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Overcrowded Housing and Relationship Break up

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Overcrowded Housing and Relationship Break up¹

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Abstract

To what extent is there an association between housing density and divorce? And if so, is it a causal relationship? Housing space may affect the probability of divorcing because of stress, lower subjective well-being, and poor mental health, any of which could put pressure on the relationship with the partner and eventually cause a break-up. Using the Luxembourgish PSELL 2003-2014, we operationalize overcrowding with both an objective and a subjective measure. We check for the following confounding factors: financial difficulties, home ownership, and nationality. We find that there is no significant association between housing density and divorce once confounders are taken into account, not to mention causality. Instead, home ownership turns out to be of the utmost importance in explaining the bivariate association between housing density and union dissolution.

Keywords: divorce ; housing ; overcrowding ; spuriousness ; union dissolution

JEL classification codes: D10 ; J12

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Introduction

Is there a bivariate association between housing density and union disruption in Luxembourg? Moreover, is it a *causal* relationship or can we explain such a bivariate association by confounding mechanisms? In this paper, we will not only see to what extent the association between overcrowded housing and union dissolution holds in Luxembourg, but we will also check to what extent the relationship is causal or spurious by using an advanced method to compare logistic regression coefficients. Jalovaara (2002) found for Finland and Krapf and Wagner (2017) for Germany that couples living in overcrowded dwellings are more likely to break-up a marital or cohabitational relationship.² They questioned the causality of this relationship, however. They found that other socio-economic and housing characteristics explained the bivariate association.

Examining possible causes of divorce and separation in Luxembourg has rarely been done and is important for policy-makers and scholars alike. Knowing the causes for marital break-ups can help family-oriented policies alleviate the sometimes severe negative consequences of divorce for adults and children. Separation influences individuals' economic, social, and psychological outcomes and is an event which may unsettle people and have consequences for people's functioning in society, at least in the short term (Kitson & Morgan, 1990). The major concern in this area has been on the effects of divorce for children's well-being and many studies have found that a parental divorce may indeed have negative consequences for several child outcomes (Amato, 2000; McLanahan & Sandefur, 1994; Spruijt, 2007).

So far, scholars have studied the negative consequences of overcrowded housing on a set of outcomes such as mental and physical health (Gove, Hughes, & Galle, 1979), suicide thoughts (Fuller, Edwards, Vorakitphokatorn, & Sermsri, 1996), aggressive behavior (Baum & Koman,

² We investigate housing effects on the dissolution of marital and cohabitational relationships and use break-up, separation, divorce, and union dissolution interchangeably when referring to these kinds of dissolutions.

1976)), or marital problems ((Gove et al., 1979), although Baldassare (1983) found insignificant effects). To our knowledge, the link between overcrowded housing and divorce has rarely been studied with the exceptions of Jalovaara (2002) and the recent unpublished study of Krapf and Wagner (2017). Overcrowding may affect the probability of divorcing directly because there might be a spill-over effect from difficulties for families living in a poorer housing situation; i.e. difficulties in housing lead to difficulties in other aspects of life (Evans & Lepore, 1993; Gove et al., 1979; Wells & Harris, 2007). It may also lead to lower subjective wellbeing, stress, and poor mental health (Foye, 2016; Gove et al., 1979; Solari & Mare, 2012; Wells & Harris, 2007) because of lack of privacy (Kaya & Weber, 2003; Palisi, 1984) which puts pressure on the relationship with the partner and could eventually lead to a break-up. However, housing space may also be related to divorce because of certain confounding factors. An example may be poverty/having economic problems. In certain countries, especially those with lower economic, social, and legal divorce costs (e.g. in more generous welfare systems), the poor may be on average more likely to break-up (Goode, 1966, 1993)). Finally, anticipation might occur. Thus, we will look to *what extent there is an association between housing density and divorce and to what extent this relationship is likely to be (1) causal (i.e. housing density affects break-up, be it via the unmeasured mechanism of stress), or (2) confounded* (see Figure 1). We will also briefly address to what extent ‘reverse causality’ may play a role (arrow 3).

[figure 1 about here]

Luxembourg is a very peculiar case in Western Europe. It is a small country with an expensive housing market and a rather large share of home owners compared to tenants (73% in 2014) (EUROSTAT, 2014). It experienced a rise in the divorce rate since the mid-seventies which

then stabilized during the 2000s with a crude divorce rate (CDR) of about 2.0-2.3 (2012), before rising again recently to 2.6 (2014) (UN Statistics Division, 2017). At the same time, it has a rather low number of people living in overcrowded housing (about 7% in 2014) (EUROSTAT, 2014). Although the CDR is not the best divorce measure to compare countries³, the rate is in line with that of Finland and somewhat higher than in Germany in 2014 (the two countries in which former studies on this topic have been done). In both Finland and Germany the overcrowding rate is also similar to Luxembourg, even though the home ownership rate in Germany is much lower (about 53% in 2014) (in Finland it is also 73%) and the ‘cost overburden rate’ (EUROSTAT, 2014)⁴ in Germany (around 16%) is much higher than in Luxembourg (and Finland: between 5-7%).

To tackle the above question, we use the Luxembourg socio-economic Panel (PSELL-3 – Panel Socio-Economic Liewen zu Lëtzebuerg), which covers the years 2003-2014 and operationalize overcrowding with both an objective and subjective measure. A first condition for assessing causality is the correct time-order between the independent variables and the dependent variable (Lazarsfeld, 1955). To assess this we take the lag of overcrowding. The second condition Lazarsfeld pointed out for assessing causality is that there is an association between the two variables. Indeed, we observe a significant correlation. In addition, the third condition is that there should not be any confounding factors affecting the direct relationship between housing density and union dissolution. We will check for the following confounding factors: economic problems (Goode, 1966, 1993), home ownership (Krapf & Wagner, 2017), and nationality (native Luxembourgish, Portuguese, or other combinations of nationality)⁵. Those three

³ Unlike some statistics it is not advisable to look at the net divorce/marriage ratio in Luxembourg since this figure might be misleading: One would think that Luxembourg would be in the ‘vanguard’ of countries when it comes to divorce (having a net divorce-to-marriage ratio of 67.5 in 2013 (Eurostat)). The reason is that the marriage rate in the country is extremely low, and (or likely because) the country has exceptionally high immigration rates.

⁴ The housing cost overburden rate is the percentage of the population living in households that spent 40 % or more of their equivalized disposable income on housing.

