

Local House Prices and First Births in Belgium

Subgroup Variation by Education and Migration Background

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This research was funded by the Flemish Research Fund (FWO: grant numbers G0ACA25N and G096321N), and an Interuniversity BOF Research Fund (Grant iBOF/25/51).

OBJECTIVE

This study on local housing prices and first birth hazards in Belgium between 2012 and 2020 addresses three questions: (1) Are changes in local housing prices linked to shifts in first birth hazards? (2) Do these associations differ by educational attainment and migration background? (3) Can these differences be explained by variation in homeownership rates across these groups?

METHODS

The study uses linked Belgian census and register data covering the full legally resident population from 2012 to 2020. Municipality fixed effects hazard models are estimated, incorporating controls for calendar time trends both across and within municipalities.

RESULTS

Findings show that increases in local house prices are negatively associated with first birth hazards among young adults aged 18–34. A clear positive educational gradient emerges: individuals with lower educational attainment are more negatively affected by rising housing costs. Migration background also moderates the relationship, though with no consistent pattern across origin groups. While homeownership buffers against the negative effects of price increases, and in some age groups entails higher first birth hazards in times of rising house prices, it does not account for the observed educational or migration-based disparities in the nexus between house prices and the transition to parenthood.

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This study extends the housing–fertility literature by providing new evidence from Belgium, a context with more moderate housing price shifts than some other countries which have received more attention, and by highlighting the role of educational and migration-based differentiation beyond the renter–owner divide.

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Housing – Parenthood – Education – Migration Background – Belgium

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1. Introduction

The decline of birth rates below the level required to replace generations (2.1 children per woman) has been a major force contributing to population ageing in Europe since the 1970s, with severe consequences for labour markets and social security systems. The decline of period fertility levels was largely induced by the rapid postponement of family formation to increasingly older ages (Bongaarts and Feeney, 1998), and a declining proportion of women having third and higher-order births. The pace of fertility postponement is closely associated with rising enrolment in education (Neels et al., 2017; Ni Bhrolchain and Beaujouan, 2012), but also variation in economic conditions (e.g., unemployment) (Sobotka et al., 2011; Neels et al., 2012; Neels et al., 2024). There is wide scholarly consensus that unfavourable economic conditions can play a central role in early adulthood transitions, such as the transition to parenthood (Blossfeld et al., 2005). In addition, a large body of research has now carefully mapped population heterogeneity in groups being affected by economic uncertainty and variation in their fertility responses, showing strong variation by level of education and migration background (Sobotka et al., 2011; Alderotti et al., 2021). The lack of recovery in period fertility rates in countries across Europe after the Great Recession in 2009, and the associated housing crises in many high-income countries, have recently led researchers to consider access to housing as a newly emerging uncertainty affecting fertility (Vignoli et al., 2013; Tocchioni et al., 2021; Zavisca and Gerber, 2016; van Wijk, 2024; Brauner-Otto, 2023; Atalay et al., 2021; Daysal et al., 2021; Florida et al., 2021; Clark and Ferrer, 2019; Li, 2018; Dettling and Kearney, 2014; Kulu and Steele, 2013; Lovenheim and Mumford, 2013; Clark, 2012; Mulder and Billari, 2010). This more recent focus on housing seems warranted as evidence indicates that housing costs represent one of the largest costs associated with family formation (Lino et al., 2017; Henman and Unit, 2007).

However, in comparison to the much larger body of literature on the educational and employment-related fertility determinants, the literature connecting housing and fertility exhibits limitations typical for more premature strands of research, such as coverage of a narrower set of countries and time periods, but also a lack of studies focussing on population heterogeneity. The former illustrates a need for studies addressing the linkage between housing and fertility for countries that have hitherto received less attention. The latter implies that we know little about whether the link between local housing prices and fertility decisions varies depending on the population subgroup considered. From a theoretical point of view, this is remarkable as different population subgroups typically face different normative (e.g., regarding the importance of home ownership and specific housing characteristics) and socio-economic contexts (e.g. resources and credit opportunities) and thus can be assumed to be differentially affected in their fertility behaviour by local housing markets. Additionally, despite an increasing consensus that home owners are more likely to experience positive wealth effects of rising housing prices, whereas renters are faced by limitations in home purchasing under increasing prices, the available literature does not study the implications of compositional differences in homeownership by social class (i.e. here measured using educational attainment) and migration background (i.e. origin and generation). As a result, this paper addresses the questions whether changes in local housing prices associate with shifts in first birth hazards in Belgium anno 2012-2020 (research question 1), whether the association varies by level of education and migration background (research question 2), and if such variation by level of education and migration background can be accounted for by differential rates of home ownership (research question 3).

In addition to documented positive associations between births or birth intentions and homeownership (Azevedo et al., 2019; Feijten and Mulder, 2002; Mulder and Wagner, 2001; Bayrakdar et al., 2019), housing security (Vignoli et al., 2013), housing space (Ström, 2010), detached housing (Chudnovskaya, 2019), and recent moves (Kulu and Vikat, 2007), most

studies on housing prices and fertility report postponement of first births in renters in tandem with higher house prices, whereas findings for homeowners also include findings suggesting positive wealth effects (Florida et al., 2021; Clark, 2012; Simon and Tamura, 2009; Aksoy, 2016; Atalay et al., 2021; Daysal et al., 2021; Clark and Ferrer, 2019). However, the latter body of empirical studies exhibits a wide range of analytical choices in terms of the type of variation studied. So-called “fixed effects” or “within-estimate” approaches in which variation in housing prices within localities over time are generally accepted to provide less biased results compared to cross-regional approaches in which estimated associations between regions’ housing prices and fertility are more likely to be spurious due to the wide range of unobserved time-invariant differences which might affect both housing prices and fertility. Consequently, whilst acknowledging the contribution of studies comparing fertility and housing prices between regions (Clark, 2012; Florida et al., 2021; Öst, 2012), we estimate associations between shifts in housing prices and fertility over time within municipalities. Additionally, most recent research on housing prices and fertility concludes that individual-level data is required, especially if population heterogeneity is also to be considered. Consequently, notwithstanding the contribution of aggregate-level studies (van Wijk, 2024; Dettling and Kearney, 2014; YI and ZHANG, 2010), we follow calls for more research on the housing-fertility nexus at the individual level (van Wijk, 2024), and connect information on housing prices to individual-level fertility data.

Focusing on studies exploiting longitudinal individual-level data to address within-region associations between changing housing prices and fertility narrows down the body of existing studies to findings reported by Atalay et al. (2017) for Australia, Lovenheim and Mumford (2013) for the US, Aksoy (2016) for England, Clark and Ferrer (2019) for Canada, and Daysal and colleagues (2021) for Denmark. These studies indicate that in Australia, rising housing wealth (i.e. rising housing prices for home-owners) is positively associated with increased

fertility intentions and outcomes among homeowners, particularly young, mortgage-holding individuals, while renters experience a decline in fertility intentions (Atalay et al., 2017). Similarly, in the U.S., increases in housing wealth are linked to higher fertility rates among homeowners, in contrast to the non-effect for renters (Lovenheim & Mumford, 2013). In the U.K., a rise in house prices leads to more births among homeowners but fewer births among renters, particularly younger renters (Aksoy, 2016). Canadian research also suggests that rising housing prices positively affect fertility among homeowners, while renters show no such effect (Clark & Ferrer, 2019). Finally, a study in Denmark finds that housing price increases similarly boost fertility among homeowners, (Daysal et al., 2021). However, the extent to which such findings might mask population heterogeneity by level of education and migration background, remains unknown.

