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Guillaume Claveres,

Thomas Y. Mathä,

Giuseppe Pulina,

Jan Stráský,

Nicolas Woloszko,

Michael Ziegelmeyer

OECD

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By Guillaume Claveres, Thomas Y. Mathä, Giuseppe Pulina, Jan Stráský, Nicolas Woloszko and Michael Ziegelmeyer

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ASTRACT/RÉSUMÉ

Housing and inequality: The case of Luxembourg and its cross-border workers

The rate of homeownership is close to the OECD average in Luxembourg. However, strong house price increases, mainly driven by population growth and limited housing supply, led to a deterioration in affordability of housing, in particular for the young and added to the wealth gap between homeowners and renters. As in many OECD countries, housing is the main asset of the middle class. However, at the top of the wealth distribution housing is less prominent and accounts for a smaller share of wealth than in most OECD countries. Mortgage market participation in Luxembourg is higher than in neighbouring countries and households in the middle income quintile are almost as likely to have a mortgage as those in the top income quintile. Among cross-border workers, homeownership is higher than the average for the country in which they live, mainly reflecting their higher income. Still, high real estate prices are an important reason for not living in Luxembourg. In addition, a third of Luxembourg residents continue to rent, often citing high real estate prices and insufficient own funds. Even controlling for other household characteristics, there is a substantial gap in net wealth between renters and homeowners. The data also indicates that median net wealth among Luxembourg residents is significantly higher than among cross-border commuters. Within each subsample, higher education and income play an important role in explaining wealth differences between households.

This Working Paper relates to the 2019 OECD Economic Survey of Luxembourg

http://www.oecd.org/economy/Luxembourg-economic-snapshot
JEL classification codes: D31: R21: R23: R31:

Keywords: Homeownership, wealth distribution, inequality, household survey, cross-border workers, Luxembourg

Logement et inégalités : le cas du Luxembourg et de ses travailleurs transfrontaliers

Le taux de propriétaires au Luxembourg est proche de la moyenne des pays de l'OCDE. Néanmoins, une forte hausse des prix de l'immobilier, causée principalement par la croissance de la population et les limites de l'offre de logement, a conduit à une détérioration de l'abordabilité du logement en particulier auprès des jeunes, et a accru l'écart de richesse entre les propriétaires et les locataires. Comme dans la plupart des pays de l'OCDE, l'immobilier reste au Luxembourg le principal actif dans le portefeuille des ménages de la classe moyenne. Néanmoins, l'immobilier représente une part plus faible du portefeuille des ménages les plus nantis, et une part moins importante de la richesse totale que dans la plupart des pays de l'OCDE. La proportion de ménages titulaires d'un crédit hypothécaire est plus élevée au Luxembourg que dans les pays voisins, et les ménages du troisième quantile de revenu sont aussi nombreux que les ménages du cinquième quantile de revenu à être endettés. Parmi les travailleurs transfrontaliers, le taux de propriétaires est plus élevé que les moyennes de leurs pays de résidence, ce qui reflète le fait que les travailleurs transfrontaliers ont des revenus plus élevés. Reste que, les prix de l'immobiliers peuvent décourager les transfrontaliers à s'établir au Luxembourg. Un tiers des résidents Luxembourgeois louent leur résidence principale, invoquant souvent le niveau des prix élevé ou l'insuffisance de leurs ressources financières comme obstacle pour accéder à la propriété. Même en contrôlant pour les caractéristiques des ménages, il existe un écart de richesse substantiel entre locataires et propriétaires. Les données indiquent que la richesse nette médiane des résidents luxembourgeois est significativement supérieure à celle des travailleurs transfrontaliers. Au sein de chacun de ces groupes, les diplômes et le niveau de revenu contribuent largement à expliquer les écarts de richesse.

Ce Document de travail se rapporte à l'Étude économique de l'OCDE du Luxembourg 2019

http://www.oecd.org/fr/economie/Luxembourg-en-un-coup-d-oeil/
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Introduction

House prices have been growing substantially in Luxembourg, reflecting strong population growth, a buoyant economy and a limited supply of housing. Increases in price-to-income and price-to-rent ratios suggest a deterioration in affordability of housing, which is particularly important for the young. More than 40% of employees are cross-border commuters, i.e. people who choose to live in the neighbouring regions and cross the border every day to work in Luxembourg. Some residents move out of Luxembourg into the neighbouring regions, mainly to benefit from lower rents, living costs or to acquire a home. While the numbers seem to have been growing in the last twenty years or so, this phenomenon remains limited (Carpentier, 2010; Mathä, Porpiglia and Ziegelmeyer, 2018). Rising house prices may have contributed to the net wealth gap between homeowners and renters. Heavily indebted homeowners are also financially more vulnerable. Against this backdrop, this paper looks at the role of homeownership in the wealth distribution and housing inequalities in Luxembourg and the neighbouring countries, with a special focus on the group of cross-border workers living in the regions of Belgium, France and Germany that are neighbouring Luxembourg.

Housing tenure and wealth distribution

Housing has a central role in household portfolios and thus in the distribution of wealth (Causa and Woloszko, 2019). This first section analyses homeownership and wealth inequality dynamics in Luxembourg compared to other OECD countries, with a focus on Luxembourg's neighbours. As mortgage finance is key to accessing homeownership, this section also analyses mortgage market participation by age and income distribution. It shows that Luxembourg has relatively higher homeownership rate and lower wealth inequality than its neighbouring countries and the OECD average. Participation in the mortgage market is also higher in Luxembourg, especially in the middle of the income distribution and among younger households.

Guillaume Claveres (DG Trésor), Thomas Y. Mathä (Banque centrale du Luxembourg), Giuseppe Pulina (Banque centrale du Luxembourg), Jan Stráský (OECD), Nicolas Woloszko (OECD), Michael Ziegelmeyer (Banque centrale du Luxembourg)

Homeownership and wealth inequalities

Across OECD countries, higher wealth inequalities are associated with lower homeownership rates. Wealth inequalities (as measured by the share of net wealth owned by the top 10% or the bottom 40%) in Luxembourg are slightly lower than the OECD average (Figure 1), and a rate of homeownership close to the OECD average (Figure 2). The homeownership rate is higher and the top wealth share lower than in both France and Germany.

Figure 1. Homeownership and net wealth inequalities

A. Homeownership vs. top 10% share of net wealth

B. Homeownership vs. bottom 40% share of net wealth
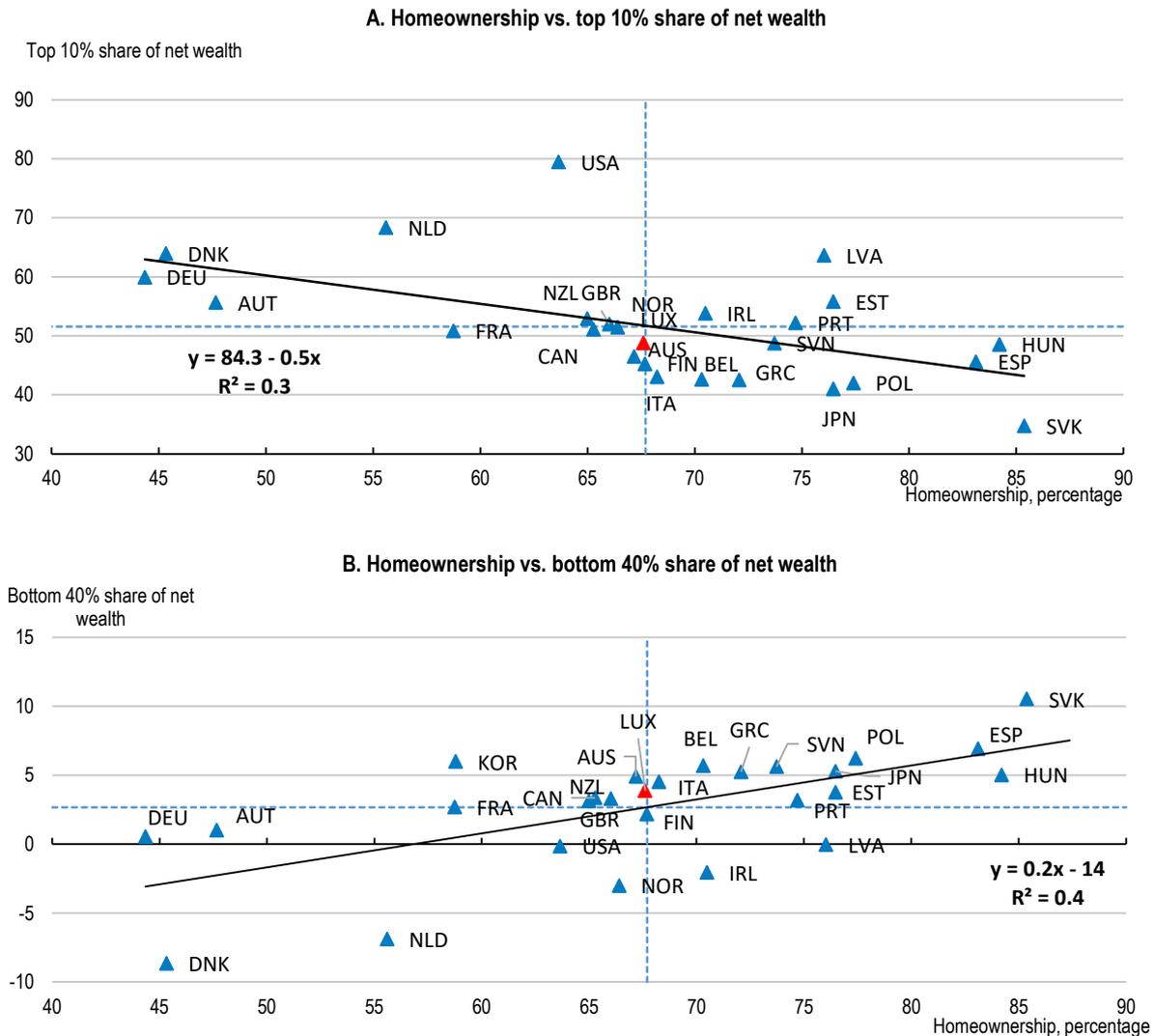
Source: OECD Wealth Distribution Database[2].

The tenure mix (share of renters, owners with mortgage and outright owners) in Luxembourg is close to the OECD average. The share of outright owners, as well as the share of owners with a mortgage, is slightly higher than in other European countries. A number of studies have suggested that cross-country differences in aggregate homeownership rates are due to differences in policies and institutions that affect housing demand and supply. These may include regulations of mortgage markets, of rental markets, the provision of social housing, taxation and land-use policies, or massive privatisation of state-owned dwellings in Eastern Europe following the collapse of the Soviet Union

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[2]   When it comes to European countries, the OECD Wealth Distribution Database (WDD) uses the ECB Household Finance and Consumption Survey (HFCS). Data from WDD is thus highly comparable with data on cross-border workers from the XB-HFCS.

(Andrews, Caldera Sánchez and Johansson, 2011; Andrews and Caldera Sánchez, 2011a; Andrews and Caldera Sánchez, 2011b).

Figure 2. OECD countries exhibit great variation in the housing tenure mix
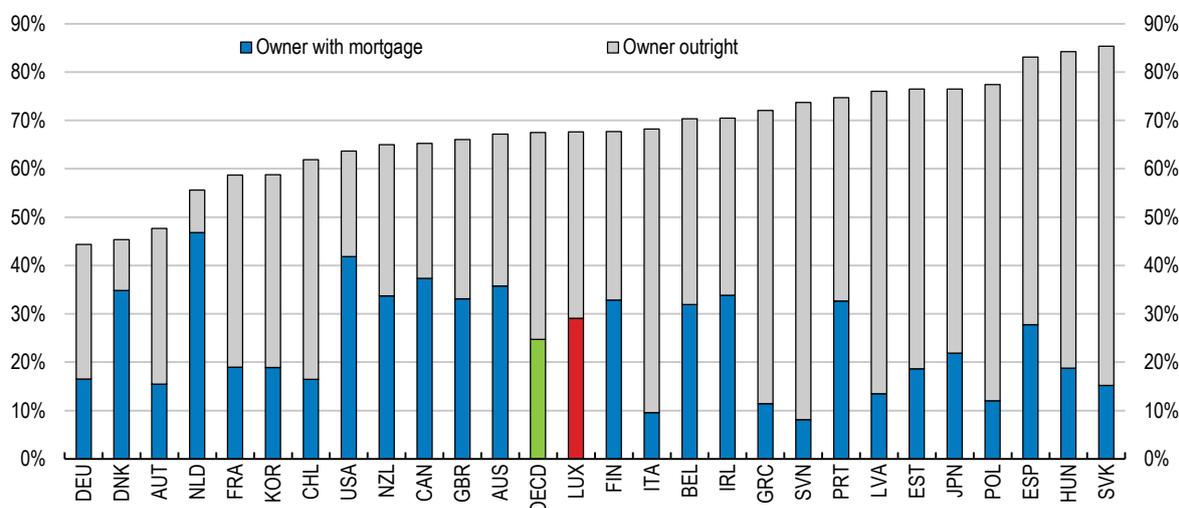
Source: OECD Wealth Distribution Database.