⁵ About half of the Luxembourgish population is of foreign descent and about one sixth of the population has a Portuguese passport (the biggest group of immigrants in the country).

variables are considered relevant and important in the Luxembourgish context and (apart from nationality to some extent) are rather open to influence by policy-makers (in contrast to variables such as age and marital status). To decompose the total effect of overcrowding on divorce into direct and confounding effects we will use the khb-approach for nested non-linear probability (transition) models.

We use two definitions of overcrowding: an objective and a subjective one: the objective one is defined as a dummy for whether or not the number of rooms needed exceeds the number of rooms that are present in the dwelling (this is in line with the definition of the Housing Observatory, department of the Ministry of Housing (2017) in Luxembourg, and EUROSTAT (2014)). The subjective one is the perception of people about the size of their dwelling (a dummy: either too small (1) or not (0)) (see also (Gove, Hughes, & Galle, 1983).

We find no significant direct effect of housing density on divorce – both when using the objective or subjective measure of overcrowding – once we control for certain confounding factors. This is in line with the findings of Krapf and Wagner (2017) for Germany who analyzed the relationship between housing problems (objective overcrowding and housing affordability) and divorce, and also with Jalovaara (2002) for Finland. Especially home ownership turned out to have a significant impact on the association between housing density and union dissolution. Nationality suppressed the association with objective overcrowding, but did not confound the association with the subjective indicator. We also took into account several other concomitant variables (household income, women's wage ratio, age difference between the spouses, women's age, educational homogamy and heterogamy, city/rural, and employment status of the male household member) that are known to be related to union dissolution. We conclude that there is no association between housing density and divorce once confounders are taken into account, not to mention causality.

The paper is organized as follows: We will first discuss some of the possible mechanisms explaining a causal relationship between housing density and break-up, as well as the confounding mechanisms that we want to test. Then we address the often-discussed issue of endogeneity and anticipation. Subsequently, we introduce the data and method that we are using to analyze our expectations. Finally, the results are discussed, followed by a conclusion.

Explanations for the bivariate association between housing density and union dissolution

Causal explanations

There may be two different explanations for a ‘positive’ direct (causal) relationship between housing density and divorce. First, overcrowding can lead to an excess of interactions, stimulations, and demands from the people in the house (Evans & Lepore, 1993; Gove et al., 1979; Wells & Harris, 2007). This may cause social withdrawal which leads via lower social support to psychological distress (Evans & Lepore, 1993; Goux & Maurin, 2005). In a laboratory study with 72 college students, Evans and Lepore (1993) found that excessive, unwanted interactions (when social demands were unavoidable) go together with less eye contact and less interaction. Housemates in turn become less likely to seek and offer support to each other and this coping behavior might be overgeneralized to other situations outside of the overcrowded house. This causes distress and such psychological distress might in turn put pressure on the relationship. A second explanation may be the lack of intimacy and possibilities for being alone (Goux & Maurin, 2005), which again may affect stress and poor mental health (anxiety) (Goux & Maurin, 2005; Gove et al., 1979; Wells & Harris, 2007). This stress can cause lower marital satisfaction and, as a consequence, union dissolution.

However, we can also expect a ‘negative’ relationship between overcrowding and divorce. This is what we call the ‘lack of alternatives’ effect. From a rational perspective, spouses may be

able to think of an alternative house (and spouse) they would get in case of a divorce. People living in an overcrowded dwelling will be most likely to have few options in finding better housing. As they are most likely poor they have limited outside options and most likely would still live in an overcrowded house after a break-up (and therefore such couples choose not to break up). Note that in Luxembourg this argument is not likely to apply as crossing the border to cheaper housing in France, Belgium, or Germany gives a reasonable outside option (but note the loss of possible social security rights built up in Luxembourg).

Confounding explanations

Three confounders are assumed to be important in explaining the association between housing density and divorce.⁶ First of all, economic problems affect both overcrowded housing and union dissolution and could therefore be a reason for the bivariate association between housing density and divorce.⁷ Note that the relationship between having financial difficulties and divorce is not so straightforward and does not occur in the same way in each country. Goode (1966, 1993) already showed a changing relationship between economic problems and divorce over the years in the postwar period with the higher socio-economic layers of society to be more likely to break up when divorce is difficult due to legal, social, and economic barriers. The lower strata would overtake them in this, however, the more common divorce would be within a society, reflecting the reduction of those barriers. The reason would be the higher amount of strain that poorer couples experience. Conflicts over financial issues have been shown to be

⁶ As the confounders occur before overcrowding, we test to what extent there are spurious (or suppressor) relationships rather than mediating relationships (note that the mechanism of the direct effect that we suggest – via stress – is unobserved). If the latter would have been the case, then there would still be evidence of causality. When that happens the causal effect of housing density to union dissolution runs via (some) intermediating variable(s) and it would clarify the interpretation of the effect of housing density on union dissolution.

⁷ On the relationship between income and housing deprivation in Luxembourg, see Fusco (2015).

problematic, long lasting, recurrent, and causing more negative emotions for couples in the long run (Papp, Cummings, & Goeke-Morey, 2009) as well as lower partnership quality. Also, financial problems may cause stress for each of the spouses.⁸ This can result in negative spousal interactions, which in turn reduces the coping behavior of each partner (Krapf & Wagner, 2017; Poortman, 2005). Since Luxembourg has developed a generous welfare state, with no-fault unilateral divorce (González & Viitanen, 2009), and generous single parent allowances (European Commission, 2016), we expect to find a ‘positive’ relationship between financial difficulties and divorce as in the Luxembourgish context legal and economic barriers have been reduced over the years. Note that we will control for household income and that this variable thus covers more of the needs or consumption of the household, things that income does not convey.

The second confounder is home ownership. This variable is expected to affect both overcrowded housing and divorce in a negative way. Homeowners live less often in an overcrowded house and they are also less likely to break-up because of the financial barrier they experience when doing so. Several studies on home ownership and divorce (Boertien & Härkönen, 2014; Krapf & Wagner, 2017) have pointed out the larger difficulties in breaking up for home owners. Such joint investments are constraints to union dissolution because they are investments that are more valuable within the current union rather than outside of it; they increase the costs (both economic and emotional) of exit out of the union. Next to having common children, home ownership is considered to be the most important form of marital specific capital (Becker, Landes, & Michael, 1977; Brüderl & Kalter, 2001). The assumption that is made regarding the effect of joint investments is utility maximization: union dissolution takes place only in the case that the expected utility of the current union is lower than the

⁸ Note that this might be a proxy for financial stress since it is a subjective measure; a perception of the individual about their own situation.

expected utility of a certain alternative. Hence, every investment that raises the relative gain of the present union reduces the probability of a break-up. However, anticipation could also play a role: couples would only invest in a house when they expect to stay together (Lersch & Vidal, 2014). In this study we cannot rule out such anticipation for sure.