This study provides three contributions to the literature on local changes in housing prices and the transition to parenthood. First, we contribute to the aforementioned set of studies focussing on within region changes in housing prices and first birth hazards. Following previous research for Denmark (Daysal et al., 2021), we compare estimated correlations from models including municipality fixed effects, and models additionally controlling for trend effects over calendar time. The comparison of these sources of variation is informative regarding the robustness of the linkage between housing prices and individual-level first birth hazards.

Second, this paper will also test whether the nexus between shifting local housing prices and first birth hazards varies by level of education and migration background. To date empirical tests of differential linkages between housing and fertility by level of education or migration background are lacking. This knowledge gap is remarkable given population heterogeneity in housing trajectories with higher vulnerabilities on housing markets (less opportunities to purchase a home) for lower socio-economic status groups (Bayrakdar et al., 2019; Lersch and Dewilde, 2015). Third, aligning with the available empirical literature indicating that the nexus

between local house prices and first births depends on homeownership (Atalay et al., 2021; Aksoy, 2016; Lovenheim and Mumford, 2013; Clark and Ferrer, 2019; Daysal et al., 2021), we address the degree to which variation in the linkage between local housing prices and first birth hazards by level of education and migration background can be accounted for by differential effects of rising housing prices by homeownership status.

We use the Belgian context as a case-study. The longitudinal population-wide microdata on the Belgian population for the period 2012-2020 from linked censuses and registers meets the data requirements in terms of addressing within region changes in housing prices in tandem with individual-level first birth hazards whilst providing sufficient statistical power to distinguish population subgroups by level of education and migration background. Additionally, most previous research has focused on rapid increases in housing prices in Anglo-Saxon countries (mostly US, UK), or the recent housing crisis in the Netherlands (van Wijk, 2024), which leaves the question whether first births and housing prices are also related in contexts with more moderate shifts in housing prices.

2. Belgian context: housing market and population heterogeneity

The Belgian housing market is oriented towards the norm of home-ownership (De Decker and Dewilde, 2010), with a relatively high share of household expenditure allocated to housing. Between 2010 and 2020, the share of housing expenditure as part of final consumption fluctuated between 23% and 25.5%, consistently remaining above the EU and OECD averages. In 2020, the housing expenditure in Belgium stood at 25.5%, compared to 23.6% in the EU and 24.4% across OECD countries. A limited set of European nations, including the Slovak Republic, Finland, Denmark, Ireland, Switzerland, the United Kingdom, France, and Czechia, reported higher housing expenditure shares during this period (OECD, 2024a). Belgium's housing market is also marked by a high share of owner-occupied dwellings. In 2022,

approximately 67% of households in Belgium lived in owner-occupied properties. This figure aligns closely with that of other high-income countries such as the UK (67.7%) and Ireland (68.7%), yet is relatively high compared to other Western European countries like Finland (62.9%), France (60.5%), the Netherlands (58.4%), Sweden (58.3%), Denmark (50.8%), and Germany (40.7%). This position is likely to signal a broader pattern of strong preference for property ownership in Belgium.

However, this general characterisation of the Belgian housing market is likely to mask strong variation between population subgroups. As Belgium has evolved toward increasing diversity in terms of educational attainment and migration background since the 1960s, it is noteworthy that these groups have consistently been found to exhibit differential outcomes in labour and housing markets.

With respect to educational attainment, since the 1960s Belgium has experienced a strong educational expansion, with continuous increases in the share of the population holding a tertiary educational degree, particularly amongst women. This significant educational expansion coincided with transformations in the economic structure, with a marked shift from manufacturing and industrial work to a predominantly service-oriented economy. As high-skill sectors have grown, lower educated groups are increasingly overrepresented in unemployment, and low-skill service jobs (e.g. retail, hospitality, cleaning, and security) tend to offer relatively unfavourable conditions, poor job security, and lower wages (OECD, 2024b). With respect to the Belgian housing market, official figures indicate that since the 1970s the rising homeownership rate masks strong variation by income group, with homeownership rates decreasing in the lowest two quintiles, and strongly increasing in the highest income groups in which highly educated individuals are overrepresented (Van Gompel, 2018).

Regarding population heterogeneity by migration background, following the aftermath of World War II, Belgium faced substantial labour shortages, particularly in coal mines and heavy

industries that were critical to the country's economic recovery. To address these gaps, the Belgian government entered into labour agreements with Italy, Greece, and Spain in the 1940s and 1950s, with additional agreements signed later with Morocco and Turkey. These agreements initially brought in male labour migrants, and large flows of family migration after from the mid-1970s onwards. In the 1980s and 1990s, a new wave of migration took shape, characterised by increasing diversity in the countries of origin and in the motivations for migration. Humanitarian migration, driven by conflict in regions such as the Balkans, the Middle East, and Africa, surged during this period. Simultaneously, the opening up of the European Union allowed for an influx of labour migrants from Eastern European countries seeking better economic opportunities. The 1990s and early 2000s marked a significant shift in the public and scholarly discourse surrounding migration. While earlier discussions had largely focused on the migrants themselves, attention increasingly turned to the integration of their descendants and their outcomes in education and the labour and housing market. Particularly non-European origin groups have been documented to exhibit lower levels of educational attainment, lower employment, and more vulnerable housing situations, which is typically exacerbated by discrimination in labour and housing markets (Baert, 2018; Verstraete and Verhaeghe, 2020). During the 2012-2020 observation period of this study, the largest groups with a migration background are those of EU-14 origin (42 percent of the subpopulation with a foreign origin), Maghrebi origin (16 percent), other African countries (8 percent), and Turkey (7 percent) (UNIA and FOD WASO, 2017).

3. Theory

3.1 Linkages between local housing prices and the transition to parenthood

This section discusses mechanisms assumed to underly the association between local housing prices and first births. Aligning with the wider state-of-the art literature on economic conditions and first births (Sobotka et al., 2011; Wood and Neels, 2017), we combine micro-economic mechanisms, mostly derived from rational choice theory, with theories highlighting the importance of social networks and societal norms, such as relative deprivation theory. As a result, we conceptualise childless adults as actors who evaluate the direct (i.e. financial) and indirect costs (i.e. opportunity costs) of parenthood against the costs of housing, and do so in a social context in which housing and childbearing standards are malleable and defined in comparison to relevant others. Using this perspective, we discuss three main mechanisms linking house prices and first births.

The first mechanism is a so-called substitution effect, implying that when housing becomes more expensive, it may lead to postponement of first births due to a trade-off between investing in housing and having children (Dettling and Kearney, 2014; Atalay et al., 2021). This mechanism, in which higher house prices thus compete with costs related to childrearing, is assumed to particularly affect renters' transition to a first birth (Atalay et al., 2021). Whereas renters who plan to purchase a property experience stronger tensions between the resources needed for childrearing and home acquisition, renters who do not plan to buy a home are also likely to be affected as high housing prices often spill-over into rents. One might assume that home-owners with a mortgage are less likely to be affected by this mechanism as not only the value of future properties they may want to purchase, but also their own property rises. However, home-owners in their twenties or thirties are likely to reside in their first home, and might plan to move to a home with characteristics considered more appropriate for family formation (e.g. a dwelling with more bedrooms, a garden). In this case, elevated housing prices also widen the absolute price gap between their current home and a more expensive home, which might also delay the transition to parenthood.