Patterns in homeownership rates across the gross income[3] distribution deliver insights about the distributional implications of housing and the potential role of economic policies (Figure 3). It appears from the data that the spread in homeownership rates between the bottom and top income quintiles tend to be smaller in high homeownership countries. From this point of view, the overall homeownership rate in Luxembourg is close to the OECD average but the difference between the bottom and top income quintiles is much larger than the OECD average. About 38% of households in the bottom income quintile are homeowners, which is 12 percentage points (pp) less than OECD average. Moreover, according to the OECD Affordable Housing Database, more than 50% of households from the bottom income quintile in Luxembourg rely on the private rental sector and less than 10% have access to subsidised rental accommodation, such as social housing.

Figure 3. Homeownership in the bottom and top income quintiles
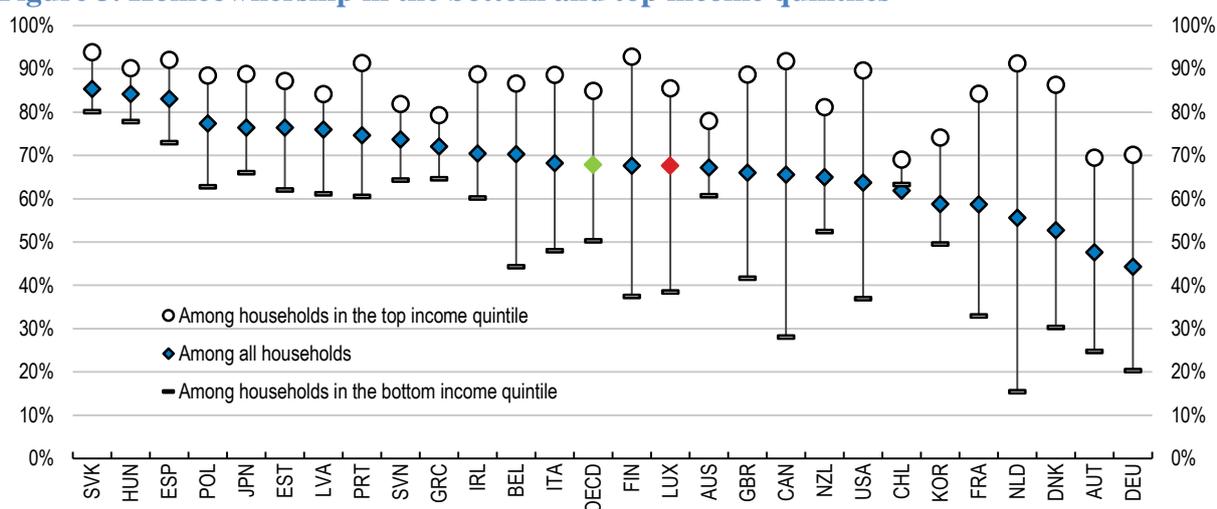
Source: OECD Wealth Distribution Database and Household Economic Survey database for New Zealand.

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[3]   Gross income includes labour income, capital income and transfers, but does not exclude taxes.

Housing wealth is central to household portfolios

Housing is the main asset in household portfolios in all OECD countries (Figure 4), and this pattern is more pronounced in Luxembourg than in the neighbouring countries (Figure 4, Panel A). Housing is the main asset of the middle class (Figure 4, Panel B). In Luxembourg, housing wealth represents 66.1% of the total wealth of households in the three middle net wealth quintiles. Housing is much less prominent when it comes to the top of the distribution (Figure 4, Panel C). In the top 1% percent of the net wealth distribution in Luxembourg, housing represents 18% of household portfolios, less than in the neighbouring countries or in most OECD countries.

Individuals typically accumulate wealth over their life cycle and the empirical evidence suggests that this process is strongly associated with housing (Figure 5). In most OECD countries, housing wealth and overall wealth exhibit a hump-shaped distribution across age groups. So does income, but with major differences: i) wealth peaks later in the life cycle than income; and ii) wealth accumulation is much steeper than income accumulation, but the decline in wealth at higher ages is much more gentle than the decline in income. As people age, their income falls faster than their wealth, especially than their housing wealth. Towards the end of their lives, people have usually not consumed their housing wealth, which remains relatively close to its peak level. However, most if not all microdata sources of the OECD Wealth Distribution Database exclude the institutionalised population (inmates of penal and mental facilities and nursing homes for the aged). Usually, households in nursing homes are not surveyed, although they become increasingly important from age 75 onwards. These households strongly reduce their wealth holdings (including housing wealth), as their saving rates become negative. The exclusion of the institutionalised population hence results in a significant overestimation of saving rates at older ages (Ziegelmeyer, 2012).

The distribution of net wealth and net housing wealth across age groups differs across Luxembourg, its neighbouring countries and the OECD average: older Luxembourg residents have higher net wealth and net housing wealth while this declines for older groups in France, Belgium and Germany. In Luxembourg, higher housing wealth in the age group 75 and above may partly reflect the generous pension system or the structure of taxation, which is not captured by the gross income variable in Figure 5. The ratio of disposable income in the age group above 75 to the overall mean is 1.02 in Luxembourg against 0.85 in Germany, 0.76 in the Netherlands, 0.74 in Belgium and 0.97 in France (OECD Income Distribution Database, 2016).

Participation in the mortgage market is relatively high in Luxembourg

Housing is a crucial asset in household portfolios, but also a major liability in their balance sheets. In Luxembourg, 29% of households have a mortgage on their main residence, against 25% on average in the OECD, 31% in Belgium, 19% in France and 17% in Germany (Figure 6, Panel A). The higher share of owners with a mortgage is driven by households in the middle of the income distribution (Figure 6, Panel B). In most OECD countries, participation in the mortgage market increases steadily from the bottom to the top quintile of the income distribution. In Luxembourg, households in the middle income quintile are as likely to have a mortgage as those in the fourth income quintile, and almost as likely as those in the top income quintile, (36%, 35%, and 42% respectively). Middle-income households are 2.1 times more likely to have a mortgage than middle-income quintile households in France, and 2.6 times more likely than middle-income quintile households in Germany.

Figure 4. Portfolio analysis: housing as a share of total assets

A. Asset decomposition of households' portfolio

B. Housing as a share of total assets among households in the middle of the distribution

C. Housing as a share of total assets among households at the top of the distribution
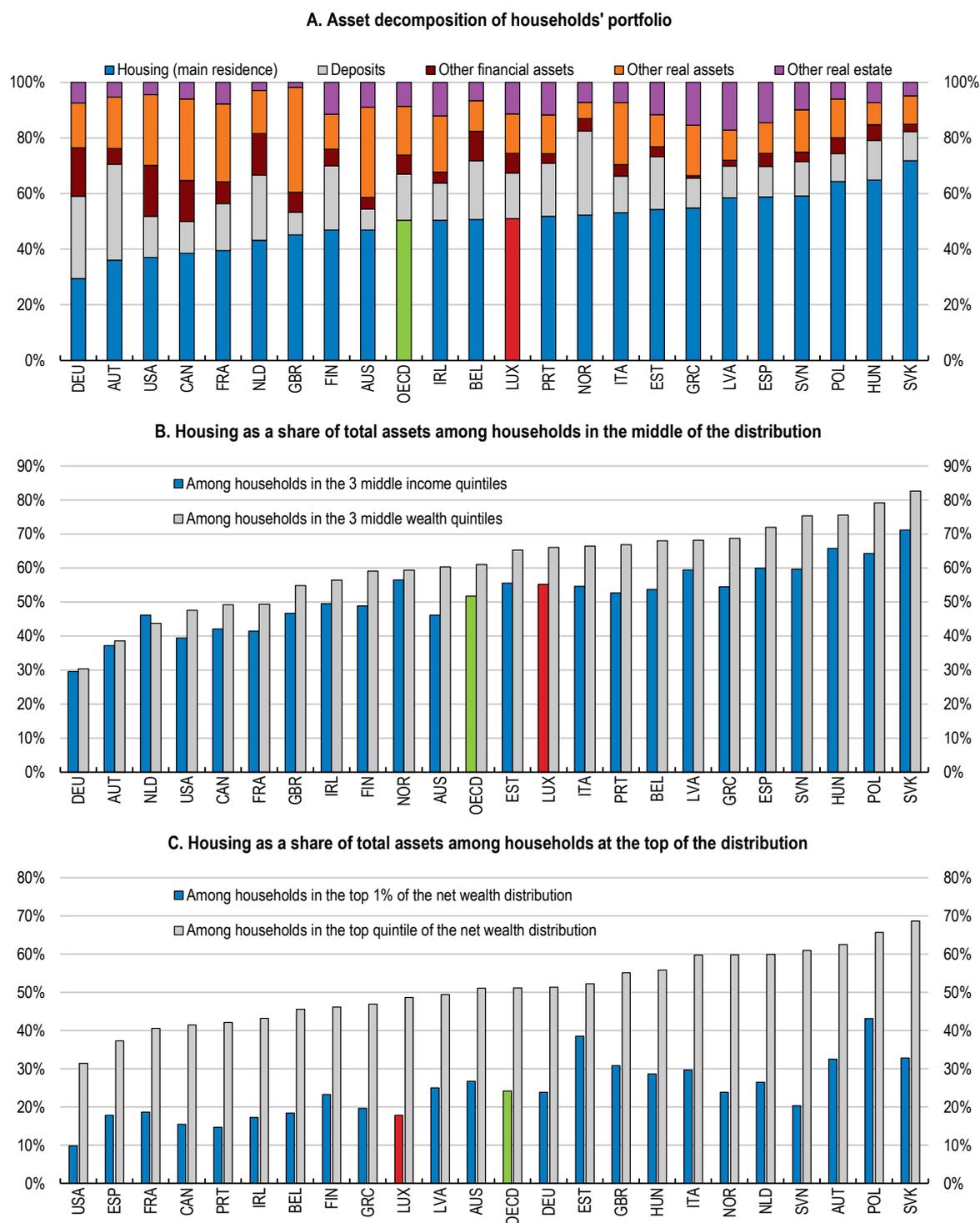
Source: Household Finance and Consumption Survey (HFCS) and Luxembourg Wealth Study (LWS).
Note: Financial assets are known to suffer from underreporting. Wealth statistics from microdata thus do not necessarily measures of aggregate wealth from national accounts. See the HFCS methodological report for more details (https://www.ecb.europa.eu/pub/pdf/scpsps/ecbsp17.en.pdf).

