour homeownership relative to renting and other investments, via the preferential tax treatment of owner-occupied housing. For example, while mortgage interest costs are tax deductible in many OECD countries, few countries tax imputed rent and those that do often substantially under-estimate the rental value.³ Moreover, while property tax is often viewed as a substitute for taxation of imputed rent, the magnitude of the tax is rarely sufficient to offset the subsidy provided by mortgage interest deductibility.

7. The main argument for subsidizing homeownership is that ownership may give rise to positive spillovers for society, although the case for subsidising homeownership is far from clear (see Box 1). In some instances, it is likely that homeownership is mistakenly attributed a causal influence for outcomes that are actually due to unobserved individual or household characteristics (Dietz and Haurin, 2003). For example, it is typically argued that children of homeowners perform better at school than those of renters. But this finding may simply reflect the impact of unobserved factors, such as the possibility that parents with a view to the longer term may be more likely to purchase a home and invest in their children.

8. A causal interpretation of these associations has underpinned in many OECD countries the notion that public policy should favour homeownership over renting. This economic rationale has sometimes been reinforced by a tendency to liken owner-occupation to the attainment of a ‘national dream’. Accordingly, many OECD governments pursue higher rates of homeownership – implicitly or explicitly – as a public policy goal.⁴ Therefore, understanding the drivers of aggregate homeownership rates is important from the perspective of public policy.

Box 1. The Economic Benefits and Costs of Homeownership

The main argument for subsidising owner occupation is that homeownership may give rise to positive spillovers for society. While the literature has identified many possible spillovers, this box focuses on four key areas: wealth accumulation, child outcomes, social capital and mobility.¹ There is competing evidence for each hypothesis and a common problem is establishing causality since any correlation between homeownership and a variable of interest (*e.g.* wealth) may simply reflect the influence of a third omitted factor. The veracity of the arguments may also hinge on other policy settings and circumstances in a country.

1. A Vehicle for Asset/Wealth Accumulation: For myopic households, homeownership – to the extent that it creates an orientation towards the future (Sherraden 1991; OECD, 2003) – may result in a higher rate of wealth accumulation than otherwise. The act of taking out mortgage debt may also prompt a change in household spending behaviour, by making households pre-commit themselves to a scheme that is costly to break. However, the effectiveness of using one’s house as a means of forced savings has weakened considerably over recent decades, given the increased prominence of housing equity withdrawal and mortgage refinancing (Li and Yang, 2010).

With the move away from publicly-funded retirement systems, homeownership is playing an increasingly important role of maintaining the standard of living of households in retirement. In Australia, the incidence of poverty amongst older households is very high according to conventional measures, but falls dramatically once implicit rents are taken into account (Yates and Bradbury, 2009). Hirayama (2010) makes a similar argument with respect to Japan.

Against this, buying a house entails higher transaction costs than renting (Haurin and Gill, 2002) making it an illiquid investment. The timing of the purchase also tends to matter, especially given the volatility in housing prices. Indeed, recent

³ For a discussion on housing taxation, see Andrews, Caldera Sanchez and Johansson (2011).

⁴ For instance, a higher homeownership rate has been explicitly pursued by successive administrations in the United States. In 2002, President Bush administration outlined “a comprehensive agenda to help increase the number of minority homeowners by at least 5.5 million before the end of the decade” (see Bush, 2002), while in 1994, President Clinton requested an “...effort to dramatically increase homeownership in our nation over the next six years” (see Clinton, 1994). Meanwhile, “The Great Australian Dream” and “The New Zealand Dream” are both centred on the acquisition of the family house (see Moran, 2006; Ferguson, 1994).

experience in the United States highlights that policies that promote homeownership can have adverse consequences for mobility to the extent they have been associated with a rise in negative equity (Ferreira *et al.* 2008; Caldera Sánchez and Andrews, 2011).

2. Better Outcomes for Children: Homeownership has been linked to better outcomes for children in terms of test scores and behaviour (Haurin *et al.* 2002). This may reflect the added geographic stability and improved home environment associated with homeownership compared to renting. To the extent that homeownership promotes neighbourhood stability, there may also be indirect benefits for children given the adverse effects of distressed neighbourhoods on the life chances of children (Jencks and Mayer, 1990). It is unclear, however, whether the positive correlation between homeownership and child outcomes is causal. This may reflect the fact that in some datasets, family wealth is not measured. To the extent that family wealth affects both the likelihood of becoming a homeowner and child test scores, studies based on such datasets will overstate the impact of homeownership on child school performance (Dietz and Haurin, 2003). Even when family wealth is measured, however, unobserved parental characteristics are likely to confound the analysis. Green and White (1997) present an example where there are two types of parents – investors and non-investors. Since this characteristic of parents is unlikely to be observed, any estimate of the impact of homeownership on child test scores will be upwardly biased if investor-type parents are more likely to purchase a home and invest in their children.²

3. Community Engagement and Voting Behaviour: Homeownership tends to be associated with more active and informed citizens (Di Pasquale and Glaeser, 1999) and more residentially stable neighbourhoods. Homeowners might be more likely to make political choices that favour the long-run health of their community (such as more investment in green space, see Richer, 1996), while renters have an incentive to favour policies bringing immediate benefits relative to long-run gains. However, the positive impact of homeownership on political engagement may be over-stated due to endogeneity bias – people who are more likely to participate in community activities may also be more likely to be homeowners (Englehardt *et al.*, 2010).

Against this, homeowners have an incentive to restrict new supply – through support for zoning and land-use regulations – in order to raise house prices, which is likely to impose costs on outsiders (Glaeser and Shapiro, 2003).

4. Homeownership Adversely Affects Labour Mobility: Labour mobility is lower and thus unemployment higher among owner-occupants than renters because of the high transaction cost of moving (Oswald 1996; Caldera Sánchez and Andrews, 2011). Of course, there are also costs associated with residential mobility. Hanusek *et al.* (2004) show that student turnover, particularly student entry during the school year, reduces achievement gain, and the effects are felt by everyone in the school, not just those who themselves move.

1. It has also been argued that homeowners take better care of their property (Di Pasquale and Glaeser, 1999), and are both happier (Rossi and Weber, 1996) and healthier (Benzeval and Judge, 1996). However, the extent to which this relationship is causal is unclear and the true relationship could, in fact, be negative if homeowners face greater anxiety due to their increased financial obligations (Nettleton and Burrows, 1998).

2. It should also be noted that the money spent on owner-occupied housing investment might crowd-out other family-specific investments that have a more direct payoff to children's outcomes (Aaronson, 2000). For example, Currie and Yelowitz (1998) argue that public housing has a positive effect on school retention because subsidised housing allows money to be directed to other family needs.

3. Evolution and potential drivers of homeownership rates in selected OECD countries

9. Table 1 shows how aggregate homeownership rates in selected OECD countries have evolved since the 1990s, based on household-level micro datasets (see Appendix A for a discussion of the data sources).⁵ Homeownership rates have generally increased, particularly in Canada, Switzerland and Spain, while declines have been recorded in Australia and Luxembourg. Numerous explanations have been advanced for the general increase in homeownership rates since the 1990s. Up until the mid-2000s, for example, Li (2005) argues that declining perceptions of global macroeconomic risk increased the relative attractiveness of mortgage debt. This explanation, however, is incomplete since such common global factors cannot account for the fact that aggregate homeownership rates have changed more in some OECD countries than others.

⁵ The study uses various household-level micro datasets, such as the Luxembourg Income Study (LIS), American Housing Survey (AHS), German Socio-Economic Panel (GSOEP) and the European Union Statistics on Income and Living Conditions (EU-SILC). While a number of data sources are utilised to improve country coverage, coverage still varies significantly between the three main empirical strategies owing to the specific data requirements of each approach (see Appendix A).

10. A more promising explanation might emphasise demographic trends, and in particular, the increase in the average age in OECD countries over recent decades. Population ageing affects the aggregate homeownership rate because older people have higher rates of homeownership than younger people. Across OECD countries, the probability of homeownership rises significantly between 25 and 44 years of age – the family formation years – and tends to peak in the 55-64 age bracket (see Figure 1 and Figure B1 in Appendix B). This implies that aggregate homeownership rates in OECD countries would have increased over recent decades because of ageing population, even if nothing else changed.

Table 1. Aggregate homeownership rates in selected OECD countries

	Circa 1990s ¹	2004 ²
Australia	71.4	69.5
Austria	46.3	51.6
Belgium	67.7	71.7 ³
Canada	61.3	68.9
Denmark	51.0	51.6
Finland	65.4	66.0
France	55.3	54.8 ³
Germany	36.3	41.0
Greece	83.1	73.2
Ireland	79.6	81.4 ³
Italy	64.2	67.9
Luxembourg	71.6	69.3
Mexico	77.2	70.7
Netherlands	47.5	55.4 ³
Spain	77.8	83.2
Switzerland	33.1	38.4
United Kingdom	67.5	70.7
United States	66.2	68.7

1. 1987 for Austria, 1990 for Spain, 1991 for Italy, 1992 for Denmark and Switzerland, 1994 for Canada, France, Germany, Mexico and the Netherlands, 1995 for Australia, Belgium, Finland, Greece and Ireland, 1997 for Luxembourg and United States.

2. 2003 for Australia, 2007 for Germany and United States.

3. The data is particularly dated for Belgium (2000), France (2000), Ireland (2000) and the Netherlands (1999).

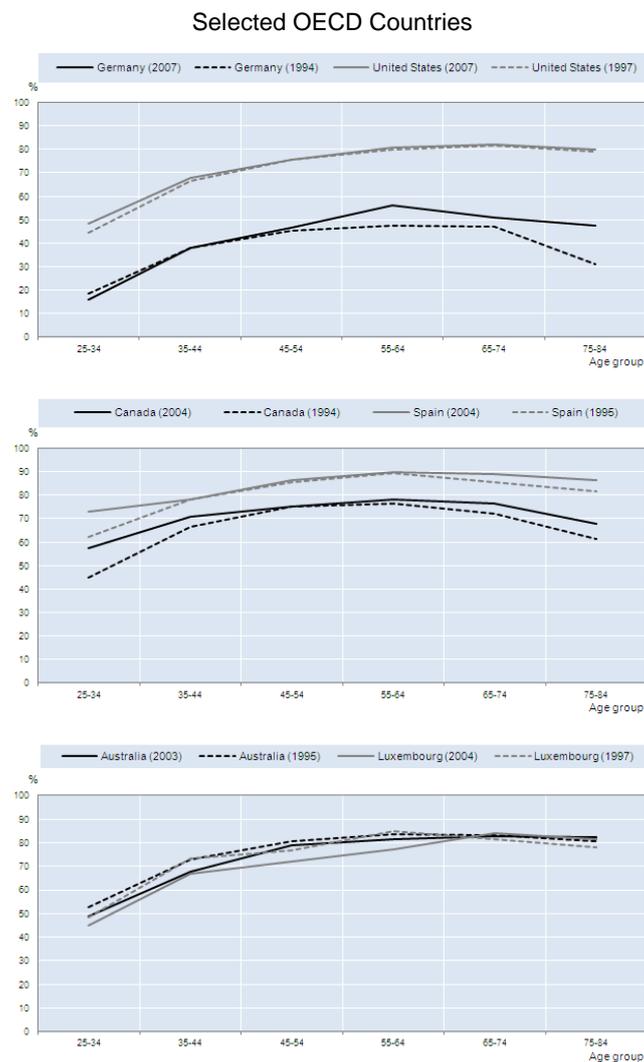
Sources: OECD, Luxembourg Income Study (LIS), GSOEP and the American Housing Survey.

11. The tendency for homeownership rates to change within age brackets over time, however, suggests that more is going on than just compositional effects (Figure 1). While homeownership rates within income quartiles have also changed over time (see Figure 2 and Figure B2 in Appendix B), homeownership rates may have also been affected by shifts in underlying household structure, such as the deferral of marriage and childbearing and the rise of single-parent households. Changes in education attainment, which may proxy for wealth and/or permanent income, may also matter.

12. Mortgage markets are also likely to be important since owner-occupied housing constitutes a household's single largest financial outlay, and generally requires debt financing. Housing finance markets have changed drastically over recent decades, reflecting a wave of financial deregulation motivated by broader economic efficiency goals. There has been considerable cross-country variation in the timing of reform and the extent to which the financial sector was regulated in the earlier period (Abiad *et al.* 2008; Andrews, 2010). These changes in financial market regulation have significantly lowered borrowing costs for housing, resulting in a substantial expansion in the supply of mortgage loans in many countries (ECB, 2009a; Ellis, 2006), with potential implications for homeownership rates.