The second mechanism refers to socio-culturally reproduced attitudes regarding housing needs as preconditions to family formation, which – particularly in contexts with a long history of homeownership norms like Belgium since the 1950s (De Decker and Dewilde, 2010) – prescribe an owner-occupied home as a precondition to the transition to parenthood. In the case of such an ideological linkage between homeownership and parenthood, increases in house prices will postpone first birth transitions as individuals find it harder to meet the homeownership norm (Kulu and Steele, 2013; Zavisca, 2012; Vignoli et al., 2013). However, such a linkage is not assumed to be set in stone. The “competing goals”-hypothesis highlights potential variation in socio-culturally reproduced attitudes regarding housing needs and preconditions to family formation, asserting that in contexts of increasing housing uncertainty, the importance of home ownership might be relaxed (Lauster, 2010) as housing costs compete with the costs of childrearing (Tocchioni et al., 2021; Zavisca and Gerber, 2016; Mulder and Lauster, 2010). Such a decoupling of housing and the transition to parenthood is assumed to weaken the presumable impact of rising housing prices on first births.

The third mechanism is an income or wealth effect (Atalay et al., 2021; Clark and Ferrer, 2019). For homeowners, higher house prices that are perceived to be permanent will raise (perceived) lifetime wealth which might stimulate first births. This increase in wealth might actually be an increase in “income potential” as homeowners always have the option to sell their property. Additionally, an actual positive income effect might also materialise when homeowners liquefy housing assets through mortgage equity withdrawal. Whether the income increase remains potential or is materialised, we assume that this strengthened economic position might positively affect the transition to parenthood. For instance, a higher wealth position and related feeling of economic security might stimulate aspiring parents to reduce paid working hours which frees up time for childrearing. However, it is noteworthy that, amongst young adults considering the transition to parenthood, materialised positive income effects of increasing

house prices seem relatively unlikely, as multiple property ownership is rare in younger age groups, and moves from one owner-occupied home to another in young adults usually imply moves from lower- to higher-cost properties, which does not imply an increased disposable income in times of increasing housing prices.

3.2 Subgroup differentiation in the nexus between housing prices and first births

Aligning with the wider literature on economic conditions and the transition to parenthood (Neels et al., 2012; Neels et al., 2024; Wood et al., 2015; Sobotka et al., 2011), we assume that the aforementioned mechanisms are likely to vary by level of education and migration background, due to subgroup differences in the individual-level consequences of rising house prices, and potential normative differentiation in the housing preconditions to parenthood. More specifically, the available literature on labour markets and fertility routinely put forward that low educated or particular non-OECD minority groups, are hit hardest during economic downturns, but also that in such conditions labour market preconditions to parenthood seem to be relaxed (Wood and Neels, 2017; Friedman et al., 1994; Kreyenfeld and Andersson, 2014). Similarly, we assume that the impact of local rises in housing prices on first births might vary by level of educational attainment and migration background as a result of (i) differential vulnerability to rising housing prices, and (ii) differentiation in the housing preconditions to the transition to parenthood.

First, regarding differential vulnerability, lower educated groups and minorities originating from non-OECD countries in Belgium are strongly overrepresented in the subpopulation of renters. As a consequence, the aforementioned negative effect of increasing house prices due to the substitution between investments in childrearing and extra resources required for housing, might be more prevalent for these groups. This implies that first births are postponed to a stronger extent amongst groups who are overrepresented on the rental market. Higher educated groups and origin groups with higher socio-economic positions in contrast are overrepresented

in the group of homeowners, who – despite potentially widening gaps between the value of their current property and an aspired house in the face of childbearing – also potentially witness a wealth effect as their capital investments in housing increase in value in the case of house price increases (Daysal et al., 2021; Atalay et al., 2021).

Second, building on the literature indicating that housing preconditions to the transition to parenthood seem to be relaxed under high and/or increasing house prices (Tocchioni et al., 2021), we argue that the degree to which housing preconditions to childrearing are malleable, may also vary depending on the population subgroup considered. Such differentiation might be rooted in socialisation on the one hand, and the potential endogenous nature of housing preconditions to parenthood on the other. Regarding the former, it is a central premises in socialisation theory that behaviour and conditions experienced during childhood partly shape young adults own aspirations and preferences. Due to a relatively strong intergenerational reproduction of educational outcomes, lower educated young adults are more likely to have grown up in a lower educated household. Young adults with a non-OECD country origin either grew up in the country of origin (i.e. migrants), or in a first generation migrant household (i.e. descendants of migrants). Such lower educated or migrant households are more likely to rent and reside in smaller homes in lower-cost areas, which implies that these population subgroups are socialised with less demanding housing preconditions to family formation. This might also imply that these groups are more flexible in relaxing dominant mainstream and middle-class housing preconditions to parenthood (e.g. in terms of ownership, rooms, garden) in times of rising housing prices, which in turn weakens the effect of rising housing prices on first births. With respect to the potential endogenous nature of housing preconditions to parenthood, we argue that individuals' housing preconditions to parenthood are likely to be influenced by the housing market opportunities. This implies that a decoupling of housing conditions and first

births might occur in response to rising housing prices, particularly amongst groups who witness severe limitations in their opportunities on the housing market.

3.3 Hypotheses

As a result of the aforementioned theoretical mechanisms linking local house prices and first births, with potential differential mechanisms depending on level of education and migration background, we put forward the following hypotheses to be tested empirically.

With respect to the general linkage between housing prices and first births, we expect that local rises in housing prices will occur in tandem with decreasing first birth hazards (hypothesis 1), as negative effects in terms of substitution and normative preconditions to parenthood are assumed to be more important than potential positive wealth effects for young adults. The reason to expect this is that homeownership is relatively less common amongst young adults, but also that liquefying housing assets through mortgage equity withdrawal is rather uncommon, unlike other countries such as the UK or US.

With respect to variation by level of education and migration background, three competing hypotheses are presented, depending on whether differential vulnerability to rising house prices or differential decoupling of housing and fertility plays the stronger part. If lower educated and non-OECD origin groups are struck harder by local increases in house prices whilst maintaining housing preconditions to parenthood, we expect a stronger negative association between local house prices and first birth hazards in lower educated groups and non-OECD minorities (hypothesis 2a). However, in case a stronger vulnerability to rising housing prices in these groups is balanced out by a stronger decoupling of housing and fertility, we do not expect to find differential associations between local housing price increases and first birth hazards (hypothesis 2b). In the case a higher vulnerability to rising house prices is overcompensated by relaxing housing preconditions to first births in response to rising prices, or as a result of

differential socialisation, stronger negative associations in highly educated and OECD-origin groups might be expected (hypothesis 2c).

Finally, with respect to the moderating role of homeownership, we expect less negative or even positive associations between local housing price increases and first birth hazards amongst homeowners (hypothesis 3), but also that differential associations by level of education and migration background can be partly explained by compositional differences in homeownership (hypothesis 4).

Data and Method

4.1 Data and measurement

We use data from the Belgian censuses which have been linked to multiple registers providing individual-level longitudinal information on birth histories, municipality of residence, level of education, migration background, and home-ownership for the complete population legally residing in Belgium until 2020. Using this data, we follow up men and women in 2012-2020 from the age of 18 until a first birth, or until censoring (due to death, out-migration, a 40th birthday, or the end of the observation period on the 31st of December 2020). This observation window provides an analytical sample of 7,863,788 person-years for men and 6,416,013 person-years for women. The dependent variable of interest is a first birth. The main independent variable of interest is derived from annual data on housing prices (i.e. the median price of sales) at the municipal level for 2011-2019, provided by Statistics Belgium and rescaled to estimate the association between a 25,000 Euro price difference and first birth hazards. As house price trends are likely to evolve in tandem with general inflationary trends in consumer prices, which in Belgium is closely connected to nominal wage and benefit levels via the “reference index”, house prices are corrected for annual consumer price inflation. Figure A.1

in appendix indicates a general increasing median house price, which is weaker when corrected for consumer price inflation, but also exhibits considerable between-municipality variation.