The third possible confounder is nationality. In Luxembourg one sixth of the population has a Portuguese background and this group is more likely to live in overcrowded houses than the native population. The question is to what extent those with a Portuguese nationality (and especially those in a mixed marriage⁹) are also more likely to break-up than the native Luxembourgish population. For the moment we do not have a specific expectation about this relationship (the crude divorce rate of Portugal is close to that of Luxembourg over the last decade), but if such an association exists, it would be an important confounder that we would need to take into account. It might be that confounding according to nationality occurs more when looking at the objective housing density indicator than the subjective one as cross-cultural differences in the perception of overcrowding may exist. Certain cultures require more privacy than others (Kaya & Weber, 2003; Palisi, 1984): perhaps the native Luxembourgish prefer to live in less dense housing than the Portuguese (immigrant) population does.

Endogeneity (anticipation and ‘reverse causation’)

People that are anticipating upon the decision to divorce may be more likely to stay in an overcrowded house because they are less willing to move out of an overcrowded house for the time being. They would be less willing to make a (new) investment in the relationship. Also, people who just broke up may be more likely to live in an overcrowded house afterwards

⁹ Couples with a mixed background (whether it is e.g. education, age, ethnicity, or religion) have been found to be more likely to break-up than those from a non-mixed background (Janssen, 2001). We assume the same applies to couples with heterogamous nationalities.

because a divorce is costly; the household is split in two so housing costs and other scale advantages cannot be shared anymore. This is called ‘reverse causation’, although in fact here we refer to two different variables in longitudinal data, so it can be a somewhat misleading concept (Rubin, 2017). In any case, by lagging all our independent variables and censoring individuals in the event of a break-up, we avoid the possibility of ‘reverse causation’. Anticipation could still play a role, however, and we will try to check if such anticipation is likely.

Importance of control variables

We also took into account several other covariates (household income, women’s wage ratio, age difference between the spouses, women’s age, educational homogamy and heterogamy, city/rural, and employment status of the male household member). These variables are known to be related to union dissolution. We particularly expect that age and marital status are important controls, since older couples usually have had more opportunities to build up a successful housing career (Sierminska & Doorley, 2013) but at the same time are less likely to break-up (cohort effect (Bodson & Segura, 2010))¹⁰. Married couples would be more likely to make joint financial investments (Lersch & Vidal, 2014) (and buy a bigger house), and they are less likely to dissolve their union than cohabitational partners (Liefbroer & Dourleijn, 2006)¹¹.

¹⁰ Indeed, in our sample the average break-up rate for married couples is lower (1.2%) than for cohabitators (4.3%).

¹¹ According to the diffusion hypotheses of Liefbroer & Dourleijn (2006), countries with a small proportion of cohabitators (in the Luxembourgish PSELL this proportion is 16%) show a ‘positive’ effect of cohabitation on the risk of divorce. This is due to the fact that cohabitators in such societies are a selective group with more modern values than married couples.

Data and measures

To investigate to what extent there is a relationship between housing density and divorce and to what extent we can explain this association, we use the Luxembourgish PSELL 2003-2014. This is a panel survey on living conditions of households in Luxembourg. Interviews were held with about 10000 individuals in each yearly wave. These numbers increase from wave 8 (2010) onwards as from then on the panel became a rotational panel and the first rotational group was added (N rotation group=3715). All the original panel members that were present since 2003 were dropped from the panel altogether in 2013. The unit of analysis is the couple and we use information of both spouses to assess whether a break-up of the relationship took place. We analyze break-ups (coded 0 (partnered), 1 (separated)) from both marriages and cohabitations (N=20577 couple-years in the age of 18-65; 9700 couples) and the break-ups can be (not yet) official divorces or break-ups from cohabitational relationships. To keep it simple we only look at first union dissolutions¹², leaving out 7 cases of a total of 332 observed divorce events (with valid scores on the relevant confounders and covariates). We examined to what extent this is a low percentage of events of union dissolution by checking attrition. We found an attrition percentage of 16% in each wave on average, while for divorcees this is 14%.

We analyze the possible influence of two independent variables: an objective and a subjective housing density measure.

The objective indicator is constructed as follows: Number of rooms¹³ needed minus actual number of rooms present in the house. The need is different for different household members according to their gender and age and is as follows:

¹² This is 1.6% in each wave (3.6% between-averages per wave), which is comparable to the wavely number of separations in the BHPS/ Understanding Society Panels in the UK (about 1-2%).

¹³ Without the kitchen, bathroom, outbuildings, or study/work rooms.

1. one room for the household
2. one room for each couple
3. one room for each single person 18+
4. one room for two single persons of the same sex between 12-17
5. one room for each single person of different sex between 12-17
6. one room for two children under 12

If the number of rooms needed exceeds the number of rooms that are present in the dwelling then the house is considered to be overcrowded (thus a dummy no (0), yes (1) is constructed).

The subjective indicator is measured according to the following question: Is your dwelling for your household too small; too big; or about right? Considering one's dwelling as too small is coded to be overcrowded (code 1). Note that this question was not asked in 2009 and from 2012 to 2014. The scores are imputed where possible in 2009 based on the information in the neighbouring waves from 2008 and 2010.

The confounders are measured in the following way:

Financial difficulties¹⁴: With respect to your budget, could you tell me which of the following categories applies most to your case?

1. you have ample financial resources (ref cat)
2. it's ok

¹⁴ We also examined the influence of an objective measure of poverty (50% of the median income). The results are similar and can be provided upon request.

3. the budget is tight
4. difficult to make ends meet

Home ownership: Is the first responsible of the dwelling:

1. owner of an own built house
2. owner of a bought dwelling
3. owner of an inherited house
4. renter or subletter (according to the market price)
5. renter or subletter (below market price)
6. having free housing?

A dummy is created for those being home owners (1) (score 1-3) or not (0) (score 4-6).