13. An important consequence of mortgage market deregulation was to significantly reduced deposit requirements, thereby easing the down-payment constraint for many households wishing to become homeowners.⁶ The down-payment constraint tends to be particularly binding for financially-constrained households, but particularly younger households who have had less time to accumulate a deposit. Previous empirical research shows that from the late 1970s until the early 1990s, homeownership rates among younger households tended to increase more in those countries where the maximum loan-to-value (LTV) ratio rose, implying a reduction in the down-payment constraint (Chiuri and Jappelli, 2003).⁷ While the maximum permissible LTV has risen in many OECD countries since the 1990s, important cross-country differences remain (see Andrews *et al.*, 2011).⁸

Figure 1. Homeownership rates by age group



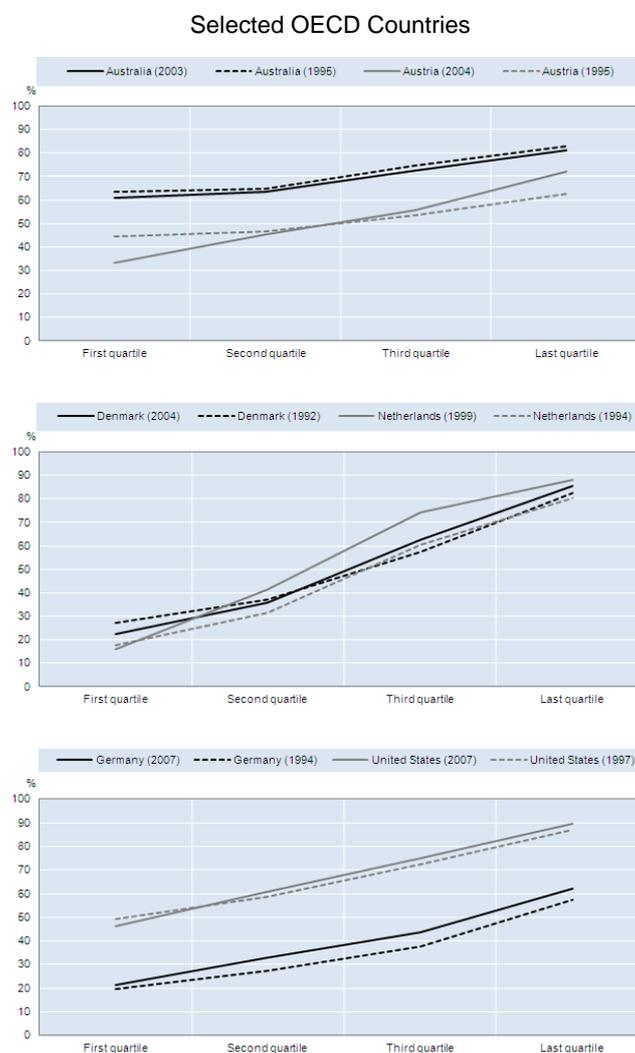
⁶ Asymmetric information and other credit market frictions mean that lenders often require equity contributions (*i.e.* a down-payment) from borrowers when granting a home mortgage loan.

⁷ Similarly, Duca and Rosenthal (1994) found that borrowing constraints lowered the United States homeownership rate by around 8 percentage points, disproportionately affecting younger households.

⁸ Regulatory ceilings on LTV ratios have tended to be particularly binding in Germany, while in other countries, LTVs are effectively capped by lengthy legal procedures in the event of default (Catte *et al.* 2004).

Sources: OECD, Luxembourg Income Study (LIS), GSOEP and the American Housing Survey.

Figure 2. Homeownership rates by household disposable income quartile



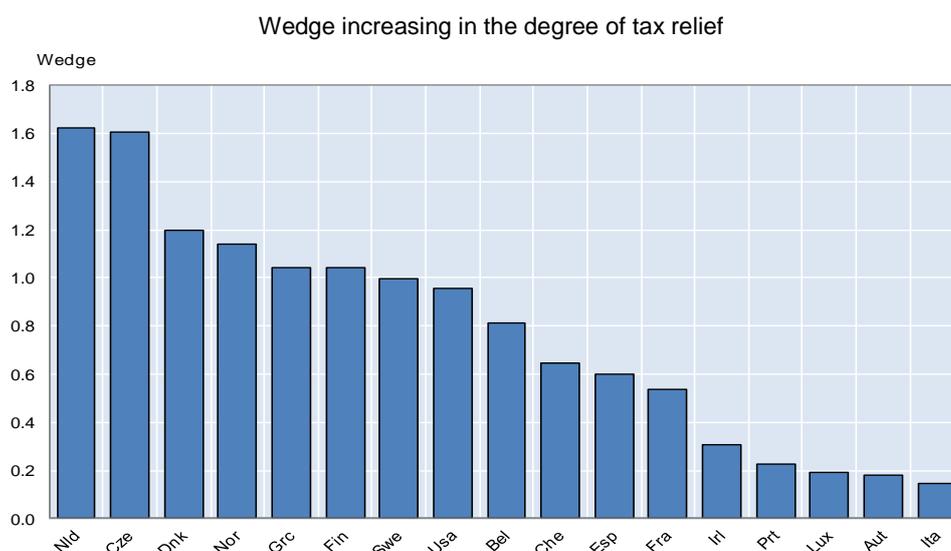
Sources: OECD, Luxembourg Income Study (LIS), GSOEP and the American Housing Survey.

14. Cross-country differences in homeownership rates may also reflect differences in the tax treatment of housing. The wedge between the market interest rate and the debt financing cost of housing (the after-tax interest rate) provides one indicator of the extent to which the tax system favours owner-occupied housing with respect to debt financing (see Johansson, 2011). While this simplified measure is imperfect, it nevertheless serves as well useful indicator since households generally finance their house purchase with debt.⁹ According to this indicator, tax relief is most generous in the Netherlands and effectively zero in countries where mortgage loans are not tax favoured (Figure 3).

⁹ The specific focus on tax relief to debt financing is also appropriate, given the important changes that have taken place in mortgage markets in OECD countries over recent decades.

15. The impact of tax reliefs on mortgage debt financing costs on homeownership, however, is unclear. One reason for this is that such tax reliefs generally takes the form of a deduction against earned income rather than a credit and, thus, are worth more to high-income earners (Andrews *et al.*, 2011). To the extent that homeownership rates amongst high income earners in countries that do not allow mortgage interest deductibility (*e.g.* Australia) are still relatively high, it is likely that these households would still be homeowners in absence of the subsidy (Figure 2).¹⁰ This suggests that such tax reliefs have little effect on aggregate homeownership rates and the effect may in fact be negative, if tax reliefs get capitalised into real house prices (Capozza *et al.* 1996; Andrews, 2010) and make homeownership less affordable for lower income households than otherwise (Bourassa and Yin, 2007).

Figure 3. Tax relief on debt financing cost of homeownership¹, 2009



1. This indicator takes into account if interest payments on mortgage debt are deductible from taxable income and if there are any limits on the allowed period of deduction or the deductible amount, and if tax credits for loans are available (see Johansson 2011 for details). For countries that have no tax relief on debt financing costs, this indicator takes the value of zero.

Source: Calculations based on OECD Housing Market questionnaire. See Johansson (2011) for details.

16. Accordingly, the following sections empirically analyse the extent to which changes in aggregate homeownership rates can be attributed to shifts in the characteristics of households and public policy influences. Panel estimation techniques are used to update and reassess earlier research highlighting the link between changes in the down-payment constraints and homeownership rates (Chiuri and Jappelli, 2003). Unfortunately, it is not possible – due to data limitations – to estimate the direct impact of housing tax arrangements on homeownership rates over time. Instead, the paper investigates whether the impact of financial market deregulation on homeownership rates is affected by the extent to which housing is tax advantaged. This is a natural extension to recent empirical research, which shows that housing demand shocks – such as financial deregulation – are more likely to be capitalised into real house prices in countries where tax relief on mortgage debt financing is generous (Andrews, 2010). Finally, the paper uses two newly constructed indicators of rent regulation and tenant protection (see Johansson, 2011) to investigate the extent to which such policies increase the relative attractiveness of renting. The cross-sectional nature of this modelling, however, makes it difficult to identify the contribution of rental market regulations to changes in aggregate homeownership rates over time.

¹⁰ Tax relief on mortgage debt financing also encourages households (particularly those with high incomes) to hold more debt than otherwise (Hendershott *et al.*, 2002)

4. Empirical strategy

17. This section outlines the three different empirical strategies adopted to assess the impact of non-policy and policy-related factors on homeownership rates.

Non-policy influences on tenure choice

18. A variant of the Blinder-Oaxaca Decomposition (Blinder, 1973; Oaxaca, 1973) is utilised to decompose the change in the homeownership rate into the part that can be explained by changing household characteristics – including age, household size and structure – and changing propensities for homeownership given these characteristics. While this approach is somewhat partial as it assumes that trends in homeownership rates are demand-driven, it is nonetheless useful given the interest in estimating of the contribution of changing household characteristics to aggregate homeownership rates over time. The decomposition technique involves two steps. As a first step, a binomial logit regression framework is employed to model the probability of homeownership for each OECD country:

$$\Pr(Own = 1) = \frac{\exp(X'b)}{1 + \exp(X'b)} \quad (1)$$

where $\Pr(Own=1)$, or P , is the probability that a household will choose to be an owner, given the relevant household characteristics in the vector X . A transformation of equation (1) yields:

$$\ln\left(\frac{P}{1-P}\right) = Y = X'b = \sum b_i X_i \quad (2)$$

Implying that the dependent variable is the log of the odds that a particular tenure choice will be made.

19. In turn, to decompose the change in the homeownership rate over time (*e.g.* between 1994 and 2004) the following calculations are performed:

- The average probability of homeownership in 1994 (\bar{P}_{1994}) and 2004 (\bar{P}_{2004}) is calculated based on (1) setting each relevant independent variable equal to its sample mean and applying the estimated logistic coefficients.
- The decomposition of the change in the probability of homeownership (P) can be then expressed as:¹¹

$$\bar{P}_{2004} - \bar{P}_{1994} = (\bar{X}^{2004} - \bar{X}^{1994})\beta^{2004} + \bar{X}^{1994}(\beta^{2004} - \beta^{1994}) \quad (3)$$

“Explained effect” “Unexplained effect”

where \bar{X}^t is a row vector of average values of the independent variables and β^t is a vector of coefficient estimates for period t (where t equals 1994 or 2004). The change in the homeownership rate can be decomposed into two parts:

¹¹ This is the expression for the Blinder-Oaxaca decomposition based on a linear regression. To account for the binary dependent variable and the non-linear nature of equation (1), however, a more involved non-linear procedure proposed by Fairlie (1999) is adopted, although the intuition is essentially the same as in the linear case (see Appendix C for more details).

- *Explained effect*: captures the impact of shifts in household characteristics, such as age, household size and structure, household income and education.
- *Unexplained/residual effect*: captures changes in a household's underlying propensity to become a homeowner, holding household characteristics constant. This effect may reflect both changes in behaviour and the impact of housing policies.

20. The vector X includes a number of variables relevant to the decision to become a homeowner:

- The head of household's age is controlled for via a series of dummy variables covering seven age ranges (20-24, 25-29, 30-34, 35-44, 45-54, 55-64 and 65 and above).
- Household size and four different household structures: couples without dependents; couples with dependents; singles without dependents and singles with dependents. While changes in household structure will affect household size, there may also be changes in household size independent of household structure if families chose to have fewer children over time.
- Real household disposable income is included to capture the financial capacity to afford a down-payment and service a mortgage.¹² Educational attainment is also included, since current income may be an imperfect proxy for permanent income or wealth (Goodman, 1988).
- Controls for health status, ethnicity, immigrant status and linguistic skills are also included, although these variables are not available for all countries.
- Dummy variables capturing the residential location of the household (*e.g.* state/province for large countries; city for small economies) are included, where possible, as a proxy for the relative prices of homeownership and renting.¹³

21. Since most of these variables are categorical, the specification has sufficient flexibility to control for non-linearities. In the case of the income variable, which is continuous, income-squared is included. Interactions between real income and each age bracket were also included to proxy for unobserved wealth effects, while interactions between real income and the household structure terms were included to proxy for an unobserved budget constraint (see Li, 1977). Finally, the potential simultaneity between tenure choice and household formation decisions is not addressed. Instead, it is assumed that the decision to form a household or change a household type is made prior to the tenure choice decision, which has been a common approach in the literature (see Yates, 2000). While this is a strong assumption, the data-intensive nature of this exercise (the modelling is repeated for 12 OECD countries) makes this potential simultaneity issue impractical to address.

Policy influences on tenure choice

22. After estimating the contribution of shifts in household characteristics to changes in aggregate homeownership rates, the role of selected public policies is assessed using panel and cross-section regression techniques.

¹² This is obtained by deflating the nominal income measure contained in the survey by the consumer price index.

¹³ To the extent that housing costs tend to be higher in large cities, regional dummies may provide a reasonable proxy for relative house prices.

Mortgage market innovations and tax policy

23. To estimate the impact of mortgage market innovations – specifically, changes in the down-payment constraint – on homeownership rates over time, a cross country panel model is estimated:

$$HO_{i,t}^{Quartil2^j} = \alpha + \delta_1 LTV_{i,t} + \delta_2 LTV_{i,t} * Taxrelief_i + \delta_3 Z_{i,t-1} + \rho_i + \eta_t + \varepsilon_{i,t} \quad [4]$$

where i denotes country and t year. To the extent that the tenure decision of the ‘marginal homebuyer’ will be most sensitive to changes in the down-payment constraint, the dependent variable in equation (4) is the homeownership rates of the marginal buyer. Two proxies are used to measure the marginal buyer: all households in the second income quartile and households aged 25-34 years in the second income quartile.¹⁴ LTV is the maximum LTV ratio and Taxrelief is a time invariant variable capturing the extent of tax relief on mortgage debt financing (see Figure 3).

24. The vector Z further controls for real household income, real interest rates, price-to-rent ratio, real construction costs and the share of the total population aged 25-34. The homeownership rates of the remaining income/age groups (*i.e.* income quartiles 1, 3 and 4) are also included in Z to control for the influence of unobserved factors on homeownership and to make the implications for the aggregate homeownership rate clearer.¹⁵ The regressions also contain country-fixed effects (ρ), which control for time invariant country-specific factors, such as cultural attitudes toward homeownership, and time fixed effects (η) to capture common global shocks, such as the relatively benign macroeconomic environment that possibly increased the attractiveness of homeownership in the first half of the 2000s (see Li, 2005). The standard errors are clustered at the country level in order to allow for an arbitrary variance-covariance matrix within each country.