In addition to our aim to estimate associations between local housing prices and first birth hazards, we also address potential differentiation in such associations depending on level of education and migration background. Highest level of education reached during the observation window (time-constant) is measured using the ISCED97-classification, distinguishing (i) low (i.e. no education, primary education (ISCED97, 0&1) and lower secondary education (ISCED97, 2), (ii) medium (higher (post-)secondary education (ISCED97, 3&4), (iii) high levels of education (i.e. short-type tertiary education (ISCED97, 5B), and long-type tertiary education (ISCED97, 5A&6), and (iv) unknown level of education.

Migration background is determined combining origin and migrant generation. With respect to the latter, we use country of birth or nationality at birth in case information on country of birth is missing to distinguish ancestral natives (i.e. born in Belgium with two parents who were also born in Belgium) from first generation migrants (i.e. born abroad or a foreign nationality at birth in case of missing information on country of birth), from second generation migrants (i.e. born in Belgium, with at least one parent born abroad or a foreign nationality at birth in case of missing information on country of birth). Origin country for non-ancestral Belgian origin groups is determined in four steps. First, if one's mother's nationality at birth is non-Belgian, that nationality defines a given individual's origin. Second, if information about the mother's nationality is unavailable or Belgian, a non-Belgian birth nationality of the father will define an individual's origin. Third, if neither parent's nationality is non-Belgian, the individual's own nationality at birth is assessed and if it is non-Belgian, it defines their origin. Fourth, in the case of missing information for nationality at birth of an individual and both parents, the respondent's current nationality is used to determine origin. The analyses presented in this article distinguish the following groups, depending on their origin: without a migration background (BE), Dutch

first generation migrant (NL G1), Dutch second generation migrant (NL G2), French first generation migrant (FR G1), French second generation migrant (FR G2), German first generation migrant (DE G1), German second generation migrant (DE G2), Western European first generation migrant (WEUR G1), Western European second generation migrant (WEUR G2), Eastern European first generation migrant (EEUR G1), Eastern European second generation migrant (EEUR G2), Southern European first generation migrant (SEUR G1), Southern European second generation migrant (SEUR G2), Turkish first generation migrant (TU G1), Turkish second generation migrant (TU G2), Moroccan first generation migrant (MO G1), Moroccan second generation migrant (MO G2), other Maghreb first generation migrant (MAG G1), other Maghreb second generation migrant (MAG G2), Congolese, Burundi, or Rwandese first generation migrant (CBR G1), Congolese, Burundi, or Rwandese second generation migrant (CBR G2), other African first generation migrant (AFR G1), other African second generation migrant (AFR G2), other Asian first generation migrant (AS G1), other Asian second generation migrant (AS G2), Latin American first generation migrant (LAM G1), Latin American second generation migrant (LAM G2), other OECD first generation migrant (OECD G1), other OECD second generation migrant (OECD G2), and Unknown (UNK).

Additionally, in line with the available literature on house prices and fertility, differential effects for homeowners and renters are examined. Information on home-ownership is derived from fiscal registers, which include indications for mortgage payments declared on tax forms. Such declarations are automatic which rules out the risk of under-coverage of mortgage payments. However, this proxy for home-ownership does not correctly identify home-owners without mortgage payments, which is relatively unlikely given the 18-39 age selection.

4.1 Model specifications

We estimate discrete-time hazard models of yearly first birth hazards as a function of age (biological age, centred at 18, quadratic specification). As a result of the usage of a logit link function, the exponentiated parameter estimates can be interpreted as odds-ratios. We distinguish three steps in the analyses: (i) address the association between local housing prices and first birth hazards (research question 1), (ii) test differential associations by level of education and migration background (research question 2), and (iii) estimate differential associations by level of education and migration background whilst controlling for differential effects of housing prices depending on homeownership (research question 3).

With respect to the first research step, four sets of hazard models are estimated separately by sex (male and female) to address the association between local housing prices in year $t-1$ and first birth hazards in year t . The first set of models (model 1A) includes a quadratic baseline hazard function in terms of biological age. In addition we control for highest level of education, migration background, and full interactions between level of education and migration background on the one hand, and the baseline hazard function on the other. Furthermore, an indicator for homeownership is included which denotes unity in the case an individual was living in an owner-occupied property in the three consecutive years preceding the measurement of the housing price. This lag is used to make sure ownership status is not influenced by housing prices. In addition, the first set of models include municipality fixed effects, which implies that all time-constant differences between municipalities are controlled for by including municipality dummies in the model. As a result, a positive association between local housing prices and first birth hazards implies that, within a municipality, times in which housing prices are higher will also exhibit higher first birth hazards. It is likely that the experience of change in local housing prices is a strong determinant of fertility decisions as one has experienced the situation both before and after the change. Similar arguments have been used to focus on changes in other contextual factors such as unemployment or formal childcare availability

(Sobotka et al., 2011; Baizan, 2009; Wood and Neels, 2019). Finally, the first set of models also estimates age-specific associations between local house prices and first birth hazards (i.e. for age groups 18-24, 25-29, 30-34, 35-39).

Whereas the first set of models includes all the aforementioned covariates in a municipality fixed effects model, the second to fourth set include further controls for variation in calendar time, in order to control for unobserved factors within both municipalities and year, as trends in housing prices and first births can also be spurious (e.g. tax reforms might impact housing markets and first birth decisions directly) (Atalay et al., 2021). The second set (model 1B) additionally controls for linear calendar time, to capture general trends in first birth hazards, which might not be related to shifts in local housing prices. The estimated association between local housing prices and first birth hazards in these models consequently exploit variation that deviates from a general linear pattern over calendar time. The third set of models (model 1C) adds $k-1$ dummies for calendar year to the specifications of the first set, which is a more flexible way to model for general year-to-year fluctuations across all municipalities. The estimated association between local housing prices and first birth hazards in this set of models thus exploits variation that deviates from a general year-to-year upward or downward shifts in local housing prices across all municipalities. The fourth set of models (model 1D) allows for the linear effect of calendar time (cf. second set) to vary by municipality, by including interactions between calendar time and municipality. As a result, this set of models exploits deviations from within-municipality linear trends to estimate the association between local housing prices and first birth hazards. Age-group-specific associations estimated under different model specifications (i.e. model 1A-1D) will be used to accept or reject our first hypothesis on the association between local housing price rises and first birth hazards.

In a second step, we aim to answer the question whether the association between local house prices and first birth hazards differs depending on level of education and migration background.

Consequently, we add interactions between local house prices on the one hand, and level of education and migration background on the other, to the last set of models in the previous step, i.e. municipality fixed-effects models including municipality-specific linear calendar time trends (model 1D). The decision to test moderations using these specifications is motivated by the fact that this model can be considered the strictest test of the association between house prices and first birth hazards (results for other specifications are available upon request). Consequently, model 2 adds an interaction between level of educational attainment and the age-group-specific effects of housing prices to the specifications of model 1D. Similarly, model 3 also builds upon model 1D, by including interaction terms between migration background and age-group-specific associations between local house prices and first birth hazards. As a result, these models will allow us to evaluate hypotheses 2a-2c regarding potential subgroup differentiation in the link between house prices and first births.