Nationality of the couple:

1. both are Luxembourgish
2. both are Portuguese
3. Luxembourgish/Portuguese
4. all other (ref cat)

The other variables that we will investigate are: whether the couple is married or cohabiting; relative education (homogamy and heterogamy), age difference of the couple, women's age, women's wage ratio compared to that of her spouse, log of household income, whether the male

household member is unemployed, city/rural area of living. For the subjective housing density measure, we also control for the type of household member (having at least one other adult in the house and the number of dependent children).¹⁵

Analytical approach

We perform transition models estimating the log odds of union dissolution in each year (using a logistic regression) and try to explain these by overcrowding and some covariates. Note that we lag all independent variables. Unfortunately, the PSELL does not have the starting dates of many relationships, so we could not control for union duration in our models.¹⁶ To break down the total association between housing density and divorce into a direct effect and the indirect effects of confounding factors, we use the khb-approach (Karlson-Holm-Breen) (Breen, Karlson, & Holm, 2013; Karlson, Holm, & Breen, 2012) for nested nonlinear probability models. This technique takes into account the rescaling of the variance of the dichotomous dependent variable¹⁷ when more variables are introduced into the model and hence decomposes the total effect into a confounding and a rescaling effect. The method holds the error distribution constant between the full and the reduced model (which is the model without the confounder(s)). Hence this method is unaffected by rescaling (i.e., changes in the variance of

¹⁵ We also considered including (poor) health of the household head into the model, but this can be a mediator. Hence, we decided to leave it out.

¹⁶ We also tried to estimate models in which we only analyze couples that we observe forming a relationship during the panel, but these would lead to a bias in the results as we can observe a maximum duration of 11 years. In addition, we did not observe any couple that was formed during the panel, who divorced and was living in an overcrowded house simultaneously.

¹⁷ Because the logistic regression is a latent dependent variable model, the variance of the dependent variable is not fixed and the estimator for the regression coefficients requires an assumption about the distribution and the variance of the error terms in particular (Karlson et al., 2012; Mood, 2010). The regression coefficients of the full and the reduced model (the model without confounders) are therefore a combination of the true regression coefficients and a rescaling factor. The khb method includes the residual of the confounding variable after taking the overlap with the key independent variable into account rather than the confounding variable itself. By doing so the method rescales the reduced equation to the scale of the full equation and therefore the coefficients of the independent variable in the two models (reduced and full) can be subtracted from each other to get the direct effect.

the error distribution) *and* by the changes in the shape of the error distribution across nested models. Other methods, such as naive estimation of the confounding effect (by just comparing odds ratios of nested models) – which leads to an underestimation of confounding, – Y-standardization, Average Predicted Estimates (marginal effects), and Linear Probability Models do not have this advantage. The last three do take rescaling into account but they perform less well when the difference between the full and reduced error distributions becomes greater (Karlson et al., 2012). We corrected the standard errors for clustering due to repeated observations within individuals.

Results

Descriptive statistics

In the following table, we provide some descriptive statistics (between-couple averages per wave). We observe a separation of couples only in 3.6% of the cases on average per wave; 10% of the couples lives in an objectively overcrowded dwelling; 17% says so subjectively; couples on average do not experience financial difficulties, but in 8.5% of the cases they do; 72% are home owners; 19% of partners are both Portuguese; 41% are both native Luxembourgish, only 2% are mixed Luxembourgish/Portuguese, and 39% constitute the rest of the marriages/cohabiting relationships, either of mixed or the same nationality.

The bivariate relationships between the lagged values of the overcrowding measures and union dissolution are shown in two cross tabulations in tables 2a and 2b. Both tables show that living in an overcrowded house goes together with a larger likelihood of breaking up. Note that this is a very crude way of assessing the association between the two variables since we do not yet take dependency between the observations among the different years (panel waves) into account.

[Tables 1 and 2a and 2b about here]

Khb-decomposition results

We now perform the khb-analyses, examining the part of the total association between housing density and divorce that is due to confounding. The results for objective housing density are presented in Figure 1.¹⁸ When considering the reduced model (without any confounders or concomitant variables included), the log odds of divorce are $[\exp(0.566)=1.76]$ for couples living in an overcrowded house, (which is significant). This is the bivariate, total relationship between housing density and divorce (M0a). This coefficient reduces to $[\exp(0.216)=1.24]$ (which is not significant anymore at a 5% one-tailed test) when taking control variables into account (M1a), of which the most important controls are women's age and being married. As these are couple characteristics that are hard for policy-makers to influence, we do not zoom in further on these effects. Moreover, about just as large a contribution to the total effect of objective housing density on divorce is achieved by the three possible confounding variables we consider explicitly. The overcrowding coefficient reduces to $[\exp(0.247)=1.28]$ (insignificant) once taking financial difficulties, home ownership, and nationality as confounders into account (M2a). Disentangling the effects of these three confounders gives the following results: financial difficulties reduces the total effect to $[\exp(0.157)=1.17]$ (controlled). The bivariate effect decreases when home ownership and controls are taken into account [to $\exp(0.085)=1.09$] (insignificant). Nationality does not confound the controlled

¹⁸ We also did all main analyses using two other common objective (continuous) overcrowding measures: (1) We divided the number of rooms needed (based on the age and sex specific composition of the household) by the number of rooms present in the household; (2) The logged square meters of the (livable) floor space of the dwelling divided by the number of people in a household. Results were similar for both measures for the main models and are available upon request.

relationship between housing density and divorce [$\exp(0.193)=1.21$] (compare models M1a and M5a), but later on we will see it acts as a suppressor variable. Adding all three possible confounders and a number of concomitant variables to the model reduces the coefficient of objective overcrowding slightly further compared to models M1a or M2a [$\exp(0.119)=1.13$].

With respect to subjective housing density, we find a similar pattern (Figure 2). The log odds of divorce for couples claiming to live in too small a house are [$\exp(0.538)=1.71$] (significant) (Note that this model (M0b) is controlled for the type of household members (whether there is another adult present and the number of dependent children). Confounders and additional controls confound this association by reducing the coefficient to an insignificant one (Models M1b – M6b) [$\exp(0.188)=1.21$].