Figure 5. Net wealth, net housing wealth and gross income across the lifecycle, OECD average and selected countries

Ratio of variable mean by age group to overall mean
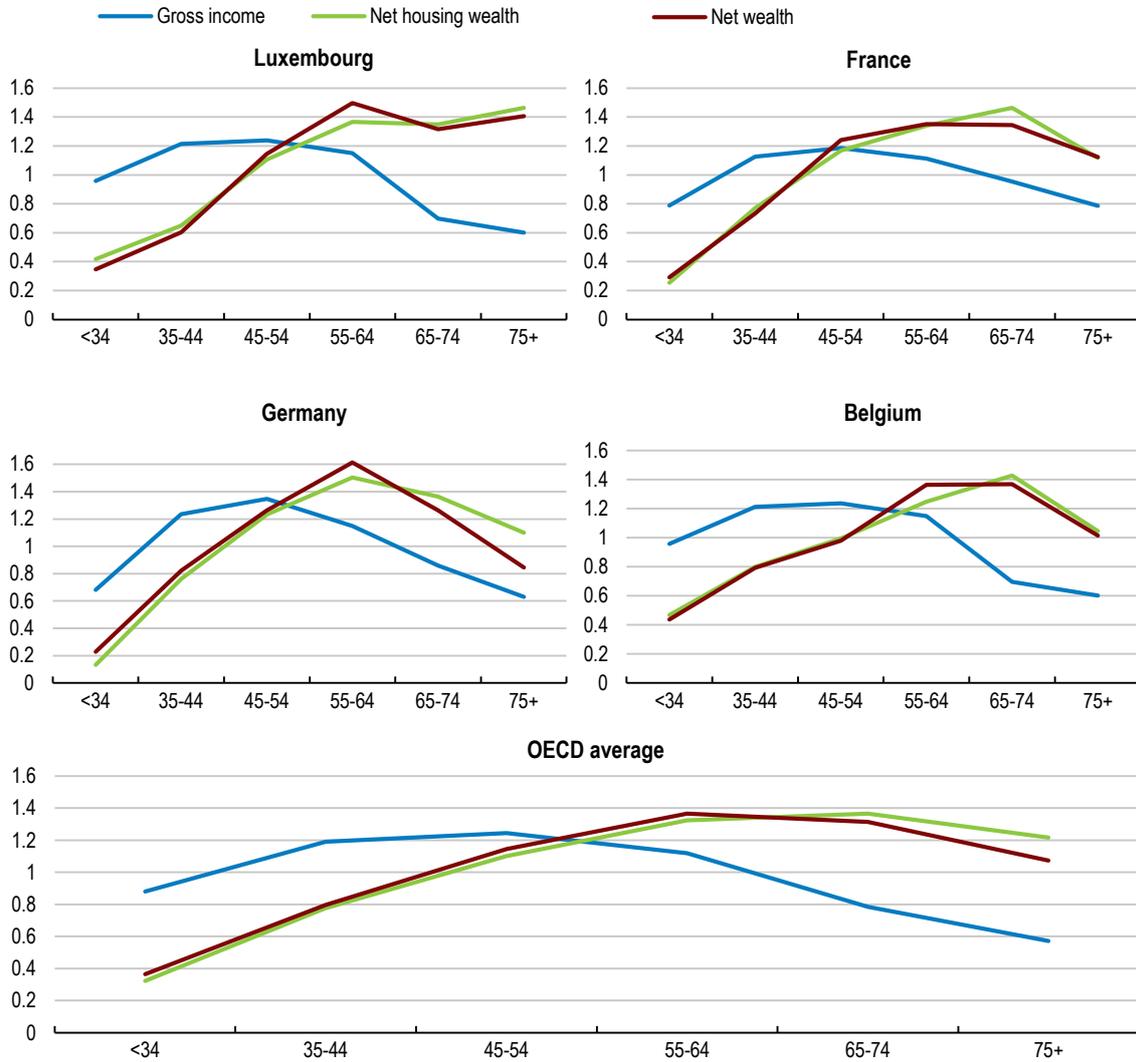
How to read this figure: in Luxembourg, mean net wealth (i.e. total assets minus total debt) among the 35-44 age group is close to 0.6 times that of overall population while mean net wealth among the 55-64 age group is 1.5 times that of overall population. Mean net wealth among the 75+ age group is equal to 1.4 times that of the overall population.
Source: OECD Wealth Distribution Database.

Figure 6. Participation in the mortgage market

A. Proportion of households with mortgage debt across OECD countries
Percentage

B. Proportion of households with mortgage debt across the income distribution quintiles
OECD average and selected countries, percentage
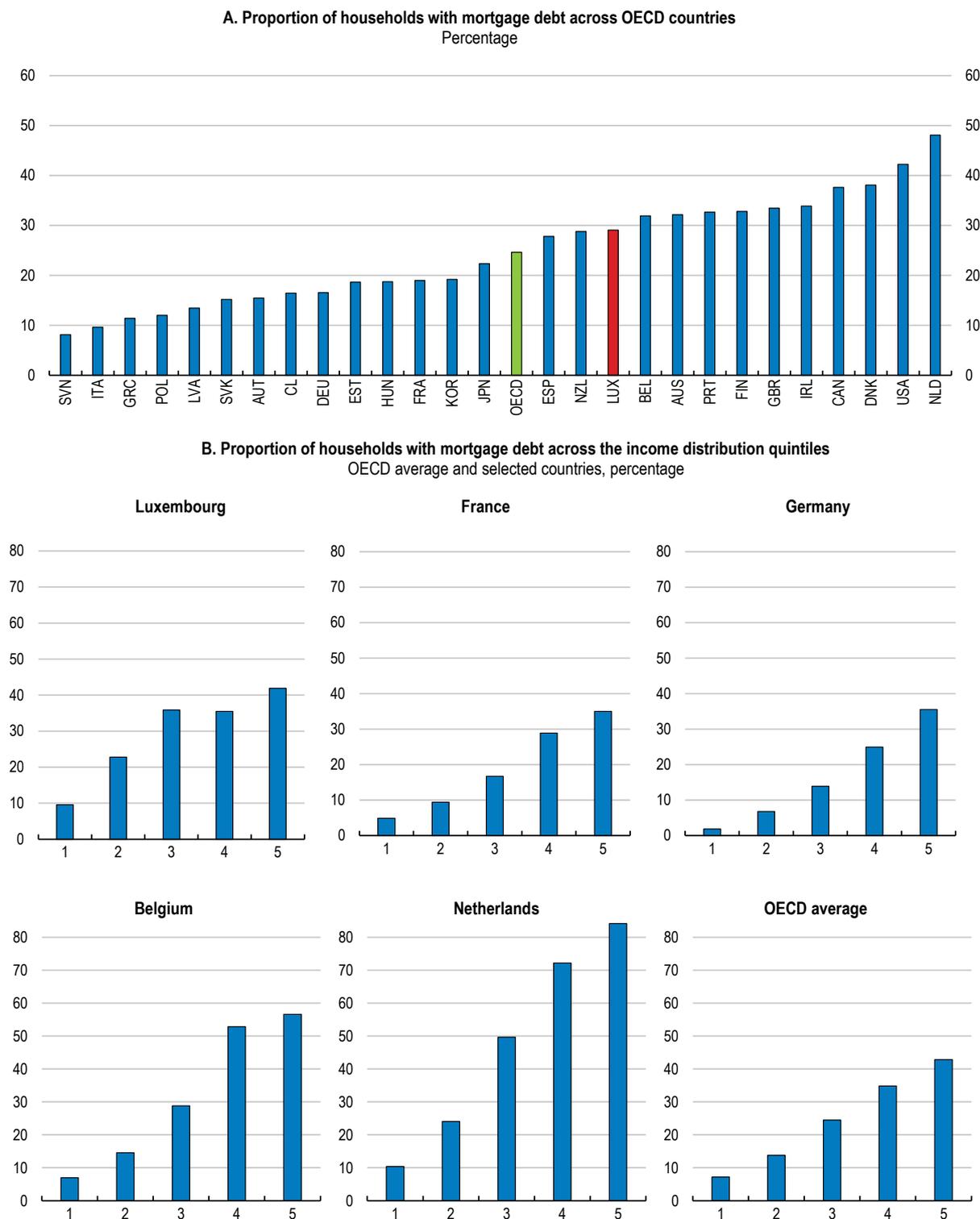
Note: The numbers refer to principal residence debt only.
Source: OECD Wealth Distribution Database.

Higher participation in the mortgage market is associated with higher homeownership among younger households (Figure 7). Access to mortgage debt for young households is likely to be one key driver of homeownership for this group, given their relatively low current wealth and income. At the cross-country level, participation in the mortgage market among the young is correlated with a reduction in the difference in homeownership rates between the young and the overall population. In Luxembourg, 35% of households aged 34 and below have a mortgage, thus bringing the difference in homeownership rates between the young and the overall population to 18pp, against 28pp for the OECD on average. The literature shows that young households are relatively more sensitive than other groups to policy settings affecting homeownership, in particular mortgage market regulations (Andrews, Caldera Sánchez and Johansson, 2011).[4]

Figure 7. Participation of younger households in the mortgage market and intergenerational differences in homeownership rates
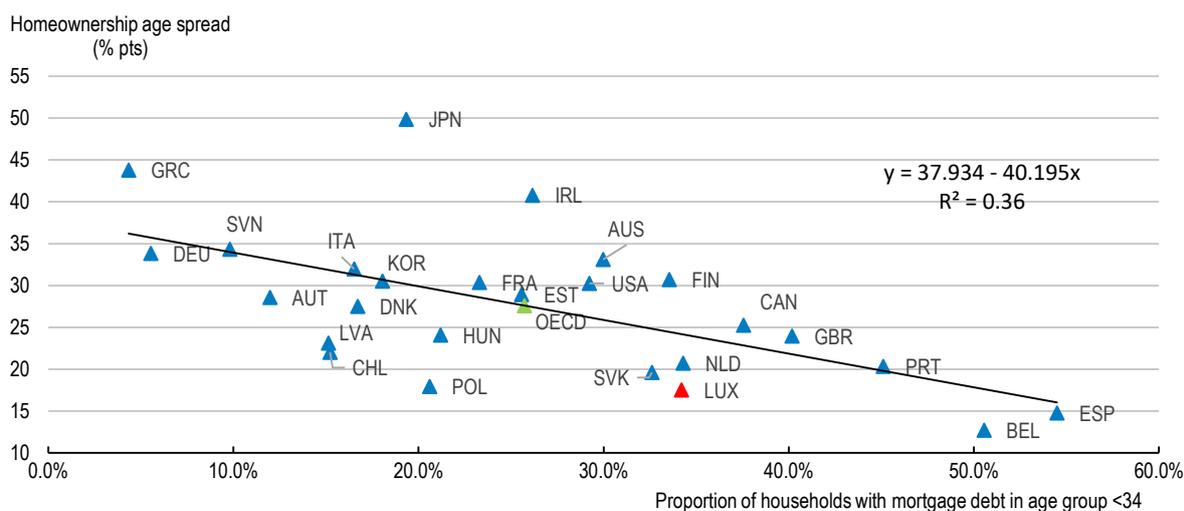
Note: Homeownership age group spread (on the Y axis) refers to the difference in homeownership rates between all households and young households. Participation in the mortgage market (on the X axis) refers to main residence debt only.
Source: OECD Wealth Distribution Database.

Figure 8 presents snapshots of Luxembourg's position relative to other OECD countries in the distribution of various housing and wealth indicators. The snapshots cover indicators of homeownership, wealth inequality, housing wealth concentration, mortgage indebtedness and residential mobility. All indicators are normalised between 0 and 1 to enhance comparability across countries and indicators. Each indicator is transformed using a min-max normalisation that consists in rescaling the range of values to [0, 1] using the following formula:

$$x' = \frac{x - \min(x)}{\max(x) - \min(x)}$$

This snapshot underlines the fact that homeownership in Luxembourg is close to the OECD average, although lower among households belonging to the bottom income quintile and higher among the young. Wealth inequalities – and to a larger extent housing wealth inequalities – are lower than the OECD average. Luxembourg is among the OECD countries with the lowest concentration of housing wealth in the hands of households belonging to the top decile of the net wealth distribution. Lower homeownership among households in the bottom income quintile reflects a low proportion of outright owners in that group, as participation in the mortgage market is high, especially among households belonging to the bottom income quintile and among younger households.

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[4] Most of the literature finds that homeownership among young households is very sensitive to mortgage market design and regulation e.g. loan-to-value and loan-to-income ratios. See e.g. Chiuri and Jappelli (2003). Homeownership among young households is also more sensitive to access to stable jobs, which is an important condition to access (mortgage) credit.