In the third step, we assess the degree to which differential associations between local house prices and first birth hazards by level of education and migration background can be explained by the moderating impact of homeownership on the linkage between house prices and the transition to a first birth. Consequently, we re-estimate interactions between local house prices and level of education (i.e. model 4) and housing prices and migration background (i.e. model 5), controlling for interactions between local housing prices and homeownership. Models 4 and 5 allow us to accept or reject our hypothesis that associations between local house price increases and first birth hazards are more positive amongst homeowners (hypothesis 3), but also that differential associations by level of education and migration background can be partly explained by compositional differences in homeownership (hypothesis 4).

In addition to the model specification required to accept or reject our hypotheses, we also run three robustness checks. First, we use different time lags for local housing prices (year $t-1$, $t-2$, or $t-3$). Second, as anticipatory moves in function of short-term family formation are routinely

documented (Vidal et al., 2017), we follow previous studies (Atalay et al., 2021; Lovenheim and Mumford, 2013) and re-run all models only including individuals who were already residing in a given municipality in year $t-3$, $t-2$ and $t-1$. Following Clark and Ferrer (2019), we assume that non-movers are more likely to experience local changes in house prices as exogenous shocks. Third, we also re-run all models using nominal housing price levels instead of trends after controlling for consumer price inflation (cf. Table A3 in appendix). The motivation to do so is that there is variation in the speed with which wages and benefits are corrected for inflation, which might imply that short-term nominal shifts are also relevant.

4. Results and Discussion

4.1 Do local housing prices associate with first birth hazards?

Table 1 provides an overview of the age-group-specific estimates of associations between first birth hazards and local house prices, depending on the lag used for house prices, sex, and whether models only control for time-constant unobserved differences between municipalities (model 1A), or also control for a linear yearly trend (model 1B), all unobserved difference between calendar years (model 1C), or municipality-specific yearly trends (model 1D). The covariate parameter estimates are provided in appendix (tables A1-A2).

The estimated age-group-specific associations between house prices and first birth hazards in model 1A indicate that first birth hazards decrease in tandem with rising house prices, with negative associations ranging from 8.7 $((1-.913)*100)$ to 2.4 per cent lower first birth odds in tandem with a 25,000 euro difference in median house prices in 18-24 and 35-39 years old men respectively. The corresponding associations for women range from 9.5 for the youngest age group to 1.7 per cent lower birth odds for 35-39 year olds.

However, when comparing the age-group-specific associations across the different model specifications, it is clear that negative associations between house prices and first births become less negative for the 18-34 age groups, and turn positive for 35-39 year old men and women.

The fact that part of the association estimated without controls for trends over calendar time (i.e. model 1A) weaken when controlling for annual trends, suggests that model specifications including both municipality and controls for yearly trends provide a more conservative test of our hypothesis on house prices and first birth hazards. Furthermore, comparing the estimates of models 1B-1D indicates that age-group-specific associations between house prices and first birth hazards are relatively insensitive to the choice between controlling for a linear trend effect, a categorical trend effect allowing for non-linear trends, or a linear municipality-specific trend. As the latter model controls for the possibility that associations between house prices and first birth hazards are confounded by municipality-specific trends in confounding factors (e.g., local shifts in housing policies, local wealth trends), in addition to unobserved differences between municipalities, we choose to interpret these in more detail. In the 18-24 age group, men and women respectively exhibit 6.3 and 6 percent lower first birth odds in tandem with a 25.000 euro higher median house price. For 25-35 years olds the associations are weaker, with 2.4 and 2.2 percent lower birth odds for 25-29 year old men and women respectively, and 1.8 percent lower birth odds for the 30-34 age group. The 35-39 age group exhibits a neutral association in men, and a positive linkage between house prices and first birth odds in women. The fact that this sex-discrepancy in the associations indicates that positive mechanisms between house prices and first births seem to dominate in 35-39 year old women and not in men, might be related to differential composition in term of homeownership, but also differential biological limitations to fertility postponement, which might disable mechanisms of postponement in order to meet housing preconditions to fertility amongst women in particular.

Robustness checks adopting two- or three-year time lags provide very similar results. Furthermore, excluding individuals who moved to the municipality of residence in the three years preceding birth seems not to alter our main findings, with estimated associations being similar for model 1D and model 1D estimated excluding recent migrations for men age 18-24

(.937 versus .943), 25-29 (.976 versus .985), 30-34 (.982 versus .995), and 35-39 (1.002 versus 1.010). This also holds for women age 18-24 (.940 versus .928), 25-29 (.978 versus .976), 30-34 (.982 versus .981), and 35-39 (1.020 versus 1.014).

Table 1: Age-group-specific exponentiated parameter estimates (i.e. odds-ratios (OR) and p-values of the association between local house prices (corrected for inflation) and first birth hazards.

| | | Lag 1 year | | Lag 2 years | | Lag 3 years | |
|-------------|-------|------------|------|-------------|------|-------------|------|
| | | OR | P | OR | p | OR | p |
| MEN | | | | | | | |
| model 1A | 18-24 | .913 | .000 | .921 | .000 | .923 | .000 |
| | 25-29 | .951 | .000 | .960 | .000 | .963 | .000 |
| | 30-34 | .958 | .000 | .966 | .000 | .968 | .000 |
| | 35-39 | .976 | .000 | .985 | .000 | .987 | .000 |
| model 1B | 18-24 | .941 | .000 | .944 | .000 | .943 | .000 |
| | 25-29 | .980 | .000 | .983 | .000 | .983 | .000 |
| | 30-34 | .986 | .000 | .989 | .000 | .988 | .000 |
| | 35-39 | 1.006 | .005 | 1.008 | .000 | 1.007 | .000 |
| model 1C | 18-24 | .940 | .000 | .943 | .000 | .942 | .000 |
| | 25-29 | .979 | .000 | .983 | .000 | .983 | .000 |
| | 30-34 | .986 | .000 | .988 | .000 | .988 | .000 |
| | 35-39 | 1.005 | .105 | 1.008 | .000 | 1.007 | .000 |
| model 1D | 18-24 | .937 | .000 | .942 | .000 | .941 | .000 |
| | 25-29 | .976 | .000 | .981 | .000 | .981 | .000 |
| | 30-34 | .982 | .000 | .987 | .000 | .987 | .000 |
| | 35-39 | 1.002 | .351 | 1.006 | .000 | 1.006 | .000 |
| WOMEN | | | | | | | |
| model 1A | 18-24 | .905 | .000 | .913 | .000 | .918 | .000 |
| | 25-29 | .942 | .000 | .950 | .000 | .957 | .000 |
| | 30-34 | .948 | .000 | .955 | .000 | .961 | .000 |
| | 35-39 | .983 | .000 | .990 | .000 | .996 | .031 |
| model 1B | 18-24 | .943 | .000 | .942 | .000 | .945 | .000 |
| | 25-29 | .981 | .000 | .980 | .000 | .983 | .000 |
| | 30-34 | .986 | .000 | .984 | .000 | .986 | .000 |
| | 35-39 | 1.024 | .000 | 1.022 | .000 | 1.024 | .000 |
| model 1C | 18-24 | .944 | .000 | .942 | .000 | .945 | .000 |
| | 25-29 | .981 | .000 | .980 | .000 | .983 | .000 |
| | 30-34 | .987 | .000 | .984 | .000 | .986 | .000 |
| | 35-39 | 1.024 | .000 | 1.021 | .000 | 1.024 | .000 |
| model 1D | 18-24 | .940 | .000 | .940 | .000 | .943 | .000 |
| | 25-29 | .978 | .000 | .977 | .000 | .981 | .000 |
| | 30-34 | .982 | .000 | .981 | .000 | .984 | .000 |
| | 35-39 | 1.020 | .000 | 1.019 | .000 | 1.022 | .000 |