[Figure 2 and 3 about here]

As stated before, we are particularly interested in the confounding contribution of three variables: financial difficulties, home ownership, and nationality, as these three variables are considered of utmost importance in the Luxembourgish context. We therefore zoom in on these three variables and disentangle the total effect of overcrowding from possible indirect confounding effects from these variables. In Table 3 the contribution of each of the confounding factors to the total association is expressed in percentages (based on Model 6a). -2% of the total association between housing density and union dissolution is explained by confounding through financial difficulties couples are experiencing. For home ownership this percentage is +56%. Note that financial difficulties are actually suppressing the relationship between overcrowded housing and union dissolution. Unexpectedly, financial difficulties (i.e. difficult to make ends meet) seem to go together with a smaller likelihood to breaking up on the one hand and a higher

likelihood to live in an overcrowded house on the other hand (but the coefficients point to a non-linear and insignificant relationship with union dissolution). A similar suppression occurs when looking at the impact of nationality (-28%). Those couples in which both spouses are Portuguese are less likely to break-up and are more likely to live in an overcrowded house than couples from other backgrounds. The result of these contradictory signs of the relationships suppresses the ‘positive’ relationship between housing density and divorce. Overall, however, the biggest confounder turns out to be home ownership. Homeowners are much less likely to live in an overcrowded house than renters and they are also much less likely to dissolve their marital or cohabitational union.¹⁹

With regard to subjective overcrowding, these percentages are +5% for financial difficulties, +26% for home ownership, and +1% for nationality.²⁰ It is striking that nationality here does not influence the relationship between housing density and divorce. A possible explanation may be that even though Portuguese couples are more likely to live in objectively defined overcrowded houses, they do not consider their house too small subjectively. We come back to this in the conclusion.

[Table 3 about here]

¹⁹ Note that we find similar percentages when we do not control the models for several variables (among which education, age, and marital status). Only the influence of financial difficulties is then somewhat stronger (hence, there is some confounding going on through some of the concomitant covariates that we take into account). Results of these models are available on request.

²⁰ We find larger percentages for all variables once not controlling for other variables. Results are available on request.

Addressing anticipation: Instrumental variable analyses

We try to check if anticipation could play a role by doing some robustness checks using several instrumental variables for overcrowding. We used two instruments for overcrowding in two-stage Linear Probability Models. First, for the objective overcrowding measure, we used the sex of the two oldest children in the household (one of them being at least 12 years old) because for these children having a separate room when there is gender difference matters in comparison to being the same gender. Families in which the two *oldest* children are a boy and a girl and where one of them is older than 12 tend to live more often in objective overcrowded housing than other families because all of a sudden they need an extra room for the same number of household members, according to the overcrowding definition as when the gender of the children is the same. So when the first child turns 12 and the second child is of a different gender, the chance of living in an overcrowded house increases sharply.²¹ For subjective housing density, the age of the child might not be considered important, but having another adult (relative or non-relative) coming to live into the household may.

A similar way of instrumentation was used by Goux & Maurin (2005) to assess the effect of overcrowding on school achievement of children in the US. Goux & Maurin (2005) also used another instrument: whether parents were born in urban areas. This is related to more often living in overcrowded houses, but it has been shown to be correlated with divorce (Fokkema & Liefbroer, 2004) so it is not a good instrument for our purpose (and in addition, we could not

²¹ Some scholars might have concerns about the validity of this instrument: it may be related to our outcome, divorce. The explanation for such a gender difference effect on divorce was that fathers would be more involved in raising boys than girls and this would affect marital quality and in turn the divorce risk of the couple (Diekmann & Schmidheiny, 2004). Although the gender composition of the children was likely to be related to separation some decades ago (in the US: Pollard and Morgan (2003)), the correlation between the sex composition of the children and union dissolution diminished over the years (Pollard & Morgan, 2003). A cross-national comparative study (in which Belgium, France, and Germany – Luxembourg's neighbouring countries – were included) even showed that such a correlation has been absent (or at least insignificant) altogether (Diekmann & Schmidheiny, 2004). Under the assumption of parental gender indifference (the number of girls in the household no longer serves as a proxy for paternal involvement), the instrument could be valid.

analyze this because the degree of urbanization of the parent's birthplace is not available in the Luxembourgish PSELL). Another instrument that we also tested was having twins.²²

Note that if the instruments correlate with divorce (and not only through overcrowded housing), the instruments are not valid and the results may still be (upwardly) biased. The first instrument turned out to be significantly influencing objective overcrowding, whereas the second instrument significantly influenced the subjective housing density measure. However, both instruments depended very much upon the covariates in the model, which makes it less plausible that the assumption that they are random variables holds. Still, we checked what the coefficients of these invalid instruments would have been. The results (not presented) showed that the coefficients indicating the effect of overcrowding on union dissolution drop substantially. For the objective measure, the coefficient became insignificant and close to zero. For subjective housing density, we found a reduction of the effect, but it remained significant [$\exp(0.181)=1.20$]. In the second case, it is very likely that anticipation will occur: *thinking* about breaking-up makes people believe their house is too small for their household. To check this, we lagged the instrument two years and found that the coefficient of subjective overcrowding on union dissolution turns insignificantly negative. Moreover, the instrument does not validly predict overcrowding anymore. Altogether, this points to a possible short-term anticipatory effect of union dissolution by adjusting overcrowding feelings shortly before breaking-up.

²² However, the validity of this instrument is even more questionable, not only because of the possible relationship with divorce ((Jena, Goldman, & Joyce, 2011), via financial stress (McKay, 2010), but also because having twins was insignificantly negatively related to living in an overcrowded house (while controlling for age of the woman and education!).

Possible misspecifications of the models

The above khb-models can be mis-specified to the extent that certain control variables or interaction effects were not taken into account. In this case, we are pretty confident that we included the necessary concomitant covariates, but we need to consider a couple of interactions. Based on the finding of a suppressor effect of nationality on objective overcrowding, we investigated to what extent there would be an interaction between nationality and the housing density effect on union dissolution. We find that there is: the bivariate association between housing density and divorce/separation is stronger (although still insignificant) among those that are not native Luxembourgish couples or mixed nationality couples (we could not distinguish Portuguese only couples due to the low number of cases) (N=70 Portuguese separation events). Still, the confounding pattern (of financial difficulties and home ownership) among these non-natives is similar to that of the Luxembourgish, although for the latter group financial difficulties play a relatively large role. (Note, however, that the bivariate, total effect to be explained away for the native Luxembourgish population is already rather small).