Figure 8. A snapshot of housing outcomes in Luxembourg
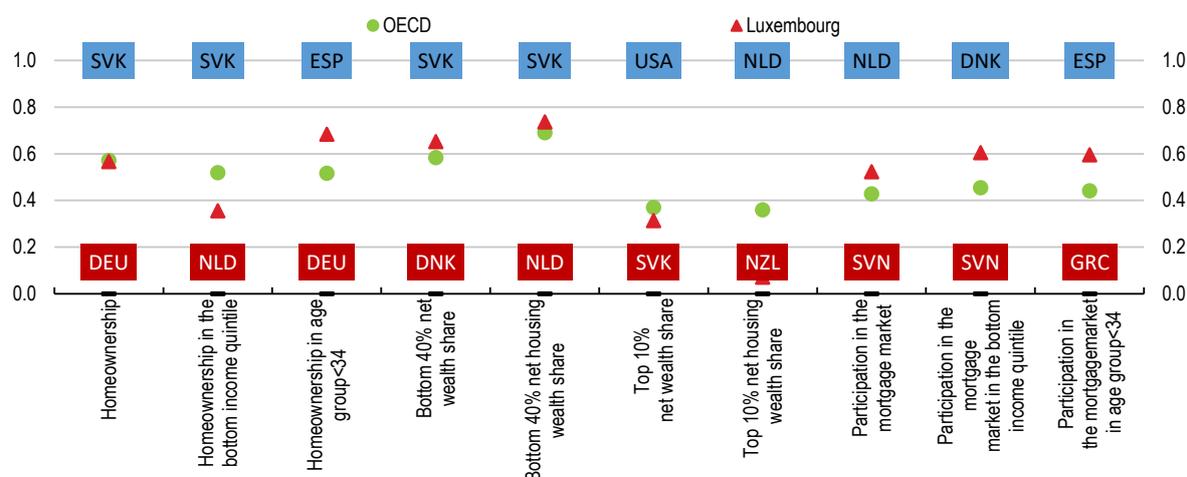
Note: Participation in the mortgage market refers to the share of households with a mortgage on their main residence. Homeownership rate is the share of homeowners (both outright and with a mortgage) in the population. Wealth shares refer to the share of net wealth owned by the top 10% or bottom 40% of the net wealth distribution. Housing wealth shares are concentration measures: households are ranked according to their net wealth, and the measures refer to the share of housing wealth accruing to the top 10% or bottom 40% of the net wealth distribution.
Source: OECD Wealth Distribution Database, HFCS, and LWS.

Homeownership and access to homeownership in the Greater Region

Crossing a border to shop or work is an economic decision, often based on arbitrage opportunities that exploit price and wage discontinuities (e.g. Mathä, Porpiglia and Ziegelmeyer, 2017). In Luxembourg, a substantial share of workers commute every day from the neighbouring regions. Cross-border commuters account for more than 40% of the total employment in Luxembourg. The XB-HFCS survey provides data from cross-border commuting households along various economic dimensions that are comparable to those in the resident survey (Box 1). Thus, Luxembourg constitutes a good case study to compare housing wealth and the impact of homeownership between two population groups who share the same labour market but choose different housing markets.

Policy and institutional settings, such as property taxation and rental market regulation, can play important roles in shaping the decision whether to live in the country of employment or to cross the border for work. By shaping housing supply and demand, they may also affect the rate of homeownership and housing wealth inequality (Andrews, Caldera Sánchez and Johansson, 2011). First, property taxation may differ between Luxembourg and neighbouring regions, and lead to differences in the tax treatment of owner-occupied housing. An international comparison reveals that the majority of OECD countries have a favourable tax treatment for owner-occupied property, relative to rental property, as often imputed rents are untaxed and interest payments are tax deductible (OECD, 2018).

In Luxembourg, beneficial tax measures combined with other subsidies that likely promote homeownership are extensive, not matched by similar policies in neighbouring regions, contributing to an important price discontinuity in homeownership at the Luxembourg border. Luxembourg has the lowest marginal effective tax rate (METR) for rental and owner-occupied residential property in the Greater Region, for both debt-financed and equity-financed residential property (Figure 9). For equity-financed property, the METR for owner-occupied property stands at 0.3%, one of the lowest values in the OECD.

Box 1. The cross-border HFC survey

The cross-border Household Finance and Consumption Survey (XB-HFCS) dataset contains micro-data on the balance sheet of households residing in the neighbouring regions of Luxembourg, with at least one member working in Luxembourg. This is collected by the Banque Centrale du Luxembourg (BCL) and the Luxembourg Institute of Socio-Economic Research (LISER) as a companion dataset to the resident dataset LU-HFCS. The two share the main features and are comparable.

By construction, households in the XB-HFCS dataset are (self-)employed by definition. Therefore, in this section they will be systematically compared to resident households that are (self-)employed. Cross-border commuters tend to be highly educated, male, married or living as a couple. More details can be found in Mathä, Pulina and Ziegelmeyer (2018).

The household head in the XB-HFCS is defined as the contacted cross-border commuter. The household head in the LU-HFCS is defined as "most financially knowledgeable person" (FKP).

Figure 9. Marginal effective tax rates for residential property
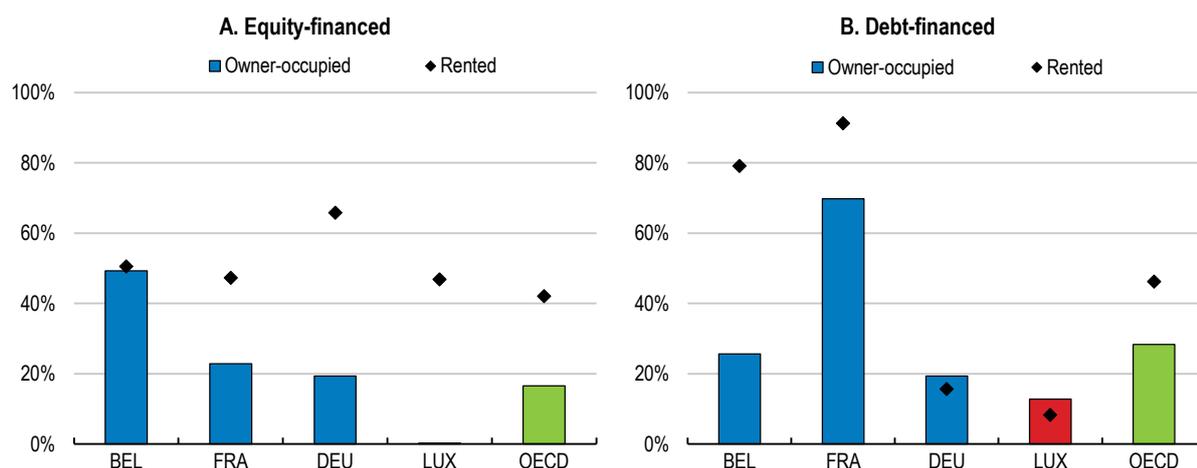
Note: The METRs are calculated as the difference between the pre- and post-tax rates of return on a marginal investment divided by the pre-tax rate of return on that investment.
Source: OECD (2018), Taxation of Household Savings.

Apart from tax aspects, rental market regulation can also affect stocks of new and existing housing, rent volatility and labour mobility (Caldera and Johansson, 2013). Regulation of rental markets aims at several sometimes conflicting objectives, such as affordable housing, balanced bargaining power between tenants and property owners, or adequate labour mobility. Kholodilin (2018) builds an international longitudinal database of housing policies, including rent control and tenure security, from legal texts of 48 countries between 1910 and 2018. According to various indices based on this database, there are differences in rental market regulation across the Greater Region. Luxembourg is characterised by relatively tight regulation compared to neighbouring countries and the OECD average, with only France providing tighter landlord-tenant regulation (Figure 10).

Figure 10. Rental market regulation
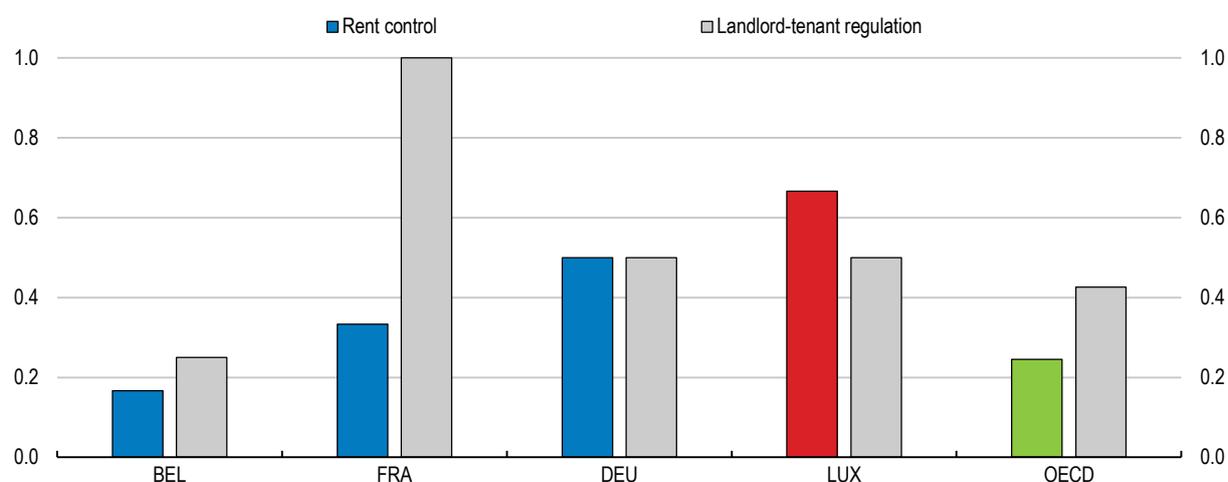
Note: Indices vary from 0 for loose regulation to 1 for tight regulation. The rent control index is based on regulations that restrict rent increases, such as rent freezes, rent level control, limits of decontrolling (preventing rents from increasing at the beginning and during the tenancy), and restrictions on subletting. Landlord-tenant regulation is based on regulations that protect tenants from eviction.
Source: Kholodilin (2018), and OECD (2018).

Homeownership across the Greater Region

Focussing on the housing tenure choice, the share of homeowners is higher in the cross-border sample compared to the respective national samples (Figure 11). For cross-border commuter households in Germany, the share of homeowners is 14.5 pp higher than the national average. In France, the corresponding difference is 14.2 pp. For both countries, the differences are statistically significant. In Belgium the homeownership rate is 76%, the highest across the four countries, but among cross-border commuter households it is even higher at 79% (in this case the difference is not statistically significant). Splitting the Luxembourg resident sample into native and immigrant households (based on the country of birth of the household head) reveals marked differences between native and foreign-born residents in Luxembourg. The overall homeownership rate is 65%, but it is much lower among foreign-born residents (50%) and much higher among native residents (80%).

Higher homeownership rates among cross-border households may be related to income differences between cross-border commuter households and their national counterparts in their country of residence. Mathä, Pulina and Ziegelmeyer (2018, Figure 8) compare yearly gross income distributions and find that the median for German cross-border households is more than €16 000 above the median for employed households in Germany as a whole. In France the difference is €18 000. However, in Belgium the difference is not statistically significant, which might explain the similar homeownership rates discussed above. Income differences may also explain differences in homeownership rates between native-born and foreign-born households in Luxembourg. The median gross income across native households is more than €27 000 above that for foreign-born households. In addition, native households may benefit from intergenerational transfers that provide land zoned for residential construction.