Source: Belgian Census and Registers & Statistics Belgium

5.2.2 Does the link between housing prices and first births vary by population subgroup?

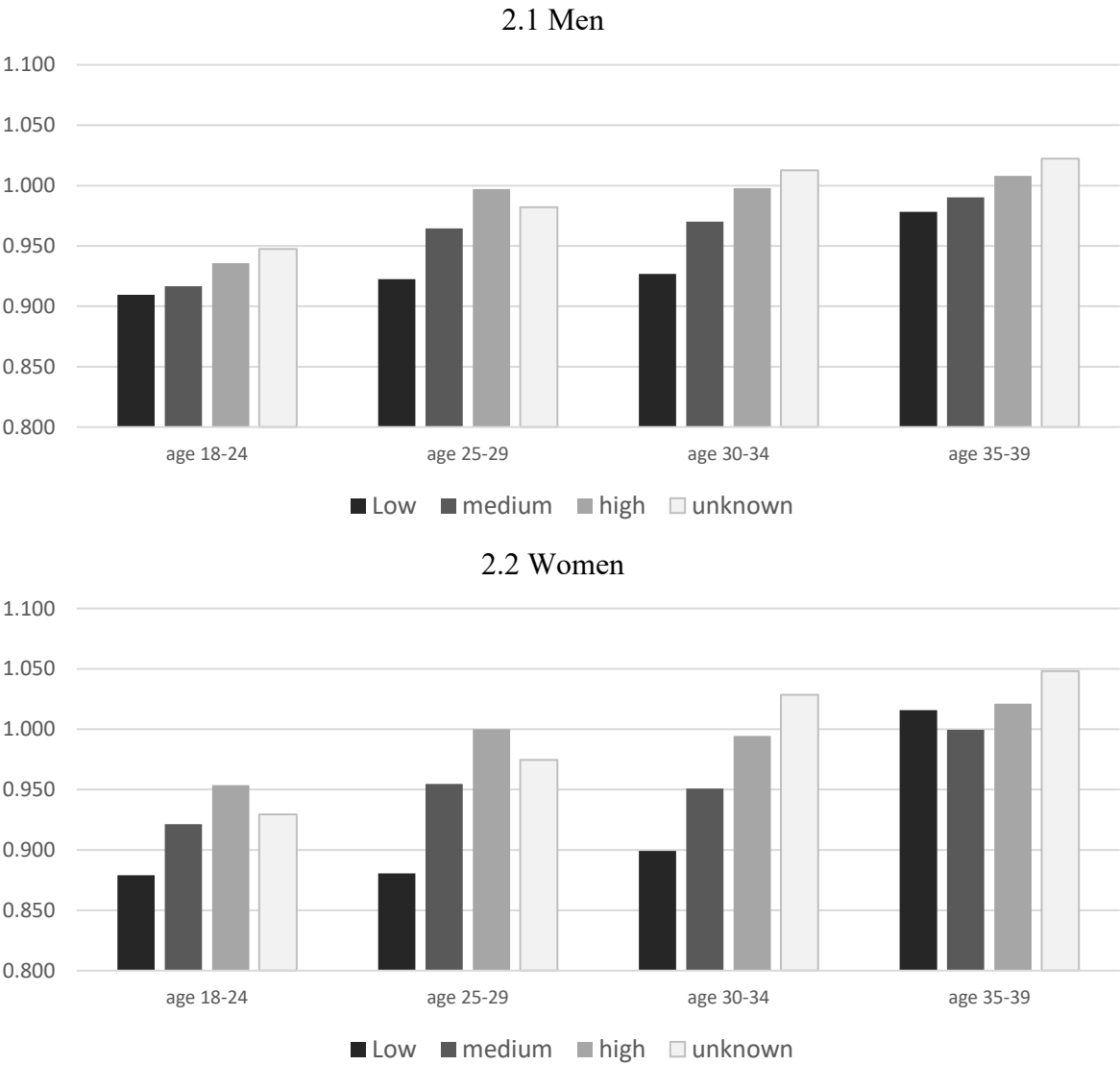
Figure 2 illustrates the degree to which the association between house prices and first birth hazards varies by level of educational attainment. Amongst men and women, the strongest negative associations are found for low educated individuals. Model comparison tests indicate that the model with the interaction between house prices and level of education is a significant improvement over model 1D, both for men (Δ -2LL: 1232.75; Δ df.: 12; p-value: .000), and women (Δ -2LL: 2674.7; Δ df.: 12; p-value: .000).

With respect to the 18-24 age group in the male population, estimated associations in model 2 indicate negative associations ranging from 9 $((1-.910)*100)$ to 6.4 per cent lower first birth odds in tandem with a 25,000 euro increase in median house prices amongst low-educated and highly educated men respectively. For medium-educated men, the decrease in first birth odds is slightly weaker than for low educated groups, at 8.3 per cent, while the unknown education group shows the weakest decrease of 5.3 per cent. In the 25-29 age group, the educational gradient in the association between house prices and first birth odds intensifies, with 7.8 percent lower first birth odds coinciding with a 25,000 euro increase in median house prices amongst low-educated, and an association approximating unity for the highly educated group. The educational patterning in the association between house prices and first birth odds is very similar in the 30-34 age group. Notwithstanding associations which approximate neutrality more closely, the 35-39 age group continues to display a positive educational gradient in the estimated associations between house prices and first birth odds.

Findings for women reveal even stronger educational gradients in the association between house prices and first birth odds in the 18-34 age categories. In the 18-24 women with low levels of education experience the most significant decrease in first birth odds in case of rising house prices, followed by medium-educated women, who see a moderate decrease. Highly educated women exhibit a smaller decline, while women with unknown educational

backgrounds show a decrease similar to those with medium education. In the 25-29 and 30-34 age groups, the positive educational gradient strengthens further, with no association for highly educated women, in contrast to 11.9 and 10.1 percent lower first birth odds for low educated women ages 25-29 and 30-34 respectively. By the 35-39 age group, the associations between house prices and first birth odds are either minimal or reversed, with no clear educational patterning.

Figure 2: Age- and education-specific exponentiated estimates (odds-ratios (OR)) of the association between local house prices (corrected for inflation) and 1st birth hazards (model 2)



Source: Belgian Census and Registers & Statistics Belgium

The association between house prices and first birth odds also varies significantly across migration backgrounds for men (Δ -2LL: 635.09; Δ df.: 116; p-value: .000) and women (Δ -2LL: 1308.99; Δ df.: 116; p-value: .000) (Figure 3). Focusing on the variation between the Belgian origin group (BE) and other European origin groups in men (Figure 3.1) and women (Figure 3.3), we find that in the 18-24 age category, most groups with a European migration background exhibit a stronger negative association between house prices and first birth hazards compared to individuals of Belgian origin¹. In the 25-29 age group, a similar pattern persists, with many European migration background groups showing more negative associations than the BE group. However, by the 30-39 age groups, the variation in these associations tends to decrease, and the relationship generally becomes more neutral.