For subjective housing density, we find the following: The perception of living in an overcrowded house is positively and rather strongly related to union dissolution for the native Luxembourgish population: $[\exp(0.795)=2.21]$. Moreover, this association can hardly be explained away by home ownership or financial difficulties $[\exp(0.761)=2.14]$, nor by any of the other covariates in the model. It appears that the feeling of living in too small a house seems to be related to higher chances of breaking up for this subpopulation (N=103 events of whom 17 say they live in too small a house). As a robustness check we ran an IV model because anticipation is even more likely for this subjective measure than for the objective one and we found that the relationship between subjective overcrowding and union dissolution is reduced

to a small insignificant coefficient [$\exp(0.136)=1.15$].²³ Hence, even though we found a rather large association between overcrowding perception (lagged one or two years) and divorce/separation, this might still be caused by other underlying factors that we cannot measure. For instance, the relationship of the couple might already have deteriorated, which in turn causes the spouses to experience their homes as too small; people with a good relationship might not mind a small house.

For the non-native Luxembourgish population, we find no significant association between housing density and union dissolution. The bivariate relationship is [$\exp(0.109)=1.12$] and after taking into account confounders it reduces to [$\exp(0.028)=1.03$]. Home ownership is again the most important confounder.

We also wanted to check interactions of financial difficulties with housing density and homeownership with housing density. The group of those subjectively defined as poor (financial situation was difficult) was too small to estimate separately, however. As for home ownership, we did not find an interaction for objective housing density.²⁴

Also, for subjective housing density, the group living in severe financial difficulties is too small to analyze. Home owners who say they live in too small a house considering their family size are more likely to break up [$\exp(0.641)=1.90$] and this association cannot be explained by any confounding. An IV points again to greater anticipation, however.

²³ Moreover, lagging overcrowding three or more years does not relate to union dissolution anymore.

²⁴ For both homeowners and renters the bivariate relationship between housing density and union dissolution is small and insignificant. However, for homeowners, those that are having financial difficulties are most likely to break up, whereas for renters this group is the least likely to break up. In both cases nationality suppressed the relationship.

Conclusion

In this paper, we tried to discover to what extent there might be a causal relationship between objective and subjective housing density and union dissolution. It might be that there exists a causal effect of housing density on separation, which (for instance) can be explained by stress of the household members that live in an overcrowded house (via either social withdrawal or lack of privacy). Using khb-analyses and an instrumental variable approach as a robustness check, we draw the conclusion that it is very unlikely that there is such a causal direct effect from overcrowding on divorce. Instead, the khb-analyses show that home ownership is the most important confounder of the association between housing density and divorce. Where we do find a possible positive direct effect of subjective overcrowding on union dissolution, additional checks point to the likelihood of an anticipatory relationship.

We therefore conclude as follows: Overcrowding relates to union dissolution but this is mainly due to other aspects of the housing situation of the couple (home ownership). This result is in line with the findings of Jalovaara (2002) and Krapf and Wagner (2017). Note that this spurious effect remains present after including a number of covariates among which nationality is the most important. Home ownership can be considered one of the most important forms of marital capital and therefore a barrier to divorce (Becker et al., 1977; Brüderl & Kalter, 2001). Note that we cannot fully rule out anticipation in the khb-analyses (although we lagged all independent variables): meaning that couples might anticipate upon a break-up by not investing anymore in their relationship (Becker et al., 1977) by buying a house. A way to control for this would have been to include marital problems as a proxy for the perceived divorce probability of spouses in the model and in this way the unbiased direct effect of home ownership could have been identified. Brüderl and Kalter (2001) have shown that even though marital problems lead to lower joint investments in the relationship (i.e. having common children and joint home ownership), endogeneity does not play a role in the relationship between marital specific capital

and divorce. Introduction of marital problems in their model did not affect the direct effects of common children and home ownership on divorce. Hence, joint investments such as home ownership seem to be ‘ties that bind’ even though the couple suffers from marital problems (Brüderl & Kalter, 2001: p. 418). Boertien and Härkönen (2014) came to the same conclusion after investigating the effect of marital satisfaction and barriers on divorce in the UK. We did check to what extent a two wave lagged variable of home ownership related to divorce, but we found a strong negative association between (two wave lagged) home ownership and break-up as well as a confounding effect of (two wave lagged) home ownership. The confounding effect of a three years lagged home ownership variable is very small. Thus, overall, it seems that there is something in home ownership that withholds couples from breaking-up in the short term. Home ownership may delay the decision to break-up, or it simply may be difficult to arrange separate homes after union dissolution actually took place, but this is not reflected in the data yet because one or both of the partners did not move out yet.

Another remark can be made about the distinction between sole home ownership and joint home ownership. It could be expected that the latter would be more of an indication of joint investment in the relationship than the first one. However, Krapf and Wagner (2017) found no significant distinction between the two with respect to the risk of divorce. The authors interpret this finding in two ways: the investment of one spouse in the union through home ownership may be a strong signal of commitment, or in many cases both partners may have invested in the home while only one partner is registered as owner. In this study we were not able to check this since we do not have information regarding sole or joint home ownership but only whether the household head (the one responsible for the home) is a home owner or not.

A third remark is related to the suppressive impact of nationality for objective overcrowding, while for the subjective housing density measure this suppression was absent. Perhaps Portuguese couples do not perceive their house as being too small even though they are living

in an objectively defined overcrowded house. If that were true both cultural (privacy) and socio-economic (relative house size of the reference group) differences might play a role, demonstrating a higher validity of posing our question on subjective overcrowding in a Luxembourgish context than in for instance a Portuguese (immigrant) one. However, we did not find such a difference between Luxembourgish and Portuguese couples (see appendix table A1). It actually appears that the Luxembourgish who live in an objectively defined too small a dwelling complain *less* about their house being too small compared to the Portuguese couples. This nationality difference in perception versus the objective definition only held for those older than 40 and with relatively large floor space.

It is in any case very likely that couples that are about to break up start to consider their house as being too small. For instance, when we defined the sample according to the strongest association between subjective overcrowded housing and a break-up, we had to look at the native Luxembourgish population of homeowners. For that subsample we did find a strong bivariate relationship that was hard to be explained away (N=85 divorce events of whom 14 claimed to live in an overcrowded house) (until we lagged the overcrowding variable three waves). Of these people, however, no one was living in financial difficulties (so financial tensions seem to be less likely to be an explanatory variable), they did not have any other adults or dependent children living in their households, and most importantly, none of them was living in an objectively defined overcrowded house. The only remarkable difference of this group of people compared to those that do not break up seemed to be that they are very young couples at the beginning of their housing career.

Finally, the type of family member living within the household may be important. The impact of overcrowding might differ according to the member type. Having family members living in the household might be less of a voluntary choice than having non-relatives living in. In addition, there might be a difference between having children and having adults sharing the

home next to the couple. This might especially play a role when measuring overcrowding subjectively as the type of members living in the household are not accounted for in that measure. Note that we did control for the number of children and having at least one other adult living in. Interactions according to member type were not the focus of this paper. Future research with a larger sample size could zoom in on such interaction effects.