Figure 11. Ownership of the household main residence in national and cross-border samples

Percentage
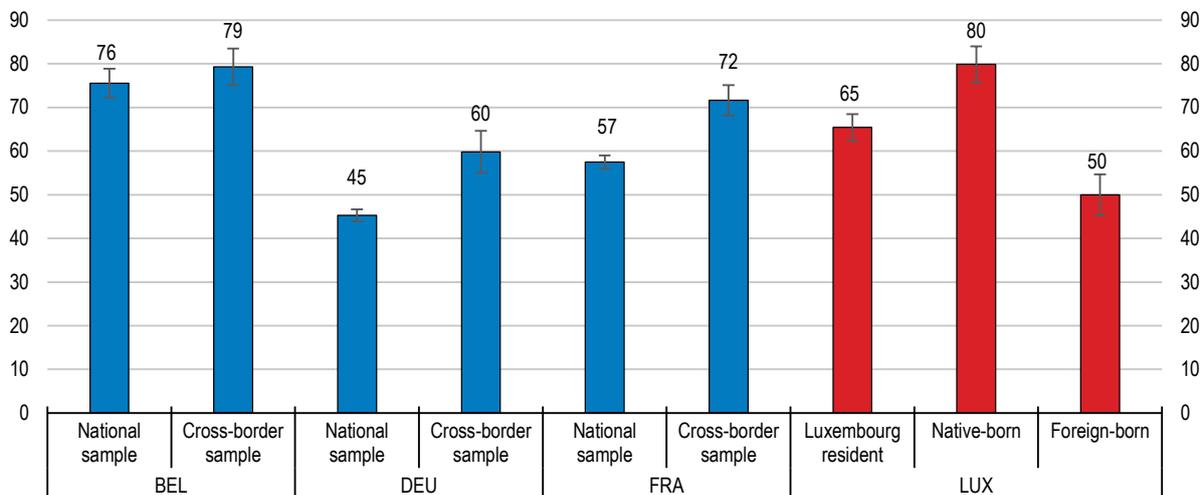
Note: Data are multiply imputed and weighted.
Source: Own calculations based on the second wave of the Eurosystem HFCS and XB-HFCS.

Cross-border households acquired their current residence at a younger age than the average household in the country where they live (Figure 12). In Germany, the difference of the means is almost 2.5 years. However, in France and Belgium the difference is only one year and not statistically significant. In Luxembourg, native households also acquired their residence at a younger age than foreign-born households. The difference of the means is 3 years and is statistically significant.

Figure 12. Mean and median age at year of main residence acquisition in national and cross-border samples
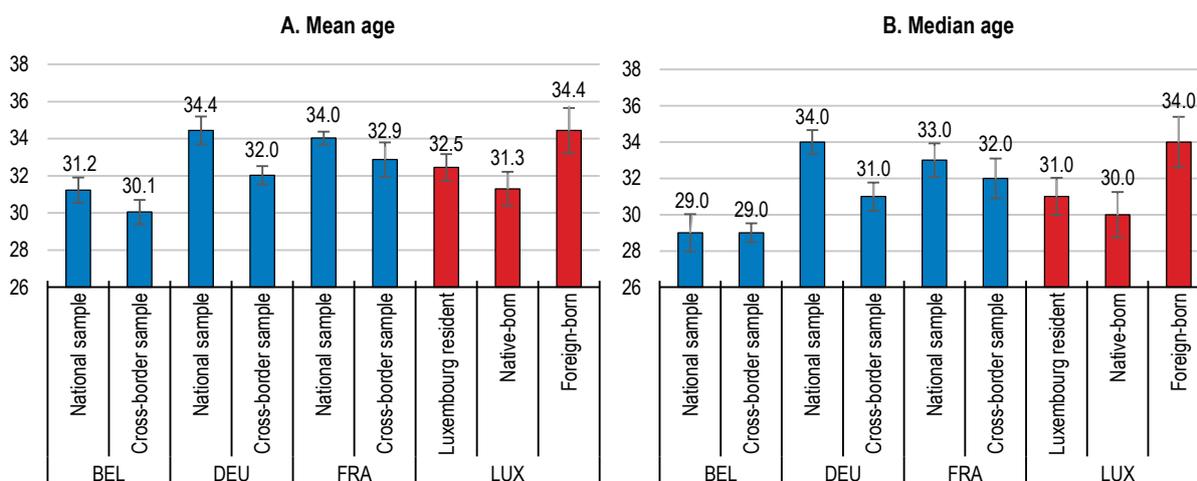
Note: Data are multiply imputed and weighted.
Source: Own calculations based on the second wave of the Eurosystem HFCS and XB-HFCS.

Figure 13 reports trends across time in the average age at the time of acquisition. The median delivers very similar results (not shown). In general, cross-border commuter households were younger at the time they acquired their current main residence. However, in Germany there is a clear upward trend over the last 20 years. In Belgium, the upward trend only appears for the most recent years. In Luxembourg, trends for native and foreign-born households co-move until 2007. Since 2008, there is an upward drift among the foreign-born and a downward drift among the native. In summary, the mean age at the year of the HMR acquisition was significantly lower before 2006 compared to the period after in all national and in the cross-border sub-samples.

Figure 13. Mean age at year of HMR acquisition over time
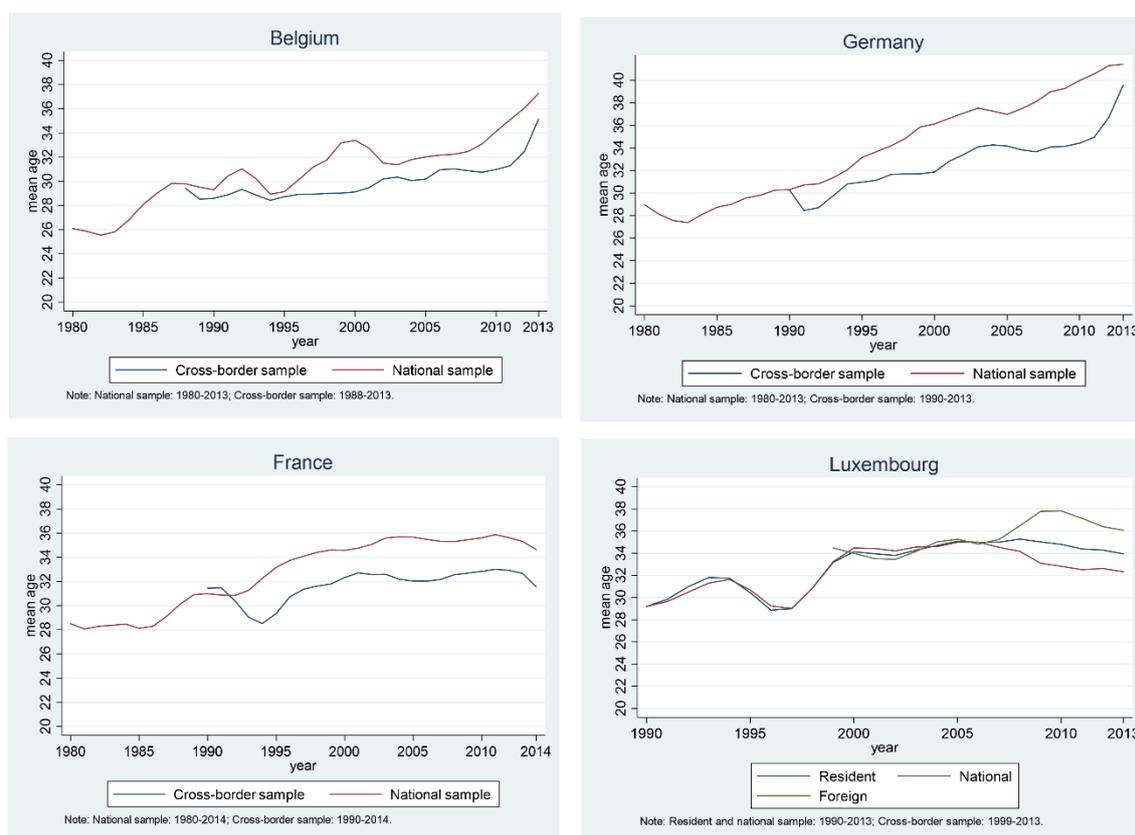
Note: The smoothed lines are estimated using Kernel-weighted local polynomial smoothing (Stata manual 13, command lpoly). Samples need to be adjusted based on the number of observations per year. Data are multiply imputed and weighted.
Source: Own calculations based on the second wave of the Eurosystem HFCS and XB-HFCS.

What about renters and their plans to become homeowners in Luxembourg?

The second wave of the LU-HFCS asked why some resident households do not become homeowners. Of all households resident in Luxembourg, 32.4% were not homeowners but rented their dwelling or used it free of charge. Of these, 75.5% reported that they did not plan to become homeowners. Figure 14 shows that the most frequent reason cited was that "real estate is too expensive" (29% of cases), followed by "insufficient own funds" (11%). An additional 5% indicated that "the bank will not/is unlikely to grant us a loan". Thus, among the households that did not plan to become homeowners, 45% indicated reasons related to financing, while 55% expressed a preference for renting or other reasons not to buy a home. Among resident households that did not own their residence, the remaining 24.5% did plan to become homeowners. Of these, 81% expected to become homeowners within five years (Figure 15). The two main reasons reported for not buying in the near future were insufficient savings (7%) and insufficient income (6%).

Figure 14. Main reason for not wanting to acquire a residence in Luxembourg
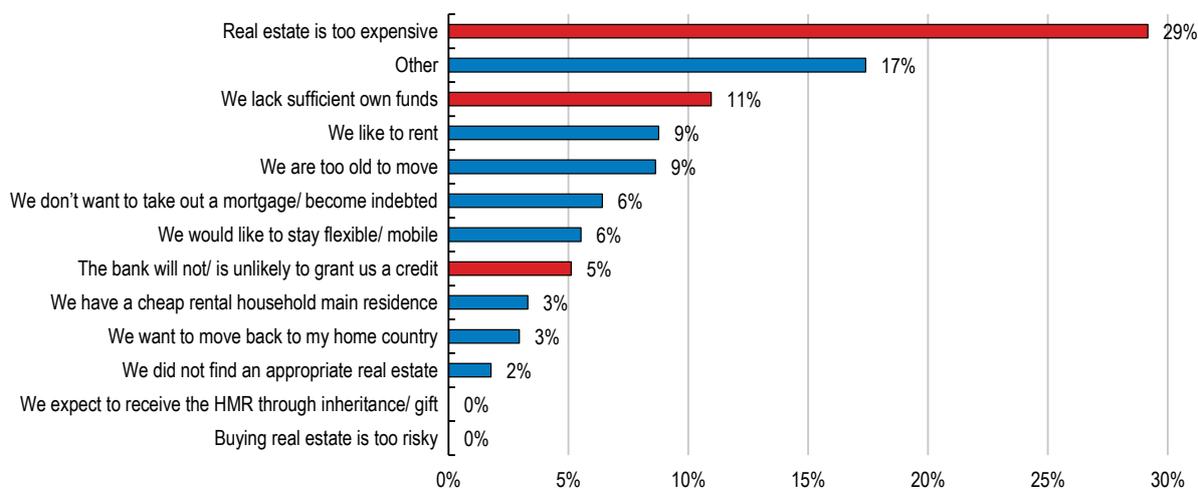
Note: Data are multiply imputed and weighted.
Source: Own calculations based on the second wave of the LU-HFCS.

Figure 15. Do you expect to become a homeowner within the next five years?
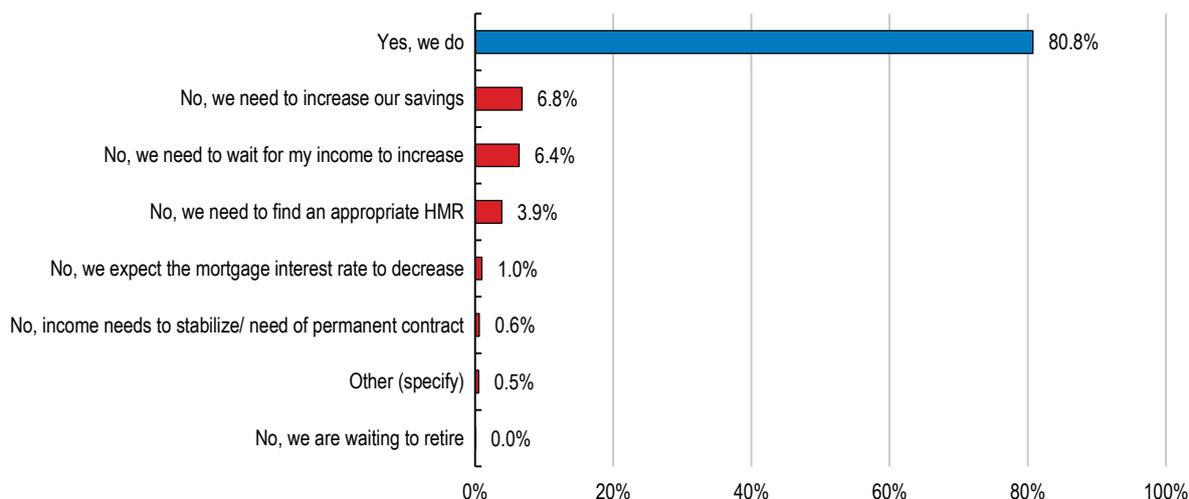
Note: Data are multiply imputed and weighted.
Source: Own calculations based on the second wave of the LU-HFCS.