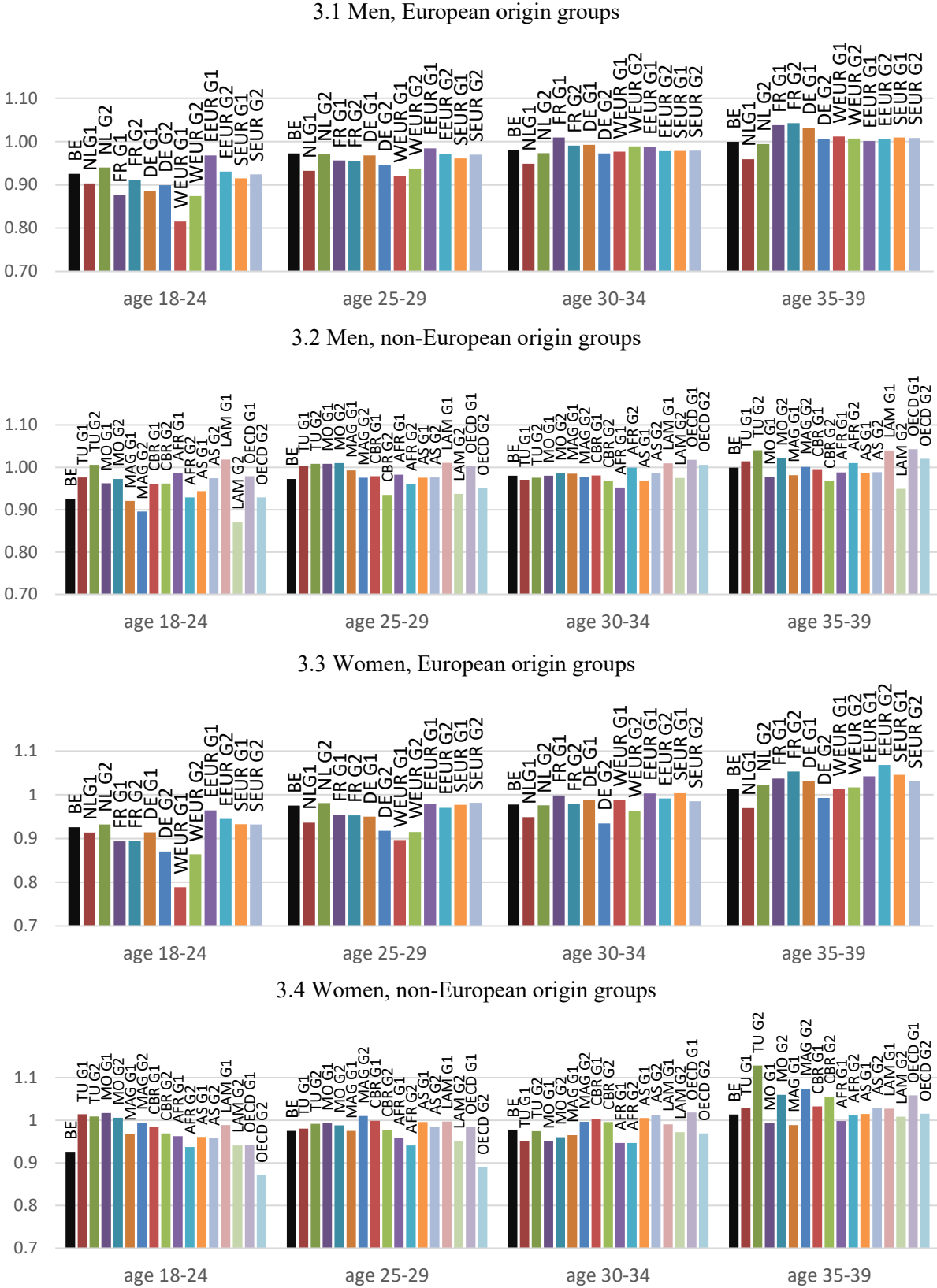
Across age groups, Dutch first-generation migrants (NLG1) show more negative associations than the Belgian origin group, in contrast to Dutch second-generation migrants who exhibit a similar pattern to the Belgian origin group (NLG2). Similarly, German second-generation migrants (DE G2) consistently show more negative associations, as do Western European first-generation migrants (WEUR G1). French first-generation migrants (FR G1) and German first-generation migrants (DE G1) exhibit more negative associations in the 18-29 age group, shifting to more positive associations in the 30-39 age group. Eastern European first-generation migrants (EEUR G1) show a more positive association, whereas Eastern European second-generation migrants (EEUR G2) exhibit a pattern similar to that of the Belgian origin group, much like Southern European first-generation migrants (SEUR G1) and Southern European second-generation migrants (SEUR G2).

When considering groups with non-European migration backgrounds (figure 3.2 and 3.4), there is substantial variation compared to the Belgian origin group, with most of the differences

¹ Age- and origin-group-specific odds ratios indicating the association between local house prices and first birth odds sorted by country rather than age group are available in appendix (Figure A.2).

appearing in the younger age groups. Turkish first-generation migrants (TU G1) and Turkish second-generation migrants (TU G2) show mostly more positive associations for both men and women, and this pattern also holds for most associations with Moroccan second-generation migrants (MO G2) and other Maghreb second-generation migrant women (MAG G2). In contrast, Moroccan first-generation migrants (MO G1) and other Maghreb first-generation migrant (MAG G1) men typically exhibit more positive associations in younger age groups, but show more negative associations in older age groups. For Congolese, Burundi, or Rwandese first-generation migrants (CBR G1), the findings are mixed, though Congolese, Burundi, or Rwandese second-generation migrants (CBR G2) women consistently exhibit more positive associations. African (AFR) and Asian (AS) groups show mixed findings by age, though Asian groups generally indicate weaker negative and more positive associations in women. Latin American first-generation migrants (LAM G1) show consistently less negative associations, while Latin American second-generation migrants (LAM G2) exhibit more negative associations, especially in men, though this is less the case for women. OECD first-generation migrants (OECD G1) generally show more positive associations, particularly in men, whereas OECD second-generation migrants (OECD G2) exhibit mixed associations across both men and women.

Figure 3: Age- and origin-specific exponentiated estimates (odds-ratios (OR)) of the association between local house prices (corrected for inflation) and 1st birth hazards (model 3)



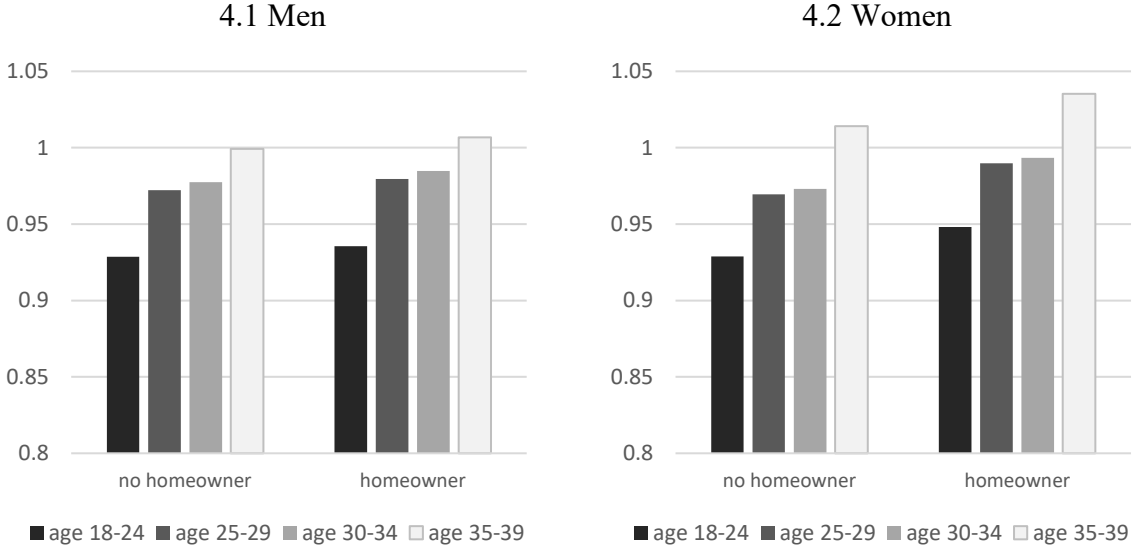
Source: Belgian Census and Registers & Statistics Belgium

5.2.3 Is subgroup variation in housing-parenthood links accounted for by ownership?

Adding interactions between local house prices and homeownership indicates that this linkage varies significantly between homeowners and non-homeowners for men (Δ -2LL: 19.2; Δ df.: 1; p-value: .000) and women (Δ -2LL: 154.24; Δ df.: 1; p-value: .000) (Figure 4). The differentiation is largest amongst women, with associations ranging from $((1-.929)*100)$ 7.1 and 5.2 per cent lower first birth odds for non-homeowners and homeowners respectively in the 18-24 age group, and the positive association ranging from 1.4 to 3.5 per cent higher first birth odds for the oldest age group, in tandem with a 25,000 euro increase in local house prices.