25. *A priori*, δ_1 is expected to be positive while δ_2 will be negative if the expansionary impact of financial deregulation on homeownership amongst marginal buyers is smaller in environments with more generous tax relief. The latter may reflect the tendency for generous housing tax policies to be capitalised into real house prices (see Andrews, 2010), thereby making owner-occupation less affordable for the marginal buyer than otherwise. The inclusion of the interaction term relaxes the slope homogeneity assumption of the conventional fixed effects model, and allows the impact of changes in LTVs on homeownership to vary with the extent of tax relief. The overall impact of a change in the down-payment constraint on homeownership is given by $(\delta_1 + \delta_2 * Taxrelief_i)$. The direct effect of Taxrelief, however, cannot be identified since a fixed effects panel estimator is employed and this (time invariant) term would be subsumed in the country-fixed effects.

Tenure choice and rental regulations

26. The effect of rental regulations on tenure choice is estimated using a cross-country probit model. Due to the absence of time series data on rental regulations, however, it is not possible to estimate contribution of rental regulations to the change in aggregate homeownership rates over time. The following probit model is estimated:

$$Pr_{hi}(Own = 1) = \Phi(\alpha + \beta P_i + H_{hi}\phi + C_i\Gamma + e) \quad [5]$$

¹⁴ In the context of equation [4], this implies that $j=2$ and a separate model is estimated for both groups.

¹⁵ For example, if the homeownership rate of the other income quartiles is not held constant, then it is possible that a rise in the LTV could increase $HO^{Quartil2}$ at the expense of another income quartile, thereby making inferences about the impact on the aggregate homeownership rate difficult.

where ϕ denotes the normal distribution, h denotes household and i denotes country. Pr is the probability that a household will choose to be an owner, given the relevant household characteristics, such as income, education, employment status, summarised in the vector H and country-specific rental regulations, including rent control and security of tenure (P). The vector C controls for other country-specific factors that may impact households' tenure decision, including national household income and urbanisation, while the error term e captures shocks and unobservable factors affecting the households tenure choice and errors are clustered at the country-level.¹⁶

27. Unfortunately, this estimation framework is unable to address the potential endogeneity between rental market policies and tenure choice, which may arise if existing policies are framed in response to a country's tenure structure. The lack of plausible instruments and time series data on rental regulations make this problem difficult to address, and the results should thus be treated with caution.¹⁷

5. Empirical results: non-policy influences on tenure choice

28. The estimated coefficients from the pooled logistic regression, equation (1), are reported in Table D1 of Appendix D, while the marginal effects are shown in Table D2. The coefficients are generally of the expected sign and, across the 12 countries studied, the models – on average – predict individual tenure status correctly approximately 75% of the time, which is comparable with previous studies (see Yates, 2000; Gyourko and Linneman, 1997).

29. The probability of homeownership increases with age, as indicated by the age dummies which are positive and highly significant. Households aged 45-64 years tend to have the highest homeownership propensities, holding other characteristics constant, although this effect tends to vary across countries, as suggested by the different homeownership-age gradients in Figure 1. In the United States, a head of household aged 45-64 years is 37 percentage points more likely to be a homeowner than where the head is aged 20-24 years, holding all else equal. By contrast, in Germany, the same household type is 54 percentage points more likely to be homeowner, than their younger counterpart.

30. Relative to the benchmark household of a couple without children, the probability of homeownership tends to be significantly lower for single-headed households, particularly those with children, possibly reflecting unobserved financial resource constraints.¹⁸ Consistent with this, household size tends to be positively related to the probability of homeownership in most of the countries analysed.

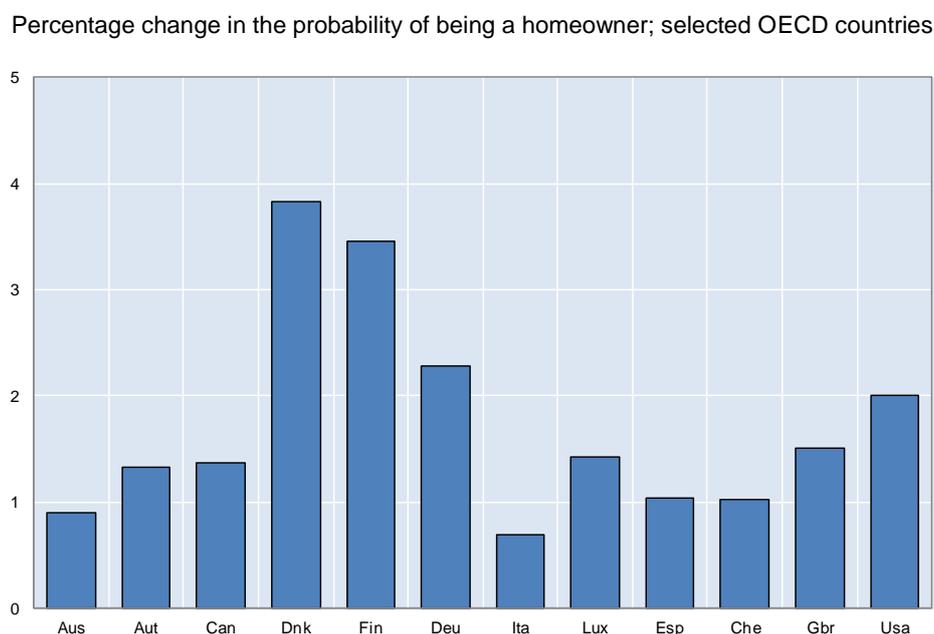
31. The probability of homeownership rises with real household disposable income, though at a diminishing rate, as implied by the negative coefficient on the income squared term. This is broadly consistent with the homeownership-income gradients presented in Figure 2. The impact of a 10 per cent rise in household income on the probability of homeownership is particularly strong in Denmark, Finland and Germany (Figure 4), consistent with the relatively high degree of homeownership inequality between income groups in these countries (Figure 2).

¹⁶ The model does not include regional fixed-effects because data on household location is not available for more than half of the countries in the sample.

¹⁷ A possible solution is to include country-fixed effects to control for time-invariant, country-specific factors. However, since the policy variables in equation 5 are only measured at a single point, their impact on tenure could no longer be identified since they would be subsumed in the country-fixed effects

¹⁸ In half of the countries studied, there tends to be little difference between the probability of homeownership for couple-headed households with children compared to those without. While it is not possible to separate household structure into the same categories for the United States, the probability of homeownership tends to be higher amongst married households and households where the head has been previously married.

Figure 4. Impact of a 10 percent increase in household disposable income on the probability of being a homeowner¹



1. Calculations are based on the marginal effects estimation contained in Table D2 of Appendix D, and show the impact on the probability of a 10% rise in household income from the sample mean level.

Source: OECD calculations based on household datasets sourced from LIS, the GSOEP and the American Housing Survey.

32. Households with higher levels of education are more likely to be homeowners. While tertiary education tends to be positively associated with homeownership, this variable is not always statistically significant, possibly reflecting the relatively high correlation with household income. This is particularly the case in continental European economies, such as Austria, Spain and Switzerland. The impact of education on the probability of being a homeowner is particularly strong in the United Kingdom – household heads that are tertiary educated are 16 percentage points more likely to be a homeowner than those without post-secondary education (see Table D2).¹⁹

33. The probability of homeownership is generally lower for immigrant households – particularly in Italy and Luxembourg – and minority households and those not proficient in the official language of the country. In the United States, African Americans and Hispanic Americans are over 15 percentage points less likely to be homeowners than other Americans (Table D2), which is consistent with existing research (see Gabriel and Rosenthal, 2005). The probability of homeownership also tends to be lower amongst households affected by health problems, possibly reflecting the financial strain associated with illness.

Decomposing the change in aggregate homeownership rates

34. By combining the coefficient estimates with changes in the average characteristics over time (these changes are discussed in Appendix E), it is possible to decompose the change in the aggregate homeownership rate as given by equation (3). Figure 5 decomposes the actual change in the aggregate

¹⁹

By contrast, the estimates from the tenure choice equation for Australia – which is most comparable with the United Kingdom – suggest a much smaller impact of education on the probability to be a homeowner. For example, households with tertiary and associate-level (*i.e.* trade) qualifications in Australia are only 4 percentage points and 7 percentage points more likely to be homeowners than those without post-secondary education.

homeownership across the two survey years (expressed in percentage points) into three parts: the portion explained by changes in the age structure (the darker bar), the contribution of non-age factors (*e.g.* household structure, income etc; the lighter bar) and a part unexplained by the model (shaded bar). The latter may reflect changes in economic behaviour and/or the impact of policy settings, which will be investigated in later sections. The 12 countries can be separated into two broad groups according to the observed changes in homeownership rates:

Rising homeownership rates: Austria, Canada, Germany, Italy, Spain, Switzerland, the United Kingdom and the United States

- Changes in the characteristics of the population generally account for around three-quarters of the increase in aggregate homeownership rates in Austria and the United Kingdom.
- In Canada, Germany, Spain, Switzerland and the United States, changes in the characteristics of the population can only account for approximately one-third of the increase in aggregate homeownership rates, implying an important role for other factors.
- For Italy, the explained contribution to the change in the aggregate homeownership rate is negative, suggesting that other factors account for the rise in the aggregate homeownership rate.

Broadly flat or declining homeownership rates: Australia, Denmark, Finland, and Luxembourg

- While the aggregate homeownership rate rose slightly in Denmark and Finland over the period studied, changes in the characteristics of the population implied a much larger increase in homeownership than what actually occurred. This implies that the aggregate homeownership rate in these countries would have declined considerably, had it not been for a shift in the characteristics of the population towards homeownership.
- In Australia and Luxembourg, the aggregate homeownership rate declined by around 2 percentage points over the decade to the mid-2000s. Australia's homeownership rate would have declined further had it not been for a shift in the characteristics of the population towards homeownership.²⁰ For both countries, the estimates point to a significant decline in the propensity for households to be homeowners, holding household characteristics constant.

35. The factors that account for the explained change in the aggregate homeownership rate are now briefly discussed. Appendix F contains the detailed decomposition estimates for each country.

Age structure

36. Across the 12 OECD countries studied, changes in the age structure boosted the aggregate homeownership rate by $\frac{3}{4}$ -1 percentage point on average, and the effect was somewhat larger in Switzerland, Germany, Denmark and Canada. Moreover, while the impact of population ageing was smaller in absolute terms in Australia and the United States, it nonetheless accounts for a significant proportion of the explained change in aggregate homeownership rate. Indeed, the estimates imply that the

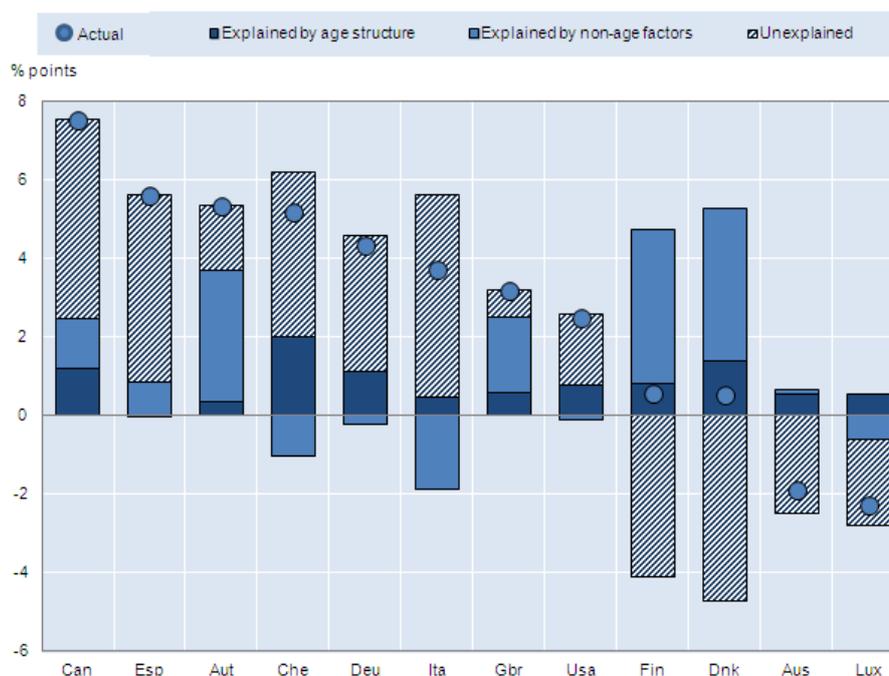
²⁰

Additional modelling (not shown) based on the Household, Income and Labour Dynamics in Australia Survey suggests a further unexplained decline in Australia's homeownership rate up until 2007.

homeownership rate in Australia and Luxembourg would have declined even further over the period examined, had it not been for changes in age structure.²¹

Figure 5. The contribution of ageing to the change in the aggregate homeownership rate¹

Circa 1995 to 2005; selected OECD countries



1. The dot refers to the actual change in the aggregate homeownership rate over the period studied. This can be decomposed into a part explained by changes in household characteristics – which include age structure and other non-age factors such as household structure, household income, and education – and a component which is unexplained by changes in household characteristics.

Source: OECD calculations based on household datasets sourced from LIS, the GSOEP and the American Housing Survey.