The information above can be combined to analyse the overall intentions of households (Figure 16). Among all resident households, 67.6% were homeowners, 13.4% were renters who did not plan to buy because they preferred renting or for other reasons, 11.1% were renters who did not plan to buy for financial reasons, 6.5% were renters who planned to buy within 5 years and the remaining 1.5% were renters who planned to buy after 5 years.

The household characteristics of these five groups are detailed in the Appendix (Table A.2). Households that did not plan to buy or planned to buy only after 5 years tended to be in the low quintiles of the gross income or net wealth distributions. In addition, the household head had a lower educational attainment on average. The share of homeowners was higher in older age groups. Households citing other reasons for not planning to buy do not have a clear age profile, although households planning to buy were younger and generally employed. The gender of the household head does not seem to influence this decision in a systematic way.

Figure 16. Homeownership and future homeownership plans across the population
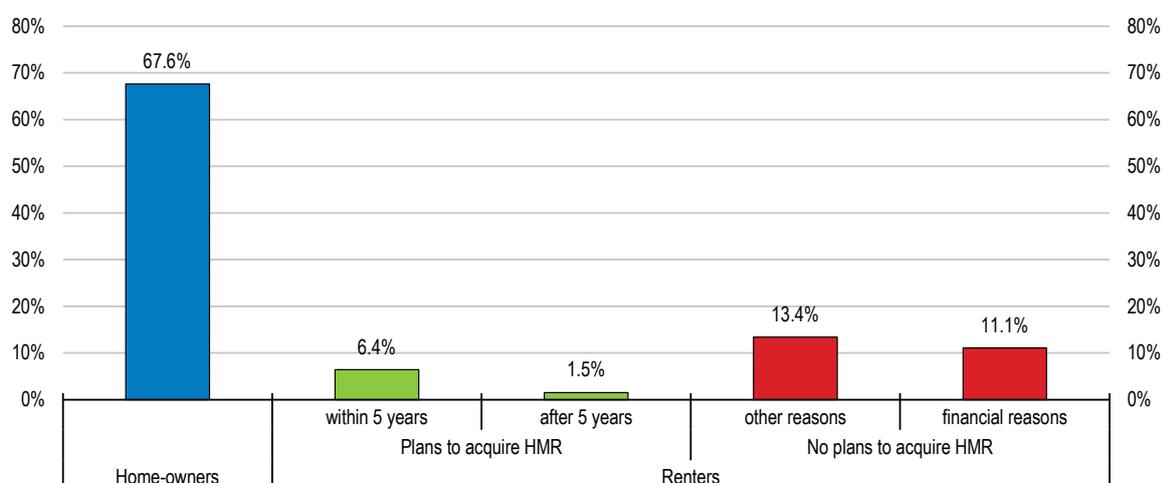
Note: Data are multiply imputed and weighted.
Source: Own calculations based on the second wave of the LU-HFCS.

More than 10% of Luxembourg's resident population cited financial reasons as an important factor in the decision not to acquire their residence. An additional 1.5% stated that they postponed their plans to acquire their residence for financial reasons. One way to overcome financial obstacles is to buy or build a residence in a cross-border region.

Most cross-border commuting households (90%) reported that the main reason they acquired their main residence in regions neighbouring Luxembourg was that real estate was too expensive in Luxembourg (Figure 17). However, although this is the most common reason, households also reported additional reasons. In fact, 74% wanted to live close to family members, 70% wanted to remain in their own cultural environment and 57% wanted to remain where they grew up. Thus, family and cultural ties are very important factors in the decision where to purchase the main residence. In fact, between 84 and 91% of all cross-border commuters in the Greater Region live in the country where they were born (Mathä, Pulina and Ziegelmeyer, 2018, Table 6). In addition, 36% reported that they prefer the institutional framework of their country of residence. [5]

Own labour contribution to the acquisition of the main residence

In principle, another way to overcome financial obstacles is to contribute own labour (sweat equity) to acquire the main residence. In practice, this mostly means participating in the construction or renovation of the acquired real estate. Survey respondents provided data on own labour for both the resident and cross-border survey (Figures 18-21). Lindner, Mathä, Pulina and Ziegelmeyer (2019) analyse the importance of own labour in the acquisition of the main residence for Luxembourg resident households. They develop a theoretical model whose predictions are confirmed by empirical estimations. Own labour contributions tend to be smaller among households with greater financial resources (own initial funds and/or income) and tend to be larger for households with higher external financing costs or more ability to provide labour contributions.

About 71% of all cross-border commuting households reported that they provided own labour (Figure 18). This is considerably above the 59% share in the resident sample. To acquire their main residence, 95% of all cross-border commuting households relied on external funds, compared to 86% in the resident sample. The pattern is reversed for the contribution from own financial funds (69% of cross-border commuters and 86% of residents). More limited own funds and lower income might explain why more cross-border commuting households contributed own labour to the acquisition of their main residence.

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[5] We obtain comparable results if the analysis is restricted to cross-border workers who acquired their HMR only after they started working in Luxembourg.

Figure 17. Reason for acquiring a main residence in country of residence

Multiple responses possible
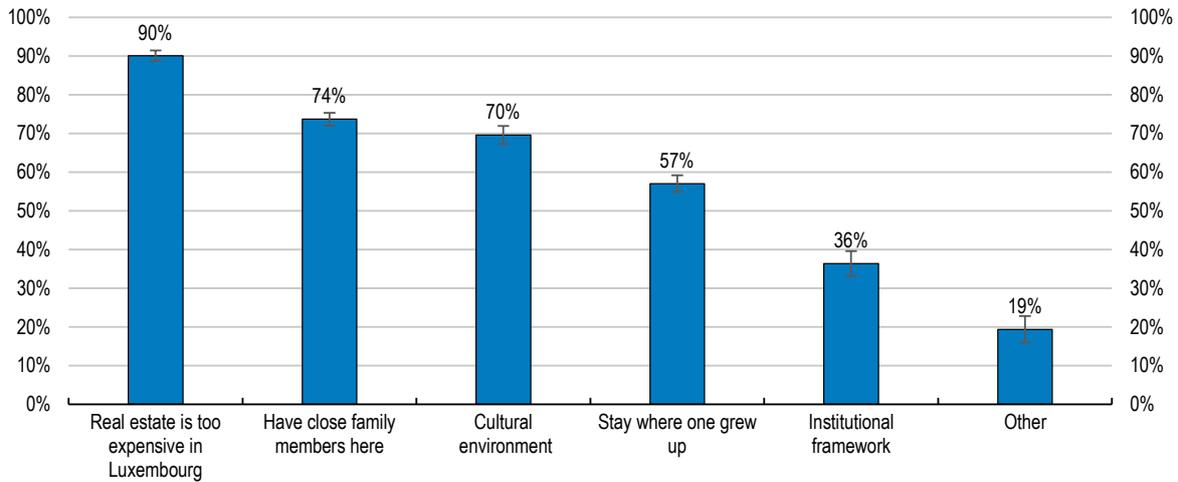
Note: Data are multiply imputed and weighted.
Source: Own calculations based on the second wave of the XB-HFCS.

Figure 18. Prevalence of different financing sources for main residence acquisition
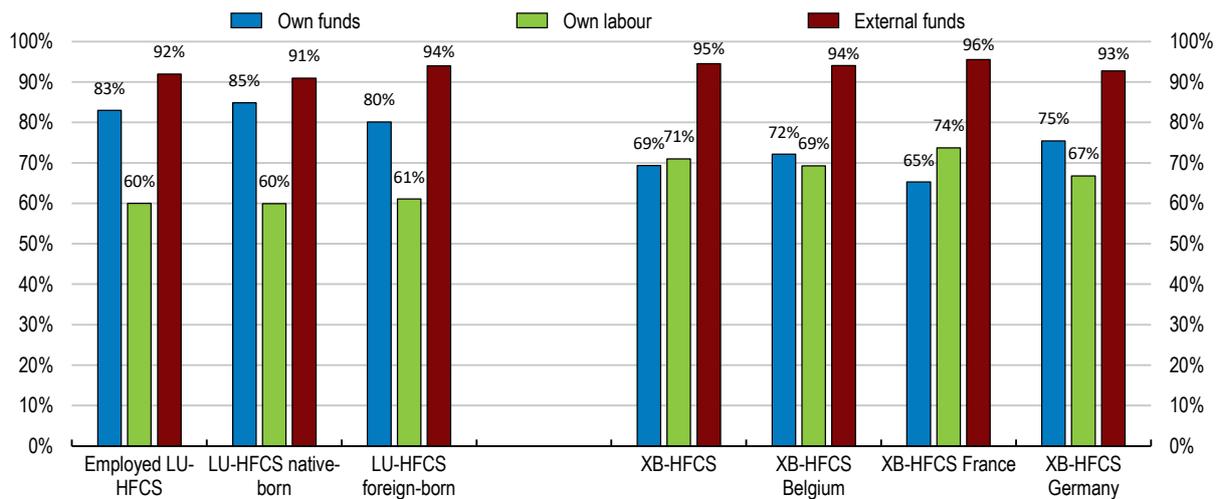
Note: Data are multiply imputed and weighted.
Source: Own calculations based on the second wave of the resident (LU-HFCS) and cross-border survey (XB-HFCS).

About 50% of all cross-border commuting households relied on all three financing sources (Figure 19). 19% relied on external funds and own labour contributions and 10% relied only on external funds. All three shares are above the corresponding figures for the resident survey. At the same time, 29% of resident homeowners relied on external and own financial funds, 12 percentage points more than in the cross-border sample. Among residents, 5% relied on own financial funds only, 4 pp above the share for cross-border commuting households.

For cross-border commuting households, the own labour contribution accounts on average for 13% of the total financing needs to purchase the main residence (Figure 20). This share is 2 percentage points lower for resident households. The difference in the median contribution is even larger (4 pp). Thus, own labour contributions appears to be an important financing source for cross-border commuters in the acquisition of their main residence. These households contribute more from this financing source both in terms of number of hours worked and in the number of households involved (intensive and extensive margin).

Figure 19. Combination of different financing sources for main residence acquisition
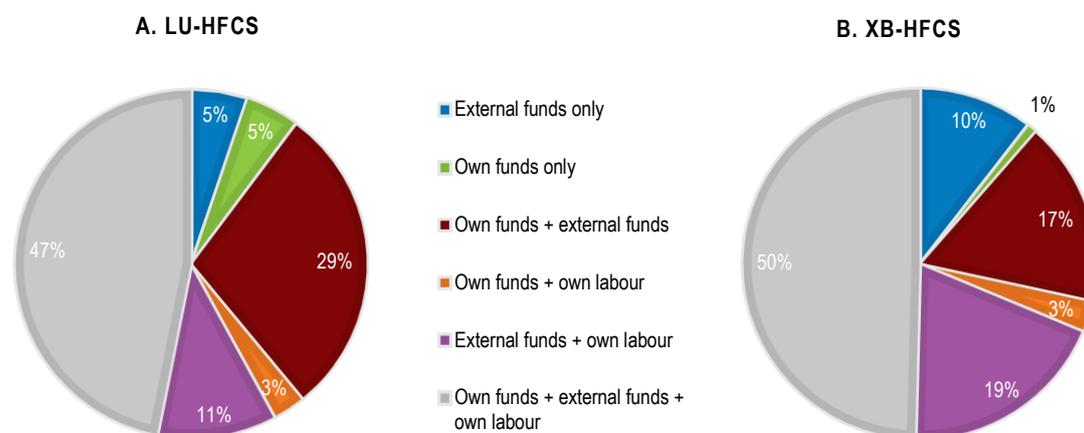
A. LU-HFCS

- External funds only
- Own funds only
- Own funds + external funds
- Own funds + own labour
- External funds + own labour
- Own funds + external funds + own labour

B. XB-HFCS

Note: Data are multiply imputed and weighted.
Source: Own calculations based on the second wave of the LU-HFCS and XB-HFCS.