If one were to point out implications of this study for policy-makers it would be that it is not overcrowding per se that needs to be addressed to improve the family life of couples. Policies should focus on reducing inequalities between owners and renters instead. To what extent can differences between home owners and renters be explained? For instance, is there a large intergenerational transmission of home ownership taking place in Luxembourg, just as has been found for other European countries (Lersch & Luijkx, 2015)? And to what extent is there a transmission of wealth in general among homeowners compared to renters? Together with our finding of the importance of nationality, this suggests that more research in Luxembourg on inequalities between owners and renters should be focused on the impact of parental background.

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Tables

Table 1. Descriptive statistics of the main variables to be analyzed (between-averages per wave)

	%
separated	3.6
objectively overcrowded	9.7
house is too small	17
financial difficulties: ample	38
financial difficulties: ok	52
financial difficulties: tight	33
financial difficulties: difficult	8.5
home ownership	72
nationality: both portugese	19
nationality: both luxembourgish	41
nationality: luxembourgish/portugese	2.1
nationality: all other	39

Table 2a. The bivariate relationship between objective overcrowding (lagged) and union dissolution.

	Intact relationship	Break-up	N years
no objective overcrowding	98.5	1.5	20078
objectively overcrowded	97.4	2.6	1489
Odds ratio	1.69		

Table 2b. The bivariate relationship between subjective overcrowding (lagged) and union dissolution.

	Intact relationship	Break-up	N years
no subjective overcrowding	98.4	1.6	15571
subjectively overcrowded	97.5	2.5	2356
Odds ratio	1.58		

Table 3. KHB-analyses decomposing the total association between housing density and divorce into a confounding (indirect) effect and a remaining direct effect.

	Objective housing density			Subjective housing density		
	logit Coefficient	s.e.	%	logit Coefficient	s.e.	%
Total effect (controlled)	0.170	0.201		0.276*	0.165	
Direct effect	0.119	0.206		0.188	0.171	
Indirect effect	0.052	0.043		0.088	0.033	
from financial difficulties: ok	0.007	0.011		-0.001	0.014	
from financial difficulties: tight	-0.001	0.012		0.012	0.011	
from financial difficulties: very difficult	-0.002	0.018		0.003	0.016	
from home ownership	0.096***	0.035		0.071***	0.028	
from nationality: both Portuguese	-0.042***	0.022		-0.002	0.004	
from nationality: both Luxembourgish	-0.005	0.024		0.005	0.007	
from nationality: Luxembourgish/Portuguese	-0.000	0.001		0.001	0.002	
Relative measures : Confounding percentages						
from financial difficulties			-2%			5%
from home ownership			56%			26%
from nationality			-28%			1%
N	20570			17111		
Chi ² (df)	206(20)***			192(22)***		

Figures

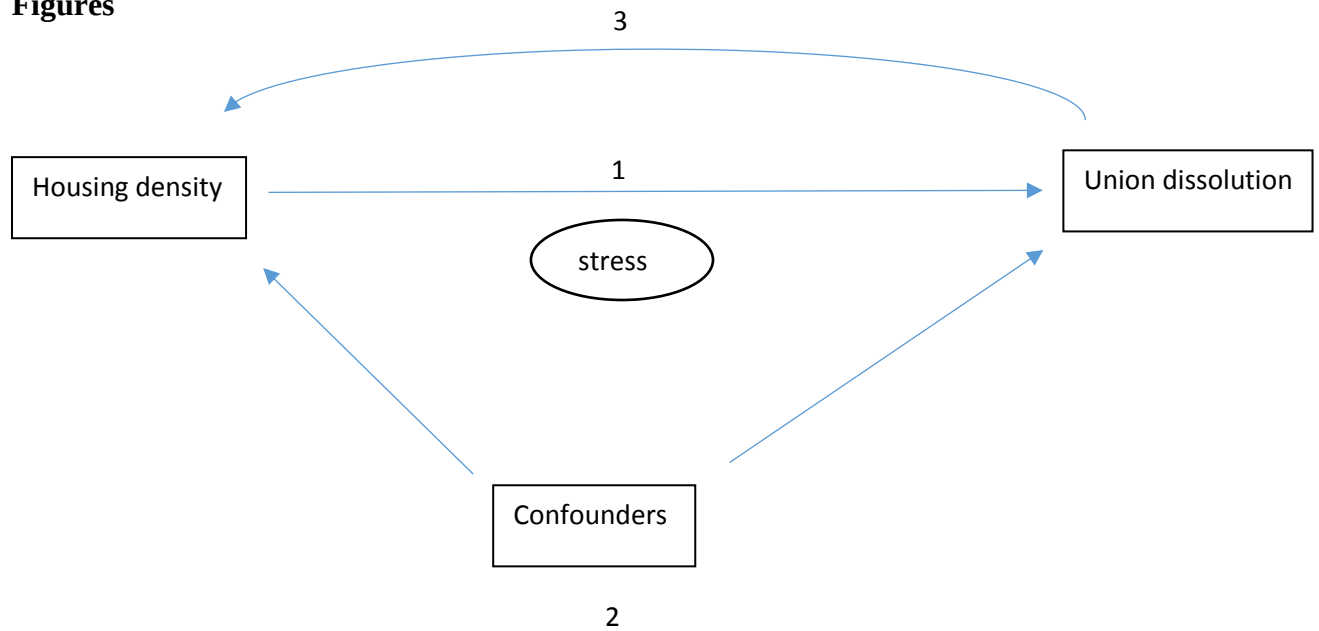


Figure 1. Conceptual model of possible explanations for bivariate association between overcrowding and divorce.