Other explained factors

37. The decomposition estimates also suggest a role for changes in other household characteristics:

- Changes in household size and structure have generally exerted a downward influence on aggregate homeownership rates, particularly in Germany, Italy and Australia (Table 2). This generally reflects a rise in the share of single-headed households over the sample period, although in Italy a decline in average household size has also contributed. By contrast, changes in household size and structure have placed upward pressure on aggregate homeownership rates in Austria, Canada and Denmark.²²

²¹ The decomposition estimates suggest that changes in the age structure had little impact on the aggregate homeownership rate in Spain. This reflects the fact that while the average age increased by over one year in Spain over the period studied, the share of households in the 45-64 age bracket – the group with highest propensity to be homeowners according to the tenure choice equation – declined somewhat. This result is robust to using different age brackets in the tenure choice estimation.

²² In Canada, the positive contribution from household structure reflects a decline in single-headed households coupled with a negative marginal impact of being a single-headed household on homeownership propensities (Table D2).

- Growth in real household disposable income generally has placed upward pressure on homeownership rates, particularly in Denmark and Finland, which is consistent with the large estimate effect of household income on homeownership probabilities. By contrast, relatively stagnant household incomes have exerted modest downward pressure on aggregate homeownership rates in Germany, Italy and Switzerland.
- With the exception of the United Kingdom, the impact of changes in education on aggregate homeownership rates is generally modest.
- Increased socio-economic disadvantaged – proxied by ethnic/immigrant and health status – has generally exerted downward influence on aggregate homeownership rates. This is particularly the case with respect to immigrant households in Italy and Luxembourg. In Canada, an increase in the incidence of disability has exerted downward pressure on aggregate homeownership rates.

Table 2. Contribution of household size and structure to the change in the aggregate homeownership rate

Percentage point contribution; ranked in order of combined effect

	Explained by household size (1)	Explained by household structure (2)	Combined effect (3) = (1) + (2)
Austria	1.1	0.2	1.2
Canada	0.1	0.3	0.4
Denmark	--	0.3	0.3
Luxembourg	-0.1	0.1	-0.1
Finland	-0.3	0.2	-0.1
United Kingdom	--	-0.1	-0.1
Spain	--	-0.4	-0.4
Switzerland	-0.6	0.2	-0.4
United States	0.0	-0.4	-0.5
Australia	--	-0.7	-0.7
Italy	-0.4	-0.4	-0.8
Germany	-0.2	-0.8	-1.0

Notes: The combined effect corresponds to the household size and structure bar in Figures F1 and F2. For Australia, Denmark, Spain and the United Kingdom, the decompositions are based on regressions that do not include household size.

Source: OECD calculations based on household datasets sourced from LIS, the GSOEP and the American Housing Survey.

6. Empirical results: policy influences on tenure choice

38. Given that shifts in household characteristics can only explain part of the change in aggregate homeownership rates (Figure 5), there may be a role for policy factors in explaining these developments. For instance, the increased propensity for homeownership amongst households in the United States, holding their characteristics constant, is consistent with the considerable relaxation of lending standards that made mortgage debt available to households who would not have otherwise have been homeowners (Doms and Krainer, 2007). Accordingly, this section sheds light on the influence of innovations in mortgage markets, tax relief on mortgage debt financing and rental market regulations on homeownership rates.

Mortgage market innovations

39. The results from the cross-country panel estimation of equation [4], which examines the link between changes in the down-payment constraint and homeownership rates amongst marginal buyers, are summarised in Table 3. Other control variables (including demographic and socio-economic influences on homeownership) are not shown in the table for sake of brevity. To aid interpretation, an estimate of the total impact of financial deregulation evaluated at the sample median value of housing tax relief is also provided. In addition, Figure 6 shows the impact of a 10 percentage point rise in the LTV on the homeownership rate of different groups – relative to the group-specific sample median homeownership rate – and how this impact varies with the extent of housing tax relief. Results are also presented using an index of financial reform (Abiad *et al.* 2008; see Figure 4 in Andrews, 2010), in place of the LTV, to demonstrate the robustness of the estimates (Columns 2 and 4).

Table 3. Panel estimation of homeownership rates

	All households		Households 25-34 years	
	(1)	(2)	(3)	(4)
<i>Variables of interest</i>				
Loan to value ratio (LTV)	0.255*** [0.054]		0.594*** [0.125]	
LTV x Tax relief	-0.189** [0.086]		-0.471* [0.268]	
Financial reform index		5.742 [4.119]		11.215* [6.255]
Financial reform index x Tax relief		-12.307*** [3.005]		-26.102*** [6.325]
<i>Impact of financial deregulation terms on homeownership rates evaluated at the median of the structural features (p-values in brackets)</i>				
LTV	0.192*** [0.001]		0.437*** [0.000]	
Financial reform index		1.636*** [0.002]		2.509*** [0.001]
Observations	63	60	60	57
Number of Countries	16	16	15	15
R-squared	0.93	0.93	0.82	0.79

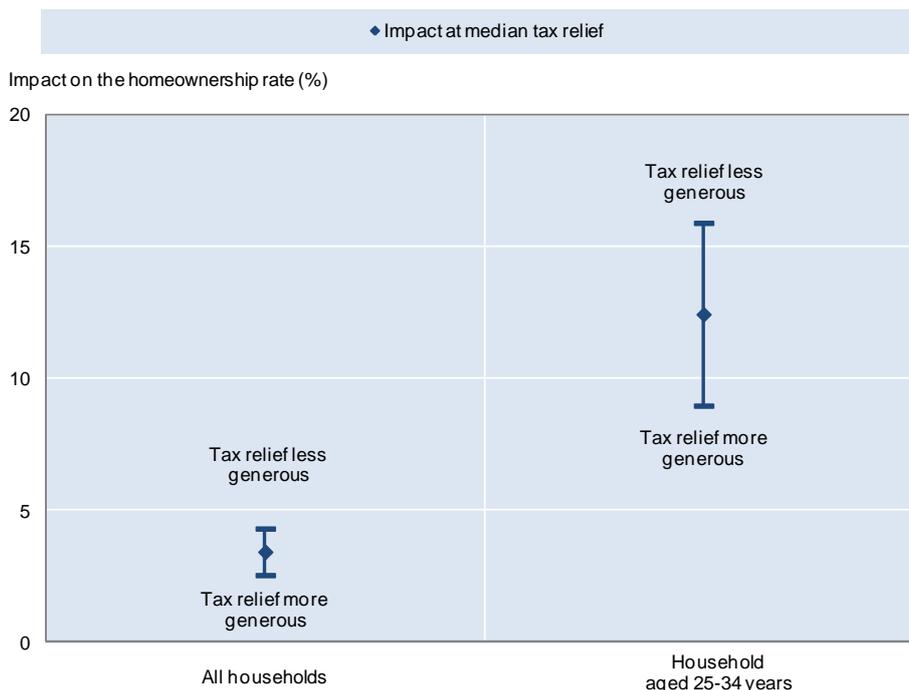
Notes: Standard errors in brackets. * significant at 10%; ** significant at 5%; *** significant at 1%. Regression includes country and time fixed effects and control variables such as real household disposable income, real interest rates, real construction costs, house price to rent ratio, share of population aged 25-44 years and the homeownership rates other income/age groups. The sample includes the following countries: Australia, Austria, Belgium, Canada, Denmark, Finland, France, Germany, Italy, Luxembourg, Netherlands, Spain, Switzerland, the United Kingdom and the United States

40. Financial deregulation has been associated with an increase in homeownership among households who are potentially financially constrained, via a reduction in the down-payment constraint. The estimates imply that a 10 percentage point increase in the LTV (*i.e.* a reduction in the down-payment constraint) could raise the homeownership rate of households in the second income quartile by 1.9 percentage points. By comparison, a 10 percentage point increase in the LTV could raise the homeownership rate of households aged 25-34 years in the second income quartile by 4.4 percentage points. This is consistent with the idea that the down-payment constraint particularly affects younger households, who have had less time to accumulate a deposit.

41. Back of the envelope calculations suggest that the impact of a relaxation in the down-payment constraint on aggregate homeownership rates is in the same ballpark as the impact of population ageing on aggregate homeownership rates. Overall, the estimates imply that a 10 percentage point increase in the maximum LTV could be associated with a 0.5 percentage point increase in the aggregate homeownership from a sample median aggregate homeownership rate of 63.6%. In comparison, changes in the age structure boosted the aggregate homeownership rate by $\frac{3}{4}$ -1 percentage point on average across the 12 OECD countries studied.

Figure 6. Homeownership, financial deregulation and housing tax relief

Impact of a 10 percentage point increase in the maximum LTV ratio on the homeownership rate of households in the second income quartile relative to the sample median homeownership rate



Notes: The Figure shows the impact of a 10 percentage point – or one standard deviation – rise in the maximum LTV on the homeownership rate of each group. The impact on homeownership is expressed in percentage terms, relative to the sample median homeownership rate for each group, to control for differences in median level of homeownership between each group. The dot shows the estimated impact of an increase in the LTV on the group-specific homeownership rate when tax relief on mortgage debt financing is set equal to the sample median level. The upper (lower) bound shows the estimated impact when tax relief is set at 0.5 standard deviations below (above) the sample median level.

When Tax relief is set to the sample median, the overall impact coefficient on LTV is 0.19 for all households and 0.44 for those aged 25-34 years (see columns 1 and 3 of Table 3). In turn, these coefficients are used to construct the following policy experiments:

- (i) *All households in the second income quartile*: a 10 percentage point rise in the LTV is associated with a 1.9 percentage point rise in the group-specific homeownership rate. This is equivalent to a 3.4% rise – as indicated by the dot – relative to the group-specific sample median homeownership rate of 55.6%.
- (ii) *Households aged 25-34 years in the second income quartile*: a 10 percentage point rise in the LTV is associated with a 4.4 percentage point rise in the group-specific homeownership rate. This is equivalent to a 12.4% rise – as indicated by the dot – relative to the group-specific sample median homeownership rate of 35.1%.

Sources: LIS and OECD Calculations. LTVs are plotted in Figure 14 of Andrews, Caldera Sánchez and Johansson (2011) and are sourced from Chiuri and Jappelli (2003), Catte *et al.* (2004) and ECB (2009).

Tax relief on mortgage debt financing

42. The impact of mortgage market innovations on homeownership, however, is also influenced by the extent of tax relief for mortgage debt financing. The interaction between LTV and Taxrelief is negative and significant, which suggests that in countries with more generous tax relief on debt financing, the expansionary impact of an increase in the LTV ratio on the homeownership rate of financially-constrained households is smaller.²³ In a typical OECD country, a 10 percentage point increase in the LTV is associated with a 4.4 percentage point rise in the homeownership rate of households aged 25-34 years in the second quartile. In a country where tax relief is half a standard deviation more generous, however, the impact is only 3.2 percentage points.

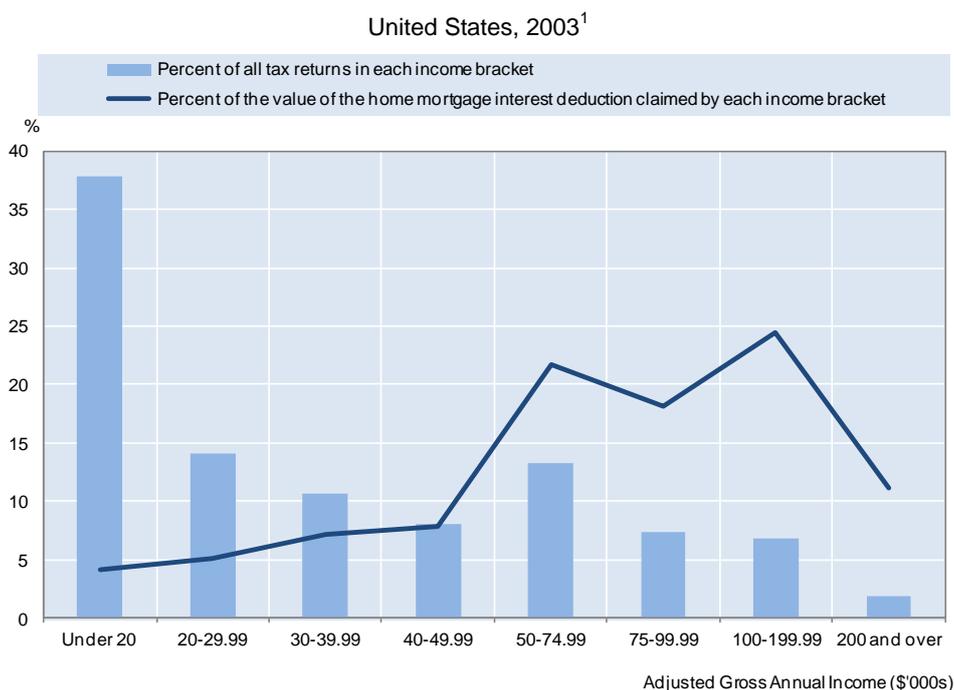
43. Thus, tax reliefs can distort the impact of other policies such as mortgage market innovations, and indirectly crowd-out financially constrained households from homeownership. This may reflect the greater tendency for house price capitalisation of demand shocks to occur in countries where housing tax relief is generous (see Andrews, 2010). In such environments, it is possible that the increase in the required deposit (due to higher real house prices) may have offset the easing of the down-payment constraint, thereby reducing housing affordability for the marginal buyer.²⁴ This interpretation is consistent with studies that show that higher real house prices can reduce homeownership rates amongst marginal buyers, by discouraging saving for a deposit and/or significantly increasing the period required to save for a deposit (Engelhardt, 1997; Engelhardt and Mayer, 1988).