Figure 20. Mean and median contribution of different financing sources to the main residence
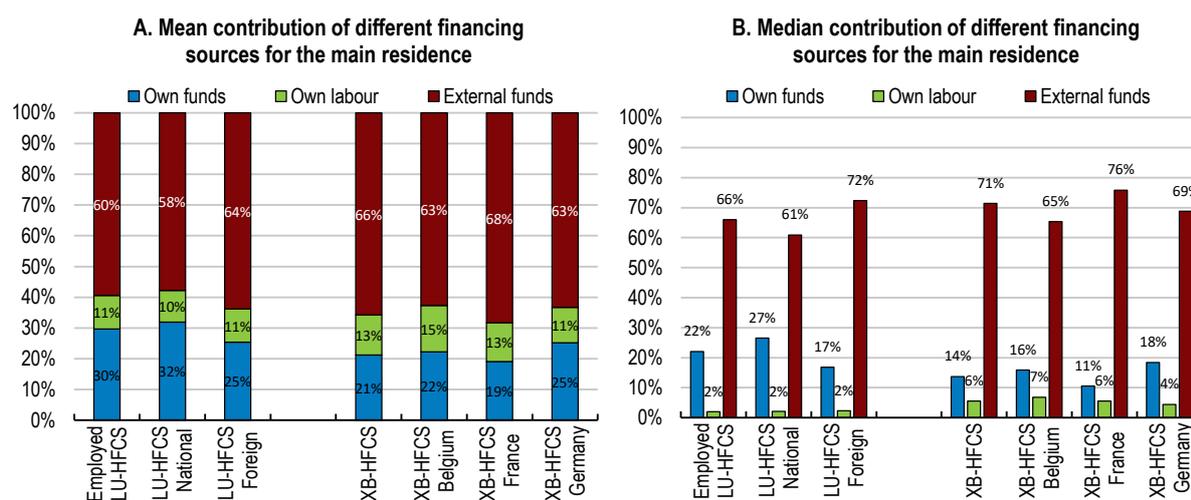
A. Mean contribution of different financing sources for the main residence

B. Median contribution of different financing sources for the main residence

Note: Data are multiply imputed and weighted.
Source: Own calculations based on the second wave of the LU-HFCS and XB-HFCS.

Household wealth and housing inequalities in Luxembourg and among cross-border workers

Assets and liabilities of resident and cross-border employed households

There are substantial differences in wealth between resident and cross-border households, both in levels and in terms of the shape of the distribution. According to HFCS data (second wave collected in 2014), median net wealth was significantly higher among employed households resident in Luxembourg than among cross-border commuters from Belgium, France or Germany (Figure 21). Among households commuting to work in Luxembourg, net wealth was highest among those in Belgium, followed by those in France, and finally those in Germany. In France and Germany, median net wealth across all employed households was lower than the median for households commuting to work in Luxembourg (the difference in Belgium is much smaller).

Figure 21. Median net wealth is higher for those who work in Luxembourg
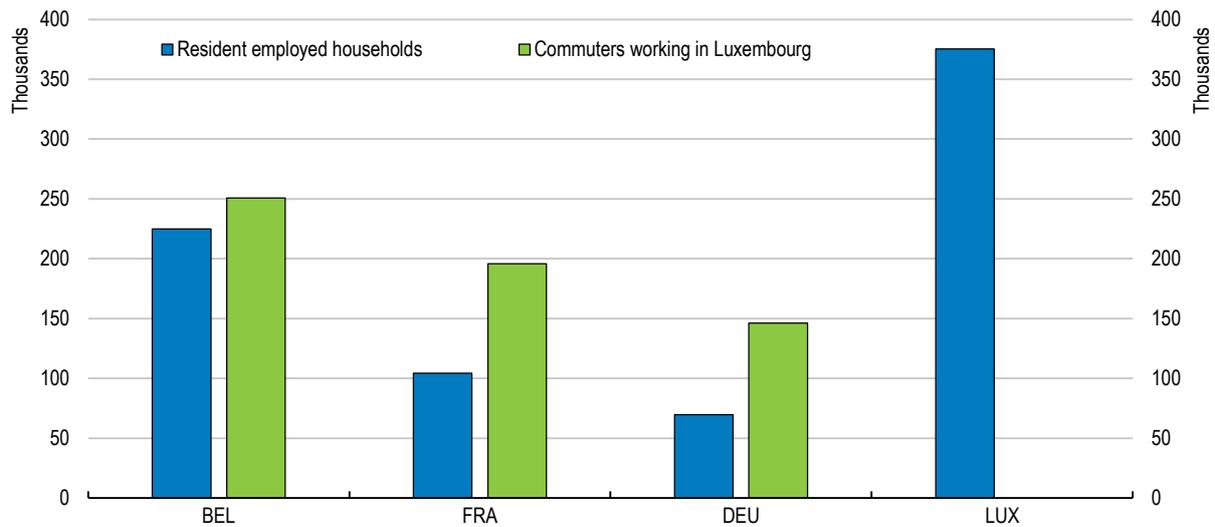
Note: Resident medians are for employed households only. Data are multiply imputed and weighted.
Source: HCFS data (second wave, 2014), Mathä, Pulina and Ziegelmeyer (2018).

Composition of wealth is comparable across countries of residence, with real assets accounting for more than 80% of total assets and mortgage debt dominating liabilities. The difference in net wealth between employed households resident in Luxembourg and households commuting to work in Luxembourg partly reflects a higher value of the main residence among residents (Figure 22). Indeed, real estate price developments suggest a significant price discontinuity at the Luxembourg border. Faster price increases in Luxembourg than in neighbouring regions contribute to higher net wealth for homeowners in Luxembourg (Mathä, Porpiglia and Ziegelmeyer, 2018).

While the composition of wealth is comparable between households commuting from neighbouring regions in Belgium, France and Germany and employed households resident in Luxembourg, there are differences in the shape of the wealth distribution. The gap in median net wealth between the two groups is higher for top wealth quintiles, such that net wealth of employed residents is distributed more unequally than that of cross-border commuting households.

Figure 22. Value of main residence is significantly higher for employed households in Luxembourg
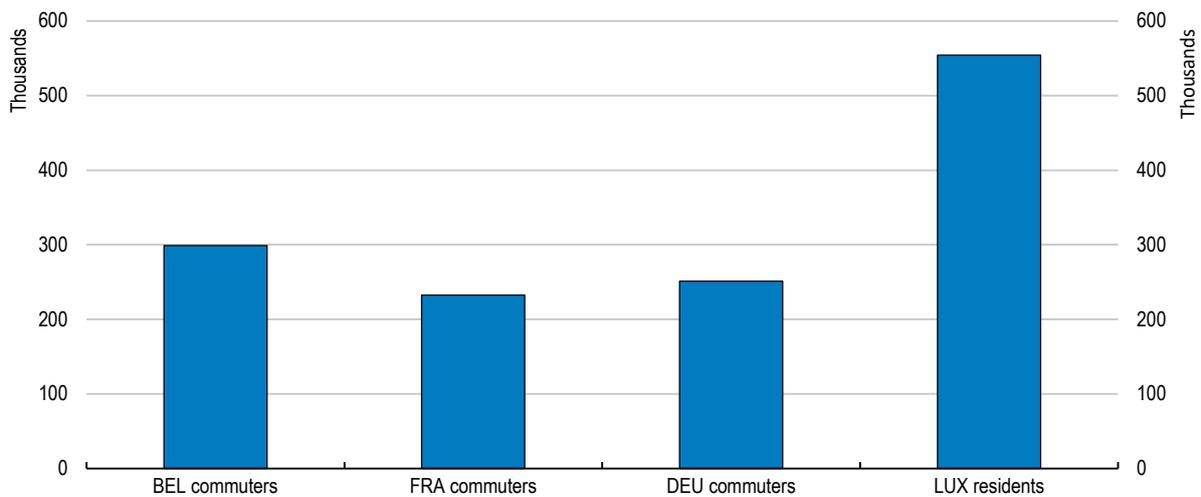
Note: Data are multiply imputed and weighted.
Source: HCFS data (second wave, 2014), Mathä, Pulina and Ziegelmeyer (2018).

Analysis of wealth differences between homeowners and renters

Net wealth is significantly higher for homeowners than for renters. To evaluate the wealth gaps between households with different housing tenures, we estimate a quantile regression model explaining the median level of total net wealth with a set of covariates, as in Bauer, Cobb-Clark, Hildebrand and Sinning (2011), Sinning (2007), Mathä, Porpiglia and Ziegelmeyer (2018) and Causa and Woloszko (2019). We estimate the following model (omitting the household identifier i):

$$W = \beta_0 + \beta_1 Y + \beta_2 E + \beta_3 Z + \beta_4 H + \varepsilon ,$$

where W represents the wealth aggregate of interest (i.e. total net wealth), Y is total household income, E captures the education level, which is likely to be associated with net wealth, and Z includes other household characteristics linked to the life-cycle and net wealth, such as the age of the household head, the household size, the civil status (single, married, divorced or widowed). We include an indicator variable H that takes value 0 if the household is a renter and 1 if it is a homeowner.

This approach allows us to identify whether housing tenure can account for a significant gap in net wealth after accounting for other household characteristics. In particular, we are interested in whether this housing tenure gap differs across sub-samples. We will compare employed households resident in Luxembourg to employed households resident in Belgium, France and Germany. We focus on employed households to compare results with Luxembourg's cross-border commuter survey, which is limited to employed households only. Thus, in addition, we will compare them to each of the cross-border commuter households from Belgium, Germany and France.[6] We estimate a separate regression for each sub-sample to compare results for cross-border commuters and the representative sample of the household population in their country of residence.

A substantial housing tenure gap appears in each subsample (Table 1). This gap is much larger for the cross-border commuter households than for the employed household in the respective country of residence (with the exception of Germany). For all cross-border commuter households combined, the gap is estimated at $e^{(2.3)} \approx 10$, meaning that median homeowner is approximately ten times wealthier than the median renter[7]. The other results are in line with main findings in the empirical wealth literature (Gale and Pence, 2006; Bauer, Cobb-Clark, Hildebrand and Sinning, 2011; Sinning 2007; Mathä, Porpiglia and Ziegelmeyer, 2017, 2018; Causa and Woloszko, 2019). Household (labour) income contributes significantly to the median level of household total net wealth. Among employed households resident in Belgium and France, age is positively linked to higher net wealth, although not in other samples. The age-squared term, usually included to capture effects related to life-cycle theory, is only significant sometimes.

Median net wealth generally increase with education attainment: secondary education is positively significant and the coefficient on tertiary education is even higher. However, among cross-border commuters the impact of educational attainment is not usually significant (except in column 5).

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[6] The sampling design in each national survey draws on the resident population, with no account for the place of work, i.e. home or abroad. In principle, a household including cross-border commuters working in Luxembourg could be drawn in the Belgian, French or German sample. However, in practice this is very unlikely.

[7] When the IHS transformation is used on the left-hand side, the interpretation of the coefficient β on a binary variable is given by the following formula (Bellemare and Wichman, 2018[2]):

$$\bar{R} = \frac{Median(wealth|owner = 1)}{Median(wealth|owner = 0)} \approx e^{\hat{\beta} - 0.5\, \widehat{Var}(\hat{\beta})}$$

In other words, the housing tenure wealth gap $\bar{R}$, is given by exponential of the regression coefficient minus its half variance.