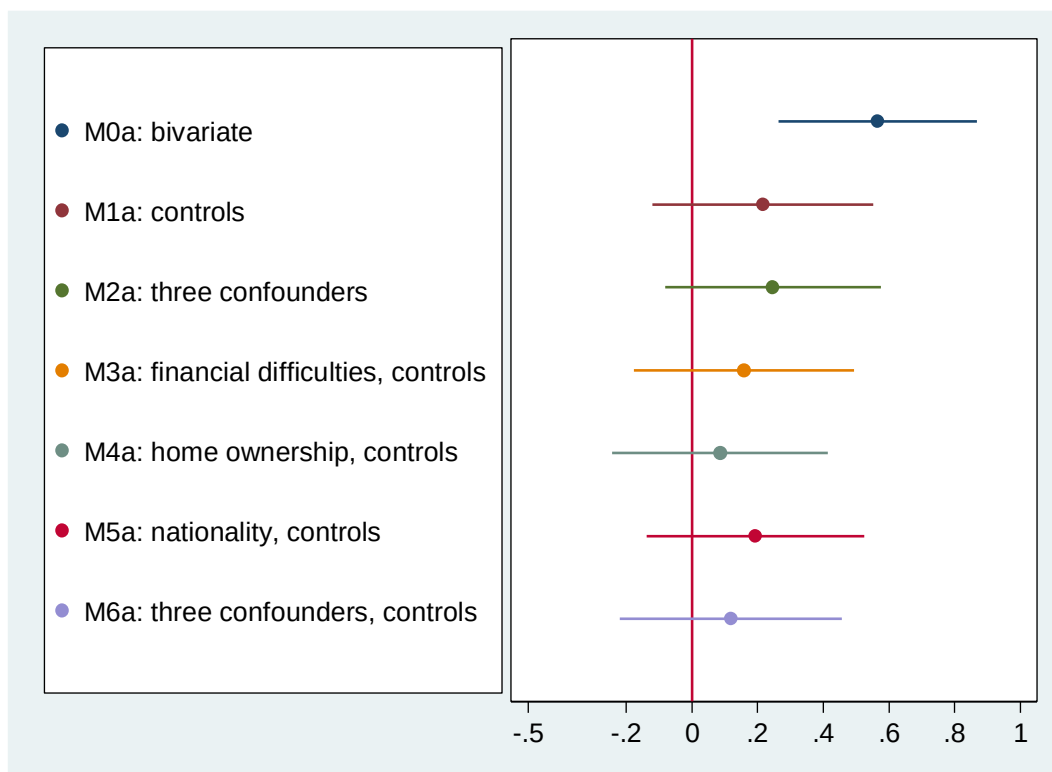


Figure 2. Khb-analyses comparing the reduced (null) model of objective housing density (bivariate) to the full models including controls, financial difficulties, home ownership, and nationality, and all of them together.

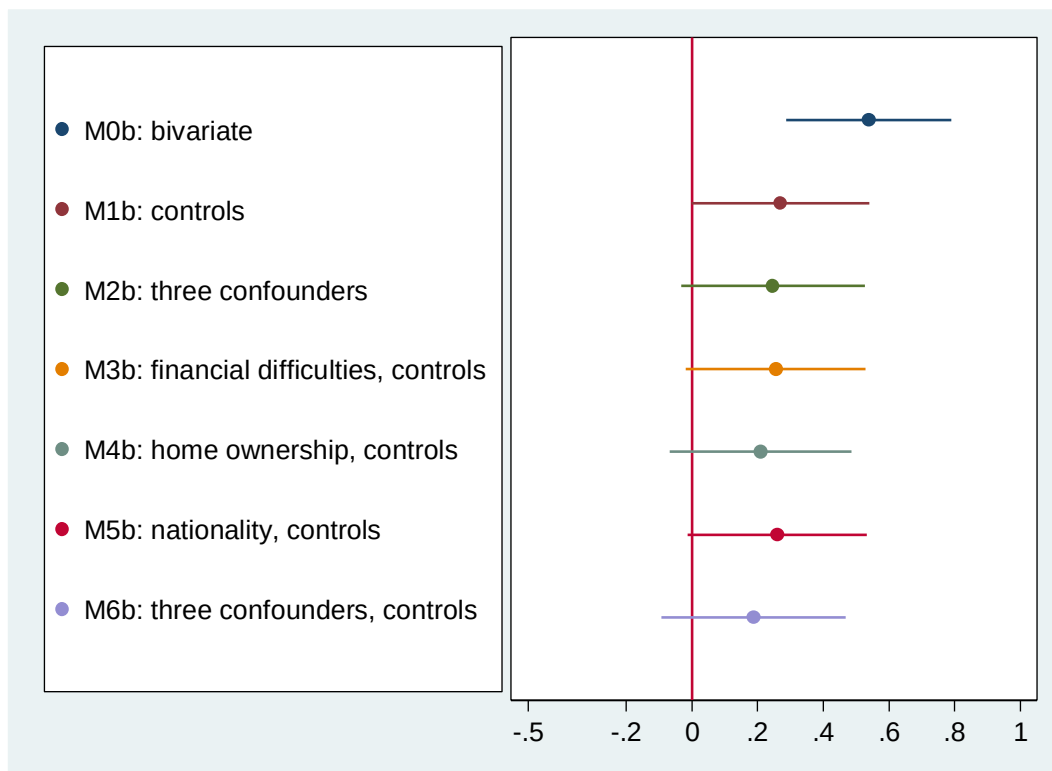


Figure 3. Khb-analyses comparing the reduced (null) model of subjective housing density (bivariate) to the full models including controls, financial difficulties, home ownership, and nationality, and all of them together.

Appendix

Table A1. The association between objective and subjective overcrowding (percentages)

Overall association

	Dwelling not too small	Dwelling too small	N
no objective overcrowding	91	9	20835
objectively overcrowded	46	54	1699

For those having no financial difficulties at all (ample budget)

	Dwelling not too small	Dwelling too small	N
no objective overcrowding	94	6	5047
objectively overcrowded	80	20	84

For those having severe financial difficulties

	Dwelling not too small	Dwelling too small	N
no objective overcrowding	81	19	594
objectively overcrowded	34	66	162

For renters

	Dwelling not too small	Dwelling too small	N
no objective overcrowding	84	16	3708
objectively overcrowded	38	62	738

For home owners

	Dwelling not too small	Dwelling too small	N
no objective overcrowding	94	6	11375
objectively overcrowded	69	31	349

When both spouses are Luxembourgish

	Dwelling not too small	Dwelling too small	N
no objective overcrowding	93	7	9109
objectively overcrowded	61	39	142

When both spouses are Portuguese

	Dwelling not too small	Dwelling too small	N
no objective overcrowding	88	12	3469
objectively overcrowded	46	54	797

When spouses are Luxembourgish/Portuguese

	Dwelling not too small	Dwelling too small	N
no objective overcrowding	84	15	343
objectively overcrowded	42	58	36

Other combinations of nationalities

	Dwelling not too small	Dwelling too small	N
no objective overcrowding	89	11	7914
objectively overcrowded	44	56	724