44. Since the direct effect of tax relief on the homeownership rate of households in the second income quartile (*i.e.* the marginal buyer) is not modelled, it is possible that this effect – to the extent it is positive – could offset the indirect effect identified above.²⁵ However, the direct effect is likely to be economically small since tax reliefs for debt financing costs generally take the form of a deduction against earned income, which is worth less to households in the second income quartile than to high-income earners. This is supported by data from the United States, which show that the bulk of the value of the mortgage interest deduction is claimed by a relatively small fraction of households with high incomes (Figure 7). For example, while over half of all filed tax returns in 2003 pertained to adjustable gross incomes of less than \$30,000, this income bracket accounted for just 9% of the value of mortgage interest deductions. By contrast, taxpayers with adjustable gross incomes over \$75,000 claimed 54% of the value of home mortgage interest deductions, despite only accounting for 16% of tax filers.

²³ Additional modelling (not presented here) suggests that the adverse affect of generous housing tax policies on homeownership is more acute in countries with more rigid housing supply, which is consistent with existing evidence from the United States (Toder *et al.* 2010). This hypothesis is tested by including a triple interaction term (Financial Reform * Taxrelief * Supplyelasticity) in the estimation framework outlined above (estimates of the elasticity of housing supply are sourced from Caldera-Sánchez and Johansson, 2011). However, this interaction term is not always significant, especially in the specifications that include the LTV in place of the Financial Reform Index.

²⁴ For instance, Battelino (2009) notes that a particular problem for first-home owners in Australia is that the rise in the ratio of house prices to income has substantially increased the deposit required to access the market.

²⁵ The direct effect of tax reliefs for debt financing costs on homeownership is not modelled since the variable used to proxy tax relief is time invariant and is thus subsumed in the country-fixed effects.

Figure 7. Who benefits from the home mortgage interest deduction?

Source: Calculations from Prante (2006) based on Internal Revenue Service data.

1. The columns show the share of tax filers in each income bracket while the line shows the share of the value of mortgage interest deductions claimed by each income bracket. For instance, while 38% of all filed tax returns in 2003 pertained to adjustable gross incomes of less than \$20,000, this income bracket accounted for only 4% of the value of mortgage interest deductions. As noted in Prante (2006), while adjustable gross income differs somewhat from other measures of personal income, this distinction does not affect the distributional analysis shown above.

Rental market regulations

45. Results also suggest a role for rental market regulations in influencing tenure choice, with stricter rent regulation and greater tenant protection associated with lower probability to be a homeowner in the sample of countries studied. The results from the probit estimation of equation [5] reported in Table 4 show that²⁶:

- Higher rent controls, measured by the rent control index (column 1) are associated with lower probability of homeownership. Similarly, higher security of tenure is also associated with lower homeownership (column 2).
- The estimates imply that decreasing rent control from the average observed in the sample of countries by ½ a standard deviation (or to the level in Ireland) would raise average homeownership by 4 percentage points. Lowering the security of tenure by ½ a standard deviation would, in turn, increase average homeownership by 2 percentage points.

46. Rental market regulations may impose costs, however, to the extent that they are capitalised into housing costs and undermine flexibility in the housing market. Across OECD countries, residential mobility tends to be lower – *all else equal* – in countries where rental market regulations are stricter, as

²⁶

The control variables, omitted from the table for the sake of brevity and listed at the bottom of Table 4 are generally of the expected sign and significance. The results are also robust to controlling for cross-country differences in the share of private rentals in the housing stock.

measured by the degree of rent control and security of tenure (see Caldera Sánchez and Andrews, 2011). This may reflect the reluctance of sitting tenants in heavy regulated dwellings to move and give up their below-market rents.

Table 4. The effect of policies on tenure choice¹

Policies	(1) Rent control	(2) Security of tenure
Dependent variable=1 if homeowner, 0 if tenant (living in the private or social sector)		
Policy	-0.083*** (0.002)	-0.061*** (0.003)
Number of observations	224359	235953
Number of countries	22	22

1. Regressions include control variables on household characteristics such as real household disposable income, age, education, employment status, household size, cohabitation status; as well as controls for the degree of urbanisation and total national income. Values are marginal effects. The coefficients correspond to the impact of one unit change in the probability to be a homeowner estimated at the mean of the independent variables. The sample is restricted to individuals who are the head of the household and aged 24-66 to avoid the results being influenced by atypical tenureship. The estimates are weighted by individual sampling probability. Robust standard errors clustered at the country level in parentheses. *** p<0.01, ** p<0.05, * p<0.1.

Sources: OECD calculations based on 2007 EU-SILC for European countries, 2007 HILDA for Australia, 2007 SHP for Switzerland, 2007 AHS for the United States and the OECD Housing Market questionnaire. This analysis covers the following countries: Australia, Austria, Belgium, Czech Republic, Denmark, Finland, France, Germany, Greece, Hungary, Ireland, Italy, Luxembourg, Netherlands, Norway, Portugal, Slovenia, Spain, Sweden, Switzerland, United Kingdom and United States.

7. Conclusion

47. The results highlight the contribution of changes in demographic, socio-economic and selected policy variables to explaining patterns in aggregate homeownership rates across OECD countries over recent decades. Since the mid 1990s, part of the change in homeownership rates can be explained by changes in household characteristics. In some of the countries studied, population ageing and increases in real household incomes can each account for around 1 percentage point of the rise in aggregate homeownership rates, although the contribution of these factors can vary significantly across countries. Shifts in household characteristics, however, cannot account for all of the change leaving a potential role for public policy in explaining developments in homeownership rates. Innovations in mortgage markets appear to have boosted aggregate homeownership rates, and rough estimates suggest that this effect appears to be broadly comparable with the impact of population ageing. However, there is some evidence that the impact of mortgage market innovations has been distorted by generous housing tax relief, especially for lower income households due to the resulting increase in house prices. The evidence also suggests that rental market regulations impact homeownership by making renting more attractive, but these policies also carry costs.

48. To the extent that boosting homeownership is a public policy goal in some OECD countries, these results highlight some of the unintended consequences of current housing tax arrangements in many OECD countries. Of course, higher homeownership rates may not necessarily be desirable to the extent that they may constrain residential and labour mobility (see Caldera Sánchez and Andrews, 2011). Moreover, while alleviating credit constraints is generally desirable, it is important to acknowledge that the relaxation in lending standards can go too far, especially if this is associated with insufficient regulatory oversight as illustrated by recent developments in the United States (see Andrews, Caldera Sánchez and Johansson, 2011).

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APPENDIX A: DATA SOURCES

As discussed in Section 3, the data sources and country coverage varies somewhat according to the empirical approach. This Appendix provides a further elaboration on these issues.

Stylised facts and homeownership decomposition

To assess the contribution of shifts in household characteristics to aggregate homeownership rates over time, country-level household surveys from multiple time periods are required. Suitable household surveys for 12 OECD countries were obtained, primarily from the *Luxembourg Income Study* (LIS). For many of these countries, LIS provides around 4 or 5 cross sections, repeated at roughly five-year intervals, beginning in the early- to- mid-1980s. At the time the modelling was undertaken, wave 6 surveys (*circa* 2004) were available for 11 OECD member countries: Australia, Austria, Canada, Denmark, Finland, Italy, Luxembourg, Spain, Switzerland, the United Kingdom and the United States. While the LIS database contains survey data for the United States, a consistent measure of the household's ethnic status – which has been shown to be an important determinant of homeownership (see Gabriel and Rosenthal, 2005) – is not available across the various surveys. Accordingly, the data for the United States in this paper are drawn from the 1997 and 2007 editions of the *American Housing Survey*. Similarly, since the wave 6 LIS dataset for Germany was not available at the time the decomposition analysis was undertaken, data for Germany are sourced from the 1994 and 2007 editions of the *German Socio-Economic Panel Study* (GSOEP). Accordingly, empirical decompositions are conducted for these 12 countries.

Repeated cross-sectional surveys are also available for Belgium, France and the Netherlands, but decompositions were not conducted for these countries since the latest available data was somewhat dated (*circa* 2000). Data of sufficient quality were lacking for Korea, Japan, New Zealand, Norway and Sweden,²⁷ and finally estimates are not presented for eastern European countries such as Hungary, Poland and Slovenia.²⁸

Cross-country panel analysis

The cross-country panel analysis – which estimates how changes in financial and tax policies influence homeownership rates of some population groups over time – also utilises data from LIS. Unlike the decomposition analysis which explicitly models tenure choice at the household level, this analysis aggregates the household data to two groups of interest: average homeownership rates of households in the second income quartile – a potential proxy for the marginal buyer – and the average homeownership rate of very young households (aged 25-34 years) in the second income quartile. While the influence of financial

²⁷ There are no time series data available for Korea, while Japan and New Zealand are not LIS members. The survey question referring to tenure status is missing for Norway and contains a large number of missing observations for Sweden.

²⁸ While survey data for these countries are available, the tenure choice equations tend to perform poorly for Eastern European countries - possibly due to the very high rates of homeownership, which make it difficult to distinguish the impact of household characteristics on homeownership.

and tax policies on the marginal buyer could also be tested by pooling the various surveys and estimating the impact at the household level, this is not possible due to restrictions on access to the LIS data.²⁹

The sample consists of an unbalanced panel of 15 OECD countries, and homeownership rates are observed at 5-year intervals, generally beginning in the early- to mid-1980s and concluding around 2004. More specifically, the sample includes the 12 countries mentioned above plus Belgium, France and the Netherlands, though for the latter three countries, the most recent (*circa* 2005) data are not available. Finally, unlike in the decomposition analysis, the data for both Germany and the United States are sourced from LIS, to take advantage of the relatively long time series that the LIS database provides.

Cross-sectional analysis

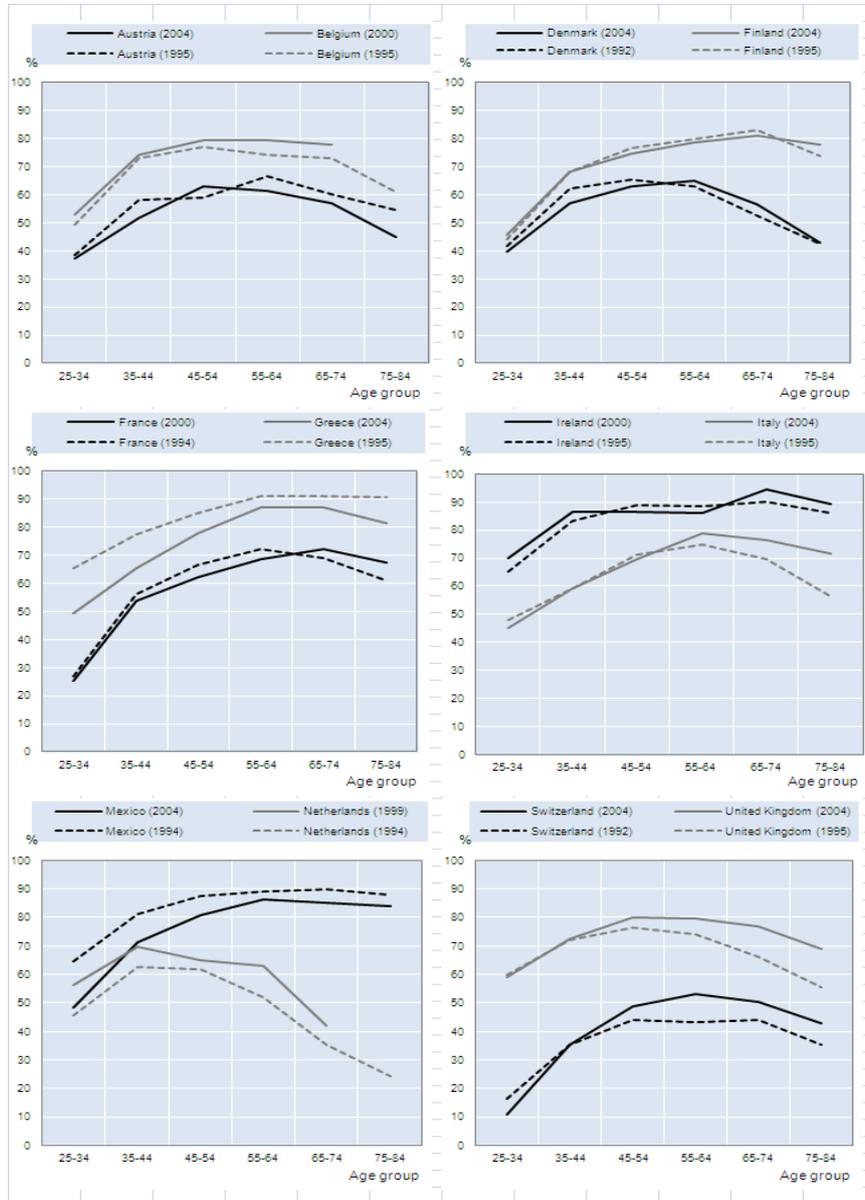
A cross-sectional modelling approach is adopted to estimate the impact of rental regulations on tenure choice at the household level. The cross-sectional – as opposed to panel – approach reflects the fact that the indicators of rental regulations are only available at a single point in time. To the extent that the data requirements are less demanding, however, data for a much broader sample of OECD countries – based on more timely data (from 2007) – are utilised. The sample is based on 22 OECD countries, sourced from the European Union Statistics on Income and Living Conditions (EU-SILC) household database, the Household, Income and Labour Dynamics in Australia Survey, Swiss Household Panel and the American Housing Survey.