Table 1. Tenure gap estimates for different sub-samples

VARIABLES	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	Employed households resident in				Cross-border commuting households from			
	BE	DE	FR	LU	all	BE	DE	FR
male	0.039	0.049	0.085*	0.126	0.028	0.104	0.029	0.006
	(0.083)	(0.088)	(0.044)	(0.089)	(0.059)	(0.121)	(0.151)	(0.075)
age	0.097***	-0.013	0.035**	0.022	-0.003	-0.085*	0.040	-0.025
	(0.027)	(0.036)	(0.014)	(0.031)	(0.032)	(0.049)	(0.063)	(0.041)
age squared	-0.001**	0.000	-0.000	0.000	0.000	0.001**	-0.000	0.000
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.001)	(0.001)	(0.000)
single	-0.078	-0.030	-0.135**	0.054	0.025	-0.002	-0.008	-0.070
	(0.143)	(0.170)	(0.063)	(0.109)	(0.091)	(0.166)	(0.195)	(0.121)
divorced	-0.162	-0.463***	-0.290***	-0.207	-0.239***	-0.039	-0.172	-0.300*
	(0.111)	(0.161)	(0.090)	(0.126)	(0.092)	(0.199)	(0.253)	(0.175)
widowed	-0.029	0.054	-0.006	-0.207	-1.039	0.362	0.726**	-2.101
	(0.194)	(0.390)	(0.122)	(0.314)	(5.607)	(0.437)	(0.355)	(7.588)
household size	-0.010	-0.060	0.001	-0.015	0.028	0.093*	0.050	-0.015
	(0.031)	(0.054)	(0.024)	(0.033)	(0.030)	(0.048)	(0.066)	(0.034)
secondary education (ISCED=3,4)	0.236*	0.903**	0.351***	0.215**	0.186	0.254	0.115	0.410
	(0.124)	(0.359)	(0.062)	(0.106)	(0.118)	(0.232)	(0.180)	(0.441)
tertiary education (ISCED=5,6)	0.408***	1.403***	0.706***	0.368***	0.356***	0.340	0.276	0.609
	(0.124)	(0.363)	(0.084)	(0.119)	(0.118)	(0.230)	(0.190)	(0.439)
ihs(income)*	0.552***	0.607***	0.334***	0.612***	0.296***	0.322***	0.255**	0.267***
	(0.094)	(0.146)	(0.123)	(0.094)	(0.068)	(0.113)	(0.120)	(0.090)
homeowner	**2.018*****	**2.015*****	**2.009*****	**2.238*****	**2.284*****	**2.509*****	**1.817*****	**2.600*****
	(0.214)	(0.108)	(0.068)	(0.178)	(0.123)	(0.289)	(0.200)	(0.212)
constant	0.914	2.244	4.711***	2.285*	6.184***	7.034***	6.309***	6.645***
	(1.277)	(1.811)	(1.254)	(1.210)	(1.060)	(1.784)	(1.814)	(1.367)
observations	1,153	2,816	7,558	1,223	2,414	708	692	1,014

Note: All individual characteristics refer to the household head, defined as the most financially knowledgeable person in the surveys for Belgium, France, Germany and Luxembourg and the cross-border commuter in the cross-border survey. To address problems related to heteroskedasticity, standard errors are calculated over 1,000 bootstrap replicates (Cameron and Trivedi, 2010, pp. 222-226). All monetary units (total net wealth and total income) are transformed using an inverse hyperbolic sine (* IHS) transformation in log form (e.g. Pence, 2006; Causa and Woloszko, 2019).
Source: Eurosystem HFCS and LU-HFCS and XB-HFCS, second wave.

Housing wealth inequality in Luxembourg and among cross-border workers

This section provides an overview of housing inequality in Luxembourg and among cross-border workers. We analyse housing inequalities with reference to the value of the household main residence (HMR).

There is much debate on how to measure wealth inequality, which complicates comparisons across different populations. Disagreement on measurement regards the substantial number of households with negative net wealth and the effect of life-cycle accumulation, which might explain part of the inequalities found in cross-sections. Cowell and Van Kerm (2015) discuss these issues in detail and provide measures of wealth inequalities for different euro area countries using the first wave of the HFCS. A focus on housing wealth is justified, as it accounts for much of households' overall private wealth and is the main asset for most households working in Luxembourg.

We use data from the second wave of the LU-HFCS and the XB-HFCS. These surveys asked owner-occupiers to report the current value of their homes, and renters to report their monthly rental payment. Both home and rent values were recorded in 2014. The sample only includes employed households. Additional data details appear in the Appendix (Table A.1).

Lorenz curves provide a graphical representation of the distribution of household main residence values and rents (Figure 23). The cumulative share of total HMR values (Figure 23, Panels A and B), and rents (Figure 23, Panel C) is plotted against the cumulative share of the corresponding population (ranked in increasing size). The gap between the Lorenz curve and the 45° diagonal indicates the degree of inequality in distribution. In other words, the closer the curve is to the diagonal the more equal the distribution.

Figure 23. Lorenz curves for HMR values and rents: Comparison between employed residents and cross-border workers
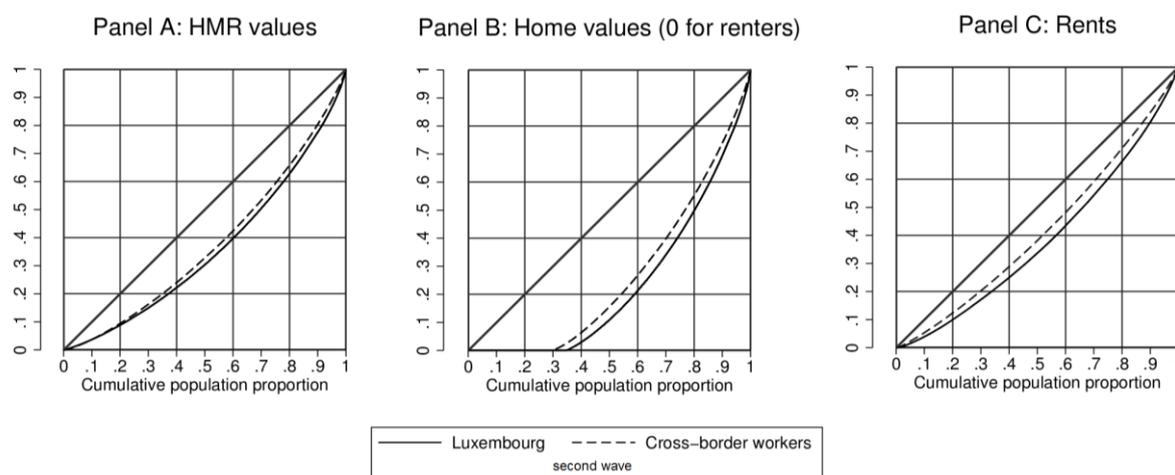
Note: These curves graph the cumulative share of self-assessed housing values (from lowest to highest), against the cumulative share of households. Panel A is for resident homeowners; Panel C is for renters. Panel B is for the sample of homeowners and renters combined. Panel B includes renters with an implied home value of zero.
Source: Own calculations based on the second wave of the LU-HFCS and XB-HFCS, data is weighted and all implicates have been used.

Using Lorenz curves it is possible to compare different parts of the distribution for Luxembourg residents and cross-border workers. Panel A shows that inequality among employed homeowners is similar in Luxembourg and in the population of cross-border workers. In Luxembourg, the top 20% of homeowners account for about 36.6% of all housing values. For cross-border workers, inequality is usually lower but still comparable, with around 33.3% of housing values going to the top 20% of homeowners.

To better understand the distribution of housing assets, Panel B includes renters, who assign a zero value to their HMR. Panel B shows that the employed population resident in Luxembourg is less equal, with more than 50% of owner-occupied housing wealth owned by 20% of households. In comparison, inequality is slightly lower among cross-border workers, with 45% owned by the top 20%. Moreover, Panel B shows that renters represent a smaller part of the population among cross-border workers than in Luxembourg (29% versus 35%). Panel C displays the distribution of monthly rents across renters. Again, although inequality among cross-border commuting households is generally below that among Luxembourg residents, overall levels are comparable.

Conclusions

As in many OECD countries, housing is the main asset of the middle class in Luxembourg. However, the contribution of housing to total wealth is much less important at the top of the distribution. In the top decile of the wealth distribution, the share of housing assets in household portfolios is only 18%, well below the OECD average. Tax benefits of homeownership take many forms, including mortgage interest deductibility and various demand-side subsidies for low-income households.

Homeownership rates and housing values among Luxembourg's cross-border workers differ. There are also important differences between Luxembourg residents and cross-border commuter households. Although those who work in Luxembourg generally become homeowners at a younger age, many households report that they face financial obstacles: some must postpone the purchase of their home, others resort to own labour contributions or acquire their

main residence in Luxembourg's neighbouring regions to avoid the high premium associated with residential real estate in Luxembourg. We also document in the various national and cross-border samples that households acquire their main residence later in life, which is in line with the reported need to postpone the purchase of their home.

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Appendix: Data description and additional results

Appendix Table 1. Descriptive and inequality statistics

Table a1. Descriptive and inequality statistics		
	Employed Luxembourg residents	Cross-border workers
Descriptive		
Sample size	1,223	2,414
Homeowners (percent)	65	71
Unconditional Median HMR value (euro)	349,089	199,114
Conditional Median HMR value (euro)	554,220	250,000
Conditional Median monthly rent (euro)	850	590
Gross housing wealth inequality		
Gini index	0.53	0.47
Gini index (homeowners only)	0.28	0.25

Source: Own calculations based on the 2nd wave of the LU-HFCS and XB-HFCS, data is weighted and multiply imputed.

Appendix Table 2. Homeownership and future homeownership plans across household groups

		Homeowner	Renter			
			no plans to acquire HMR		plans to acquire HMR: yes	
			other reasons	financing reasons	within 5 years	after 5 years
Gender*	Male	57%	53%	59%	52%	59%
	Female	43%	47%	41%	48%	41%
Age classes*	16-34	14%	28%	20%	47%	41%
	35-44	19%	12%	41%	26%	35%
	45-54	22%	19%	23%	16%	9%
	55-64	19%	17%	14%	9%	14%
	65+	26%	24%	2%	2%	0%
Country of birth*	Luxembourg	67%	48%	28%	28%	31%
	Portugal	9%	15%	21%	17%	27%
	France	6%	9%	16%	14%	9%
	Belgium	4%	3%	2%	0%	0%
	Italy	2%	5%	3%	6%	12%
	Germany	3%	4%	2%	2%	0%
	Other countries	8%	16%	29%	34%	22%
Household size	1 member	28%	55%	42%	35%	21%
	2 members	31%	21%	17%	12%	49%
	3 members	16%	12%	17%	26%	3%
	4 members	17%	8%	13%	15%	10%
	5+ members	8%	4%	12%	11%	16%
Number of dependent children	No children	64%	80%	60%	48%	60%
	1 child	15%	13%	16%	28%	15%
	2 children	15%	6%	15%	14%	9%
	3+ children	6%	2%	10%	10%	16%
Marital status*	Single	22%	37%	35%	44%	41%
	Couple	55%	33%	40%	47%	53%
	Divorced	12%	19%	23%	9%	5%
	Widowed	11%	11%	2%	1%	1%
Education level*	Low (ISCED=0,1,2)	28%	38%	37%	17%	45%
	Middle (ISCED=3,4)	41%	32%	39%	35%	34%
	High (ISCED=5,6)	31%	30%	23%	48%	21%
Employment status*	Employed	54%	58%	60%	75%	78%
	Self-Employed	5%	1%	5%	3%	5%
	Unemployed	1%	3%	15%	4%	4%
	Retired	32%	27%	6%	5%	2%
	Other	8%	10%	14%	15%	11%
Total gross income	Quintile 1	11%	40%	45%	23%	43%
	Quintile 2	18%	26%	25%	18%	21%
	Quintile 3	21%	14%	16%	22%	27%
	Quintile 4	24%	12%	9%	18%	3%
	Quintile 5	25%	8%	5%	18%	5%
Total net wealth	Quintile 1	1%	59%	67%	40%	76%
	Quintile 2	16%	28%	27%	38%	21%
	Quintile 3	27%	4%	3%	11%	3%
	Quintile 4	28%	4%	2%	6%	0%
	Quintile 5	28%	5%	1%	5%	0%

Note: References to personal characteristics of a household (indicated by a *) always refer to the "financially knowledgeable person" (FKP). Quintiles for gross income and net wealth refer to the total population.
Source: Own calculations based on the 2nd wave of the LU-HFCS, data are multiply imputed and weighted.