However, the results of model 4 also indicate that the aforementioned educational differentials in the association between local house prices and first birth odds (model 2) do not change when additionally controlling for differential associations by homeownership (model 4), both among men and women (cf. Figure A.3 in appendix). The same conclusion holds for the aforementioned variation by migration background in the association between house prices and first births. Figure A.4 in appendix indicates that the differential associations for men and women with a migration background vice versa the group of Belgian origin are nearly identical in models without (i.e. model 3) and with controls for differential associations by homeownership (i.e. model 5).

Figure 4: Age-specific exponentiated estimates (odds-ratios (OR)) of the association between local house prices (corrected for inflation) and 1st birth hazards, by homeownership (model 4)



Source: Belgian Census and Registers & Statistics Belgium

5. Conclusion

This study contributes to the growing body of literature on the link between local house prices and first births, focusing on the Belgian context between 2012 and 2020. The results provide several important insights into how housing price increases seem to influence first birth decisions, taking into account differences by education and migration background.

First, the negative associations observed between increasing local house prices and first birth hazards align with our initial hypothesis (hypothesis 1). This finding supports the notion that for younger adults, especially those aged 18-34, negative effects of rising house prices are more important than potential positive wealth effects associated with homeownership. As homeownership rates are lower among younger adults in Belgium, and the fact that mortgage equity withdrawal is relatively rare, the capacity to benefit from rising housing wealth is also limited. Our finding of mostly negative associations between house prices and first births in a context with relatively moderate price shifts, further underscores the importance of studying countries which have hitherto received less attention, such as Belgium. Whereas the estimated effects of more extreme housing price increases as seen in countries like the Netherlands might be partially driven by media coverage and public discourse about a “housing crisis” which typically only comes with dramatic house market shifts. As a result, findings for such crisis contexts should not be extrapolated to contexts with more moderate fluctuations in housing markets. This study indicates that the negative nexus between house prices and first births, particularly amongst young adults, also holds in the Belgian context.

Second, we sought to explore whether the association between local housing price increases and the transition to parenthood varies by educational attainment and migration background. The literature has largely overlooked such differential effects, despite the potential for varying vulnerabilities and responses to housing market shifts. Our results indicate a clear positive educational gradient in the impact of rising house prices on first births, supporting hypothesis

2a, which anticipated stronger negative effects for lower-educated groups. This suggests that individuals with lower levels of education are more adversely affected by rising housing prices, due to a greater vulnerability in the housing market. Interestingly, the effects of house price changes on fertility also differed significantly across groups defined by migration background. However results do not fully align with any of the three competing hypotheses in terms of OECD versus non-OECD origin groups (2a, 2b, or 2c) but point to more idiosyncratic variation which deserves more attention in future research.

Third, our findings confirm existing research showing that the impact of local housing price increases on first birth hazards tends to be less negative, or even positive, among homeowners (hypothesis 3). This aligns with the literature, which typically reports that homeowners are more likely to experience wealth effects when housing prices rise, potentially facilitating family formation. However, this effect is less pronounced in the Belgian context, where mortgage equity withdrawal is less common than in countries like the UK or the US, where housing markets and financial mechanisms are more conducive to using housing wealth to fund childbearing.

Finally, we found that the educational and migration background differences in the housing-fertility nexus cannot be explained by compositional differences in homeownership (hypothesis 4). This suggests that this study's contribution of documenting differentiation in the linkage between house prices and parenthood cannot be reduced to well-documented differences between homeowners and renters. It rather suggests that other theoretical mechanisms are at play for these subgroups, such as the impact of rising house prices on rental markets, differential decoupling of housing and fertility by social subgroup. As the identification of such mechanisms requires follow-up research, we can only speculate that our finding of consistently more negative effects of rising house prices on first births may indicate that lower-educated groups are particularly struck by rising house prices (e.g., due to limited resources) and also are

limited in further relaxing housing preconditions to fertility (e.g. already living in a small studio or with parents (Bayrakdar and Coulter, 2018)). In contrast, higher-educated groups may have more resources to rely upon to manage higher housing costs, and also more flexibility for instance to delay childbearing and purchase a home after the first birth, thus decoupling housing and fertility more effectively.

In conclusion, this study highlights the significant role that rising local housing prices play in shaping fertility decisions in Belgium, particularly among younger adults. The negative associations between house price increases and first birth hazards, especially for lower-educated groups, suggest that housing affordability is a critical barrier to family formation, in addition to importance of other sources of economic insecurity (e.g. in the labour market) (Blossfeld et al., 2005). Our findings also underline the importance of considering population heterogeneity in housing-fertility research, as education and migration background may influence the ways in which individuals respond to housing market changes. The clear positive educational gradient in the association between housing prices and first births points to the need for policies that address housing affordability for lower-educated groups, who seem most vulnerable to the effects of rising prices.

Finally, we identify three limitations of this study and corresponding fruitful avenues for future research. First, despite the fact that this paper includes robustness checks excluding individuals who have recently moved to control for potential bias of selective migration, following previous research (Atalay et al., 2021; Lovenheim and Mumford, 2013), future research more explicitly taking into account moving behaviour should be encouraged (Kulu and Steele, 2013). This would allow to study how moving and childbearing decisions are jointly affected by local house prices in the current municipality of residence, but also other municipalities under consideration. Addressing such dynamics goes beyond the scope of this article.

Second, despite the fact that this paper presents novel empirical evidence regarding differential associations between local house prices and first births by education and migration background, this study remains relatively speculative as to the underlying theoretical mechanisms for such differentiation. Although this limitation holds for most quantitative research on the nexus between house prices and fertility, we argue that complementary research on housing ideals or fertility intentions in response to housing prices (Atalay et al., 2021) should also be differentiated by social subgroups (e.g. education, migration background).

Third, despite the fact that this study provides an arguably more robust approximation of the causal effects of local house price shifts in comparison to cross-sectional research in which time-constant differences between regions might entail bias (Clark, 2012; Florida et al., 2021; Öst, 2012), our findings are still likely to not only reflect causal effects but also spuriousness and reverse causality. With respect to the latter, if individuals planning to have children and grow their families seek larger homes, the cause-and-effect relationship flows from birth rates to house prices. Consequently, future research exploiting exogenous variation and/or adopting more advanced econometric techniques to distinguish cause from consequence (Aksoy, 2016) should be encouraged to also differentiate the effects by population subgroups to assess social differentiation.

Acknowledgements

The authors thank Statistics Belgium employees for providing access to the longitudinal microdata from the 2001 and 2011 Censuses and the longitudinal microdata from the Population Register that were used for the study.

This research was funded by [anonymised]

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