²⁹

It is not possible to physically access the various LIS household surveys due to confidentiality restrictions. Instead, the data are accessed by sending statistical code to a server, and estimation results are subsequently returned. This process effectively places computational limits on estimation, which means that it is very cumbersome to estimate models that require the pooling of numerous households datasets.

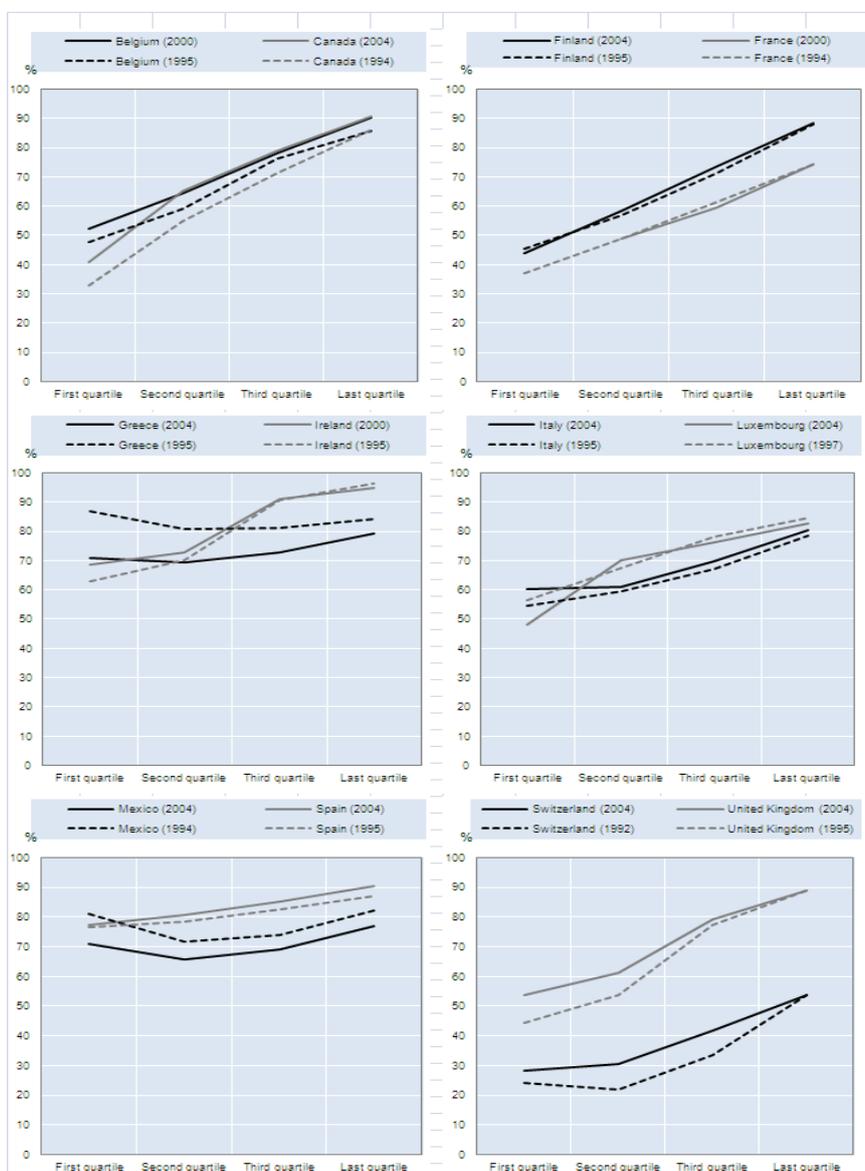
APPENDIX B: ADDITIONAL CHARTS

Figure B1: Homeownership rate by age group



Source: OECD calculations based on LIS data

Figure B2: Homeownership rate by income quartile



Source: OECD calculations based on LIS data.

APPENDIX C: FAIRLIE NON-LINEAR DECOMPOSITION

For a non-linear equation, such as $Y = F(X\beta)$, the decomposition can be expressed as:

$$\bar{P}_{2004} - \bar{P}_{1994} = \left[\sum_{i=1}^{N^{2004}} \frac{F(X_i^{2004}\beta^{2004})}{N^{2004}} - \sum_{i=1}^{N^{1994}} \frac{F(X_i^{1994}\beta^{2004})}{N^{1994}} \right] + \left[\sum_{i=1}^{N^{1994}} \frac{F(X_i^{1994}\beta^{2004})}{N^{1994}} - \sum_{i=1}^{N^{1994}} \frac{F(X_i^{1994}\beta^{1994})}{N^{1994}} \right]$$

(C.1)

where N^t is the sample size for period t and F is the cumulative distribution function from the logistic distribution. This alternative expression for the decomposition is used because \bar{P} (the average probability of homeownership) does not necessarily equal $F(\bar{X})$. That is, the predicted probability of homeownership evaluated at the means of the explanatory variables is not necessarily equal to the proportion of ‘ones’ (*i.e.* homeowners) in the sample.³⁰

In both equations (3) and (B.1), the first term in brackets represents the part of the change in the homeownership rate that is due to shifts in distribution of endowments over time, and the second term represents the part reflects changes over time in the processes determining homeownership rates. To calculate the decomposition, the average probability of homeownership for \bar{P} , the logistic function for F , and the coefficient estimates from equation (1) for β are substituted into equation (A1).

The contribution of a particular characteristic, for example age, to the change in homeownership rates over time is equal to the change in the average predicted probability from replacing the 1994 age distribution with the 2004 age distribution, while holding the distribution of the other explanatory variables constant. To generate these estimates, a matching procedure is utilised that involves the following steps:

- Estimate a logit tenure choice equation, using the 1994 sample.
- Use the coefficient estimates to calculate predicted probabilities (of being a homeowner) for all households in the 1994 sample and all households in a random subsample from the 2004 dataset with a sample size equal to N^{1994} .
- Each member of the two samples is then ranked by the value of this predicted probability and matched according to their respective ranks. This procedure assigns households with a low probability of homeownership in 1994 the same characteristics as households with a low probability of homeownership in 2004.
- Since the decomposition estimates obtained from this procedure depend on the randomly chosen 2004 subsample, a large number of random sub-samples from the 2004 dataset are drawn (with replacement) to obtain estimates that are likely to be representative of the entire 2004 sample.³¹ In turn, the contribution of a particular characteristic to the change in the homeownership rate is based on the average value of estimates from the sub-samples.

³⁰ Whether the proportion of ‘ones’ is greater or less than predicted probability will depend on the shape of the logistic function either side of the midpoint (0.5) See Fairlie (1999).

³¹ This procedure was initially conducted using 1 000 random subsamples. However, the results were not particularly sensitive to this choice so a smaller number of draws (50) was proceeded with to ease the computational burden of the exercise.

APPENDIX D: EMPIRICAL TABLES

The regression results in Tables D1 and D2 are based on a sample that pools data from the most recent household survey available, and data from an earlier period (generally the mid-1990s). The benchmark case against which the estimated coefficients and marginal probabilities are interpreted is a head of household aged 20-24, in a couple relationship with no children, with relatively low education and good health and not from an immigrant/ethnic background.

In initial specifications for Australia, Denmark, Spain and the United Kingdom, the coefficient on household size was negative. This appears to reflect a multi-collinearity problem between household size and household structure, so household size was excluded from the baseline tenure choice equation. For Austria, Denmark, Finland, Italy, Spain and Switzerland, data constraints mean that it is only possible to assess the relationship between education and homeownership using a dummy variable which takes the value 1 if the household head is tertiary educated. For Australia, Canada, Germany, Luxembourg, the United Kingdom and the United States, more detailed data on the educational level of the household head are available. For approximately one-half of the countries modelled, the interaction terms between income and age/household structure were insignificant and, thus, excluded from the baseline regression, while regional dummies are included in two-thirds of the countries studied.

Table D1. Logistic regression coefficients from tenure choice equation

Dependent variable: Probability of being a homeowner

	(1)		(2)		(3)		(4)		(5)	
	Austria		Finland		Italy		Spain		Switzerland	
	Coefficient	Standard error	Coefficient	Standard error	Coefficient	Standard error	Coefficient	Standard error	Coefficient	Standard error
<i>Age of Household Head</i>										
25-29 years	-0.022	(0.225)	0.488***	(0.136)	-1.126***	(0.217)	0.544*	(0.302)	-1.680***	(0.395)
30-34 years	0.444**	(0.188)	1.160***	(0.139)	-0.978***	(0.198)	0.895***	(0.290)	-0.694**	(0.307)
35-44 years	0.679***	(0.170)	1.593***	(0.132)	-0.350*	(0.179)	1.028***	(0.281)	0.241	(0.262)
45-64 years	1.239***	(0.157)	2.277***	(0.131)	0.053	(0.163)	1.663***	(0.280)	1.020***	(0.248)
65 years and over	1.233***	(0.162)	2.985***	(0.139)	0.303*	(0.164)	2.044***	(0.283)	1.430***	(0.255)
<i>Household structure</i>										
Household Size	0.333***	(0.050)	0.173***	(0.044)	0.056	(0.035)	..	..	0.367***	(0.084)
H2: Couple with dependents	-0.039	(0.127)	-0.112	(0.091)	-0.590***	(0.178)	0.003	(0.093)	-0.057	(0.197)
H3: Single without dependents	-0.142	(0.094)	-0.084	(0.108)	-0.711***	(0.141)	-0.320***	(0.091)	-0.249	(0.158)
H4: Single with dependents	-0.485***	(0.165)	-0.936***	(0.146)	-1.496***	(0.446)	-0.560***	(0.154)	-0.877***	(0.289)
Male household head	0.105	(0.068)	0.044	(0.061)	-0.011	(0.069)	0.092	(0.076)	0.562***	(0.125)
<i>Real Household Disposable Income</i>										
Income	0.029***	(0.005)	0.062***	(0.006)	0.000***	(0.000)	0.040***	(0.004)	0.011***	(0.002)
Income squared	0.000***	(0.000)	0.000***	(0.000)	0.000***	(0.000)	0.000***	(0.000)	0.000***	(0.000)
<i>Education of household head</i>										
Tertiary	-0.089	(0.113)	0.295***	(0.064)	0.222*	(0.114)	-0.080	(0.087)	0.117	(0.146)
<i>Indicators of socio-economic disadvantage</i>										
Disability (Household Head)	..	..	-0.067	(0.072)	-0.166	(0.127)	..	..	..	..
Disability (Spouse of Household Head)	..	..	0.126	(0.095)	0.005	(0.184)	..	..	..	..
Ethnic minority	-1.269***	(0.168)	-0.023	(0.113)	..	..	..	..	..	..
Immigrant/Foreigner	..	..	..	..	-1.436***	(0.152)	..	..	-1.382***	(0.148)
Constant	-2.292***	(0.220)	-2.694***	(0.165)	0.387*	(0.221)	-0.572*	(0.315)	-2.780***	(0.355)
<i>Interaction terms</i>										
Income * Age	No		No		No		No		No	
Income * Household structure	No		No		Yes		No		No	
Regional dummies	No		Yes		Yes		Yes		No	
Surveys	1987, 2004		1995, 2004		1991, 2004		1990, 2004		1992, 2004	
Number of observations	16294		20488		16171		33986		9547	
Classification rate	64.78%		82.36%		68.72%		80.80%		69.64%	
Robust standard errors in parenthesis, * significant at 5%; ** significant at 1%.										

Table D1 (continued). Logistic regression coefficients from tenure choice equation

Dependent variable: Probability of being a homeowner

	(1)		(2)		(3)		(4)		(5)		(6)		(7)	
	Canada		Denmark		Germany		United States		Australia		Luxembourg		United Kingdom	
	Coefficient	Standard error	Coefficient	Standard error	Coefficient	Standard error	Coefficient	Standard error	Coefficient	Standard error	Coefficient	Standard error	Coefficient	Standard error
<i>Age of Household Head</i>														
25-29 years	-0.032	(0.100)	0.087	(0.113)	0.568***	(0.199)	0.548**	(0.059)	0.220	(0.246)	0.301	(0.292)	0.454***	(0.115)
30-34 years	0.498***	(0.101)	0.377***	(0.114)	1.118***	(0.194)	1.098**	(0.058)	0.795***	(0.229)	0.709**	(0.281)	1.076***	(0.119)
35-44 years	0.967***	(0.090)	0.844***	(0.112)	1.757***	(0.187)	1.627**	(0.055)	1.381***	(0.210)	1.148***	(0.273)	1.278***	(0.099)
45-64 years	1.580***	(0.085)	1.355***	(0.088)	2.241***	(0.185)	2.313**	(0.055)	1.857***	(0.208)	1.453***	(0.263)	1.687***	(0.109)
65 years and over	1.715***	(0.101)	1.905***	(0.083)	2.767***	(0.186)	3.007**	(0.058)	2.442***	(0.218)	1.934***	(0.266)	2.091***	(0.097)
<i>Household structure</i>														
Household Size	0.050***	(0.015)			0.031	(0.027)	0.067**	(0.008)	..	..	0.284***	(0.068)		
Couple with dependents	-0.351***	(0.085)	0.322**	(0.139)	0.150**	(0.067)	..	..	-0.250*	(0.144)	-0.138	(0.180)	-0.054	(0.108)
Single without dependents	-0.830***	(0.060)	-0.864***	(0.069)	-0.579***	(0.053)	..	..	-1.423***	(0.106)	-0.319**	(0.143)	-0.886***	(0.076)
Single with dependents	..	..	..	..	-0.713***	(0.094)	..	..	..	..	..	..	..	..
Male household head	0.151***	(0.024)	0.483***	(0.020)	-0.054	(0.040)	0.065**	(0.020)	-0.149**	(0.063)	-0.043	(0.122)	0.052*	(0.029)
Married	..	..	..	..	..	..	1.124**	(0.030)	..	..	..	..	..	..
Divorced, widowed, separate	..	..	..	..	..	..	0.287**	(0.029)	..	..	..	..	..	..
<i>Real Household Disposable Income</i>														
Income	0.021***	(0.002)	0.007***	(0.000)	0.001***	(0.000)	0.000**	(0.000)	-0.004	(0.005)	0.019***	(0.003)	0.015***	(0.004)
Income squared	0.000***	(0.000)	0.000***	(0.000)	-0.000***	(0.000)	-0.000**	(0.000)	0.000	(0.000)	0.000**	(0.000)	0.000***	(0.000)
<i>Education of household head</i>														
Secondary	0.013	(0.032)	..	..	0.358***	(0.040)	0.275**	(0.027)	..	..	..	..	..	..
Associate	0.199***	(0.033)	..	..	0.225***	(0.063)	0.298**	(0.029)	0.386***	(0.048)	0.635**	(0.259)	0.889***	(0.029)
Tertiary	0.036	(0.042)	0.285***	(0.027)	0.147***	(0.055)	0.321**	(0.032)	0.218***	(0.066)	-0.234*	(0.129)	1.003***	(0.045)
<i>Indicators of socio-economic disadvantage</i>														
Disability (Household Head)	-0.193***	(0.028)	..	..	-0.106**	(0.052)	..	..	..	..	..	..	-0.599***	(0.025)
Disability (Spouse of Househo	-0.089**	(0.045)	..	..	..	..	..	..	..	..	..	..	-0.320***	(0.038)
Ethnic minority	..	..	..	..	..	..	..	..	..	..	..	..	-0.318***	(0.053)
Immigrant/Foreigner	..	..	-1.298***	(0.039)	..	..	..	..	..	..	-1.706***	(0.097)	..	..
Non-English Speaking Backgrt	..	..	..	..	..	..	..	..	-0.545***	(0.067)	..	..	..	..
African American	..	..	..	..	..	..	-0.767**	(0.027)	..	..	..	..	..	..
Hispanic	..	..	..	..	..	..	-0.659**	(0.031)	..	..	..	..	..	..
Asian	..	..	..	..	..	..	-0.921**	(0.051)	..	..	..	..	..	..
American Indian	..	..	..	..	..	..	-0.438**	(0.086)	..	..	..	..	..	..
Constant	-1.504***	(0.104)	-2.566***	(0.101)	-5.067***	(0.249)	-3.349**	(0.064)	-0.448**	(0.220)	-1.074***	(0.321)	-0.287**	(0.118)
<i>Interaction terms</i>														
Income * Age	Yes		Yes		No		No		Yes		No		Yes	
Income * Household structure	Yes		Yes		No		No		Yes		No		Yes	
Regional dummies	Yes		No		Yes		Yes		Yes		No		Yes	
Surveys	1994, 2004		1992, 2004		1994, 2007		1997, 2007		1995, 2003		1997, 2004		1999, 2004	
Number of observations	68 578		96 133		17 485		78 266		16 908		6 136		52 708	
Classification rate	77.52%		75.31%		70.81%		77.52%		76.85%		77.95%		75.49%	

Robust standard errors in parenthesis. * significant at 5%; ** significant at 1%.

Table D2. Marginal effects coefficients from tenure choice equation

Dependent variable: Probability of being a homeowner

	(1)		(2)		(3)		(4)		(5)	
	Austria		Finland		Italy		Spain		Switzerland	
	Coefficient	Standard error	Coefficient	Standard error	Coefficient	Standard error	Coefficient	Standard error	Coefficient	Standard error
<i>Age of Household Head</i>										
25-29 years	-0.003	(0.056)	0.117***	(0.022)	-0.272***	(0.053)	0.055**	(0.025)	-0.268***	(0.037)
30-34 years	0.112**	(0.044)	0.194***	(0.019)	-0.234***	(0.049)	0.084***	(0.020)	-0.131**	(0.054)
35-44 years	0.170***	(0.039)	0.258***	(0.020)	-0.078*	(0.042)	0.102***	(0.022)	-0.061	(0.061)
45-64 years	0.299***	(0.034)	0.397***	(0.023)	0.013	(0.035)	0.176***	(0.026)	0.239***	(0.057)
65 years and over	0.286***	(0.033)	0.413***	(0.016)	0.065*	(0.034)	0.192***	(0.021)	0.327***	(0.059)
<i>Household structure</i>										
Household Size	0.089***	(0.013)	0.041***	(0.014)	0.013*	(0.008)	..	..	0.086***	(0.019)
H2: Couple with dependents	-0.016	(0.032)	-0.034	(0.021)	-0.125***	(0.044)	0.000	(0.011)	-0.019	(0.043)
H3: Single without dependents	-0.046**	(0.023)	-0.017	(0.026)	-0.167***	(0.035)	-0.043***	(0.012)	-0.063*	(0.034)
H4: Single with dependents	-0.131***	(0.039)	-0.218***	(0.041)	-0.366***	(0.098)	-0.083***	(0.026)	-0.171***	(0.042)
Male household head	0.029*	(0.017)	0.010	(0.013)	-0.002	(0.015)	0.011	(0.009)	0.122***	(0.025)
<i>Real Household Disposable Income</i>										
Income ('000s of national currency)	0.004***	(0.001)	0.012***	(0.002)	0.003***	(0.000)	0.004***	(0.000)	0.001***	(0.000)
<i>Education of household head</i>										
Tertiary	-0.014	(0.029)	0.058***	(0.016)	0.050**	(0.023)	-0.009	(0.011)	0.027	(0.033)
<i>Indicators of socio-economic disadvantage</i>										
Disability (Household Head)	..	..	-0.016	(0.016)	-0.038	(0.029)	..	..	..	..
Disability (Spouse of Household Head)	..	..	0.028	(0.020)	0.001	(0.040)	..	..	..	..
Ethnic minority	-0.298***	(0.031)	-0.006	(0.023)	..	..	..	..	..	..
Immigrant/Foreigner	..	..	..	..	-0.345***	(0.034)	..	..	-0.258***	(0.021)
Regional dummies										
	No		Yes		Yes		Yes		No	
Surveys	1987, 2004		1995, 2004		1991, 2004		1990, 2004		1992, 2004	
Number of observations	16 294		20 488		16 171		33 986		9 547	
Classification rate	64.78%		82.36%		68.72%		80.80%		69.64%	
Robust standard errors in parenthesis, * significant at 5%; ** significant at 1%.										

Table D2 (continued). Marginal effects coefficients from tenure choice equation

Dependent variable: Probability of being a homeowner

	(1)		(2)		(3)		(4)		(5)		(6)		(7)	
	Canada		Denmark		Germany		United States		Australia		Luxembourg		United Kingdom	
	Coefficient	Standard error	Coefficient	Standard error	Coefficient	Standard error	Coefficient	Standard error	Coefficient	Standard error	Coefficient	Standard error	Coefficient	Standard error
<i>Age of Household Head</i>														
25-29 years	-0.002	(0.028)	0.007	(0.010)	0.146***	(0.049)	0.111***	(0.009)	0.086***	(0.018)	0.055	(0.046)	0.078***	(0.011)
30-34 years	0.089***	(0.024)	0.070***	(0.010)	0.278***	(0.043)	0.172***	(0.007)	0.173***	(0.013)	0.115***	(0.037)	0.166***	(0.008)
35-44 years	0.145***	(0.022)	0.140***	(0.009)	0.417***	(0.037)	0.247***	(0.007)	0.250***	(0.012)	0.182***	(0.035)	0.233***	(0.008)
45-64 years	0.237***	(0.020)	0.244***	(0.008)	0.512***	(0.034)	0.369***	(0.008)	0.367***	(0.014)	0.244***	(0.038)	0.340***	(0.009)
65 years and over	0.228***	(0.017)	0.301***	(0.007)	0.588***	(0.027)	0.365***	(0.005)	0.365***	(0.010)	0.274***	(0.028)	0.340***	(0.007)
<i>Household structure</i>														
Household Size	0.015***	(0.005)			0.013**	(0.007)	0.014***	(0.002)	..	..	0.056***	(0.013)		
Couple with dependents	-0.086**	(0.034)	0.079***	(0.009)	0.029*	(0.016)	..	..	0.021*	(0.012)	-0.031	(0.034)	0.044***	(0.010)
Single without dependents	-0.187***	(0.024)	-0.161***	(0.006)	-0.143***	(0.012)	..	..	-0.254***	(0.014)	-0.065**	(0.028)	-0.166***	(0.009)
Single with dependents	-0.340***	(0.038)	-0.211***	(0.010)	-0.167***	(0.018)	..	..	-0.334***	(0.025)	-0.042	(0.051)	-0.277***	(0.016)
Male household head	0.029***	(0.007)	0.115***	(0.005)	-0.012	(0.010)	..	..	-0.024**	(0.011)	-0.007	(0.022)	0.013**	(0.006)
Married	..	..	..	..	..	..	0.223***	(0.006)	..	..	..	..	..	..
Divorced, widowed, separated	..	..	..	..	..	..	0.049***	(0.005)	..	..	..	..	..	..
<i>Real Household Disposable Income</i>														
Income ('000s of national currency)	0.003***	(0.001)	0.001***	(0.000)	0.008***	(0.000)	0.003***	(0.000)	0.002***	(0.000)	0.003***	(0.000)	0.006***	(0.001)
<i>Education of household head</i>														
Secondary	0.002	(0.009)	..	..	0.087***	(0.009)	0.054***	(0.005)	..	..	..	..	..	..
Associate	0.046***	(0.009)	..	..	0.060***	(0.016)	0.061***	(0.005)	0.070***	(0.008)	0.101***	(0.033)	0.162***	(0.005)
Tertiary	0.019	(0.011)	0.064***	(0.007)	0.046***	(0.014)	0.067***	(0.006)	0.041***	(0.011)	-0.037	(0.025)	0.162***	(0.007)
<i>Indicators of socio-economic disadvantage</i>														
Disability (Household Head)	-0.041***	(0.009)	..	..	-0.027**	(0.012)	..	..	..	..	..	..	-0.121***	(0.005)
Disability (Spouse of Household Head)	-0.021	(0.013)	..	..	..	..	..	..	..	..	..	..	-0.057***	(0.007)
Ethnic minority	..	..	..	..	..	..	..	..	..	..	..	..	-0.085***	(0.011)
Immigrant/Foreigner	..	..	-0.305***	(0.007)	..	..	..	..	..	..	-0.353***	(0.021)	..	..
Non-English Speaking Background	..	..	..	..	..	..	..	..	-0.111***	(0.015)	..	..	..	..
African American	..	..	..	..	..	..	-0.180***	(0.007)	..	..	..	..	..	..
Hispanic	..	..	..	..	..	..	-0.164***	(0.008)	..	..	..	..	..	..
Asian	..	..	..	..	..	..	-0.202***	(0.013)	..	..	..	..	..	..
American Indian	..	..	..	..	..	..	-0.074***	(0.022)	..	..	..	..	..	..
Regional dummies	Yes	No	Yes	No	Yes	No	Yes	No	Yes	No	Yes	No	Yes	No
Surveys	1994, 2004	1992, 2004	1994, 2007	1997, 2007	1995, 2003	1997, 2004	1999, 2004							
Number of observations	68 578	96 133	17 877	78 266	16 908	6 136	52 708							
Classification rate	77.52%	75.31%	70.81%	77.52%	76.85%	77.95%	75.49%							

Robust standard errors in parenthesis, * significant at 5%; ** significant at 1%.

APPENDIX E: DEMOGRAPHIC AND SOCIO-ECONOMIC CHANGES

Table E1 documents how the average characteristics of the population in each country have changed over the past decade or so. Some trends in average characteristics of the population that are likely to have put upward pressure on aggregate homeownership rates include:

- The average age of the population has increased over the period studied. One indicator of this is the share of household heads aged over 45 years, which has risen from an average of 59% in the mid-1990s to around 61% in the more recent period. This trend has been particularly pronounced in Denmark, Canada, Switzerland and the United States, and less so in countries such as Italy and Austria, where the population was somewhat older at the start of the sample period.
- Average real household disposable income has increased in most countries over the period studied. Income grew particularly strongly in Australia and the United Kingdom, while it has declined or remained unchanged in Germany, Italy and Switzerland. Educational levels have generally increased, with the share of tertiary-educated household heads rising from an average of 13% in the mid-1990s to approximately 19% in the more recent period.

Selected trends that might place downward pressure on aggregate homeownership rates include:

- The share of single-person households has risen over the period studied, reflecting the deferral of marriage and childbearing. These trends have been particularly marked in Spain, Italy, Germany and Australia. Reflecting these developments, average household size has generally fallen. However, in Austria and Canada average household size has shown a modest increase over the period studied, consistent with a decline in the share of single-headed households.
- The ethnic composition of the population of many OECD countries has become more diverse. In the United States, the proportion of Hispanic households has risen noticeably since the mid-1990s, while in Italy and Luxembourg, immigrant households have also become more prominent.

Table E1. Sample means for explanatory variables

	(1)		(2)		(3)		(4)		(5)	
	Austria		Finland		Italy		Spain		Switzerland	
	1987	2004	1995	2004	1991	2004	1990	2004	1992	2004
<i>Age of Household Head</i>										
25-29 years	8.9	5.9	8.4	8.2	3.9	3.2	4.6	4.3	10.9	7.1
30-34 years	9.1	9.4	10.0	7.5	8.5	6.1	8.7	9.8	10.5	9.8
35-44 years	16.3	22.3	19.9	18.0	17.8	22.4	19.8	21.2	19.4	21.6
45-64 years	29.8	35.3	33.5	37.0	39.5	34.6	40.2	35.9	28.9	36.1
65 years and over	32.9	24.6	23.2	23.7	31.4	34.5	27.4	29.4	25.3	24.0
<i>Household structure</i>										
Household Size	2.2	2.3	2.2	2.1	2.9	2.5	3.4	2.8	2.3	2.3
H2: Couple with dependents	22.0	23.2	24.0	20.3	32.0	24.3	43.8	29.0	24.6	23.1
H3: Single without dependents	44.4	40.4	41.1	42.1	25.7	34.8	17.8	25.6	39.3	36.3
H4: Single with dependents	4.9	4.4	5.0	4.4	2.4	2.3	3.1	3.0	3.9	2.8
<i>Real Household Disposable Income</i>										
Annual Income (units of national currency)	25 086	32 677	22 969	29 275	25 084	24 809	18 353	22 747	74 603	72 818
<i>Education of household head</i>										
Tertiary	5.1	12.4	22.6	28.8	6.5	8.9	9.1	21.4	5.5	12.4
<i>Indicators of socio-economic disadvantage</i>										
Disability (Household Head)	..	..	20.6	16.9	5.0	3.3	..	..	..	..
Disability (Spouse of Household Head)	..	..	52.5	54.1	3.0	1.5	..	..	..	..
Ethnic minority	4.2	6.4	5.2	5.3	..	..	..	..	..	..
Immigrant/Foreigner	..	..	..	..	1.0	4.5	..	..	19.2	20.8

Table E1 (continued). Sample means for explanatory variables

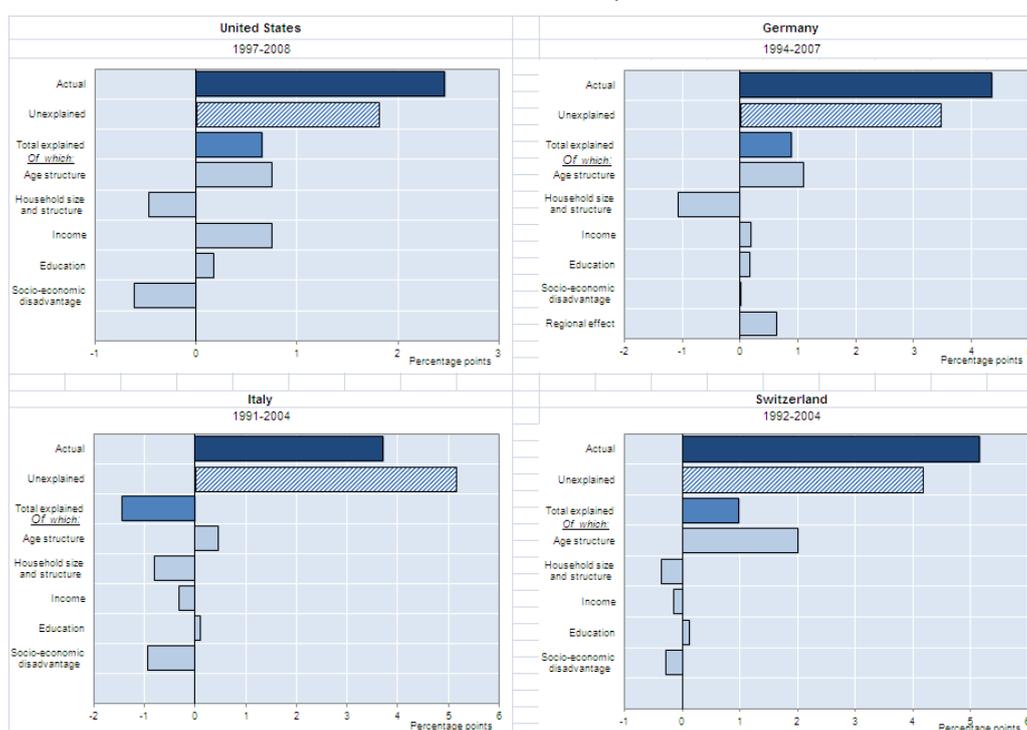
	(1)		(2)		(3)		(4)		(5)		(6)		(7)	
	Canada		Denmark		Germany		United States		Australia		Luxembourg		United Kingdom	
	1994	2004	1992	2004	1994	2007	1997	2007	1995	2003	1997	2004	1999	2004
<i>Age of Household Head</i>														
25-29 years	9.6	8.5	10.2	7.9	9.5	7.3	8.5	8.1	8.3	7.8	7.4	4.9	7.4	6.6
30-34 years	12.3	9.2	9.0	8.4	10.1	7.2	10.5	8.8	11.6	10.3	11.7	9.2	9.8	9.0
35-44 years	23.2	22.7	17.6	18.8	17.0	21.0	23.6	19.9	22.0	21.7	22.8	22.8	18.9	21.2
45-64 years	29.9	35.7	29.6	34.5	34.1	32.2	31.7	37.9	32.6	35.3	32.0	38.6	34.2	33.8
65 years and over	19.7	20.2	25.5	25.6	25.6	28.6	21.2	20.9	22.2	21.9	25.7	23.9	27.3	26.7
<i>Household structure</i>														
Household Size	2.4	2.5	2.0	2.1	2.2	2.1	2.6	2.5	2.7	2.5	2.5	2.5	2.4	2.3
Couple with dependents	25.3	24.0	20.0	20.8	20.5	15.6	..	..	30.4	26.4	29.0	28.1	22.1	21.3
Single without dependents	38.0	37.1	45.4	43.1	44.9	50.4	..	..	31.0	32.7	34.1	32.7	34.6	34.9
Single with dependents	6.4	6.2	4.9	5.7	5.1	6.3	..	..	6.0	7.1	3.3	3.0	7.2	7.5
Married	..	..	..	..	..	..	54.5	52.3	..	..	..	..	..	..
Divorced, widowed, separated	..	..	..	..	..	..	29.6	28.6	..	..	..	..	..	..
<i>Real Household Disposable Income</i>														
Annual Income (units of national currency)	44 416	50 667	221 480	275 810	27 754	27 952	56 594	66 018	39 714	44 591	45 678	55 371	20 578	24 609
<i>Education of household head</i>														
Secondary	35.3	26.6	..	..	60.8	61.3	30.2	27.7	..	..	..	..	..	..
Associate	35.4	44.4	..	..	8.8	10.5	26.7	26.5	34.4	35.7	6.4	3.8	..	..
Tertiary	15.2	19.9	10.7	16.5	13.8	20.8	24.8	29.0	12.1	16.9	17.7	22.1	15.9	19.1
<i>Indicators of socio-economic disadvantage</i>														
Disability (Household Head)	3.1	27.2	..	..	15.5	15.9	..	..	..	..	..	..	35.5	33.1
Disability (Spouse of Household Head)	1.0	14.0	..	..	..	..	..	..	..	..	..	..	56.9	57.7
Ethnic minority	..	..	..	..	..	..	..	..	..	..	..	..	5.3	7.4
Immigrant/Foreigner	..	..	2.9	6.7	..	..	..	..	..	..	28.0	35.3	..	..
Non-English Speaking Background	..	..	..	..	..	..	..	..	6.7	16.6	..	..	..	..
African American	..	..	..	..	..	..	12.1	12.8	..	..	..	..	..	..
Hispanic	..	..	..	..	..	..	8.5	11.4	..	..	..	..	..	..
Asian	..	..	..	..	..	..	2.8	3.6	..	..	..	..	..	..
American Indian	..	..	..	..	..	..	0.6	1.5	..	..	..	..	..	..

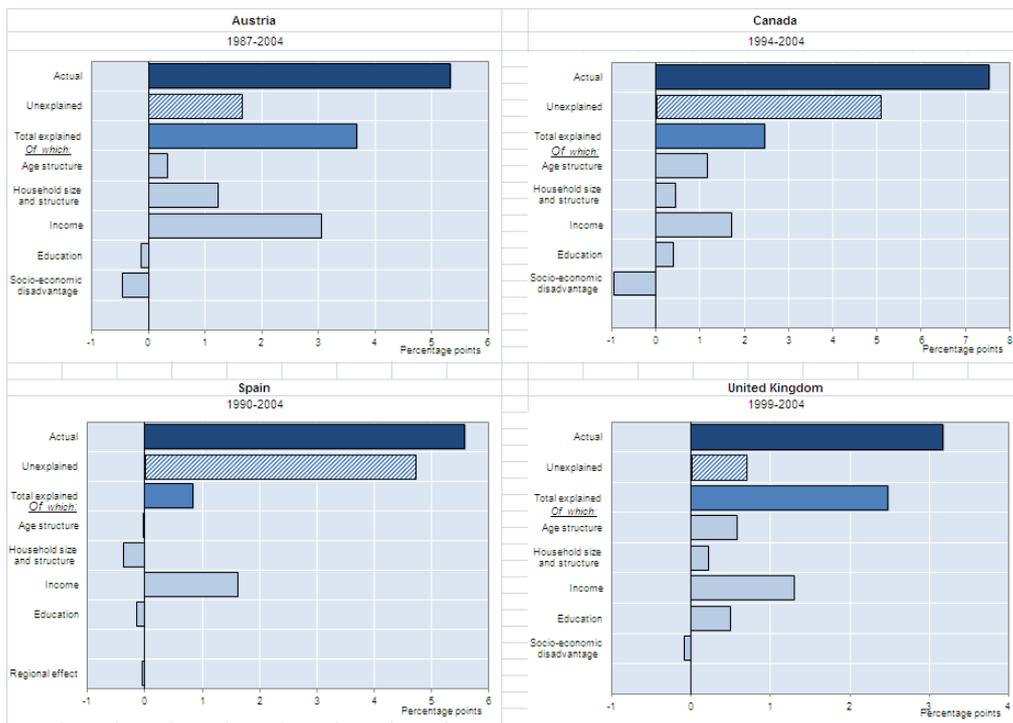
APPENDIX F: DETAILED DECOMPOSITION RESULTS

The following charts isolate the contribution of each explanatory variable included in the tenure choice equation to the change in the homeownership rate. Together, these characteristics sum to the total explained column. For some countries, the characteristics do not perfectly sum to the total explained bar, because variables that make a very small contribution (such as the regional dummies or the male household head dummy) are generally excluded for presentational purposes. Figure F1 contains the detailed decomposition estimates for countries where the aggregate homeownership rate increased noticeably over recent times, while the estimates for countries where the aggregate homeownership rate has declined or changed little are shown in Figure F2.

Figure F1: Detailed decompositions – countries with rising homeownership rates

Fairlie non-linear decomposition

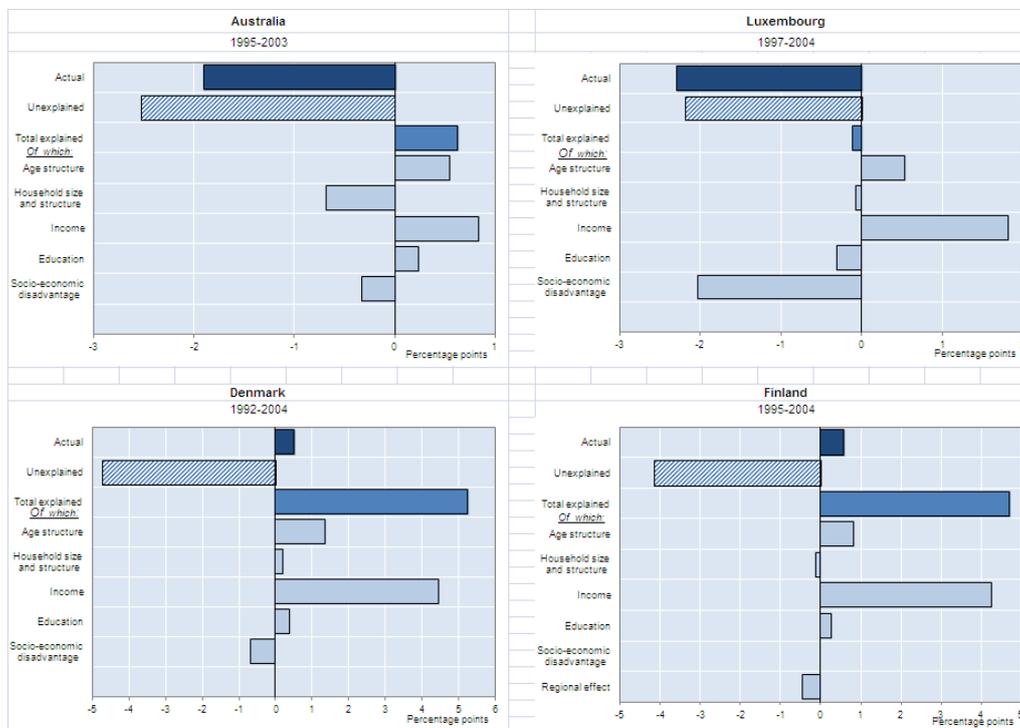




Source: OECD calculations based on LIS, GSOEP and the American Housing Survey.

Figure F2: Detailed decompositions – countries stable or declining homeownership rates

Fairlie non-linear decomposition



Source: OECD calculations based on LIS.

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