Accounting for Homeowner Mobility in Net Housing Wealth Accumulation across Professional Occupations

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ABSTRACT
The choice of principal residence is an important issue in differentiating net housing wealth (NHW) accumulation across social groups. We propose a new quantitative framework to decompose NHW accumulation as the sum of capital gains for stayers (homeowners who do not move), changes in debt, and two mobility gaps for movers. These two gaps result from differentiated access to homeownership (access gap) and transaction prices (price gap), which are estimated from micro-data of housing transactions informing the professional occupations (POs) of buyers and sellers. By adding census and mortgage data over two decades (1998–2017) for the French region of *Bourgogne-Franche-Comté*, we find an aggregate NHW accumulation of 47.2 billion current euros for all owned principal residences (175% of GDP growth). While capital gains accrue to stayers in proportion to their initial NHW, mobility generates much more unequal NHW accumulation. Mobility accounts for about one third of NHW accumulation and is regressive, as access and price gaps are more negative for low-status POs. We also find that about one half of the whole mobility gap is explained by observed housing characteristics (including location), while the other half is directly related to the POs of homeowners. These results are in contrast to what is usually found in wealth surveys and standard hedonic price imputations, with the additional specificity to be socially and spatially down-scalable.

KEYWORDS
Property ownership ; wealth distribution ; price decomposition ; social stratification ; spatial inequality.

1. Introduction

Due to a twofold movement of financialization and rentierization, housing prices have risen dramatically in most OECD countries over the last three decades (Renaud and Kim 2008; Fernandez and Aalbers 2017). Fueled by this unprecedented inflation, capital returns from homeownership increased sharply, reinforcing housing as a major asset for households (Schwartz and Seabrooke 2008; Jordà et al. 2019).

As post-World War II housing policies have significantly increased homeownership, Net Housing Wealth (NHW) is relatively spread across middle-class households in western Europe (Causa, Wolosko, and Leite 2019). The modern shift from a social welfare state to an asset-based welfare state (Ronald and Kadi 2018; Rolnik 2013) has also sustained the rise of homeownership until recently, but at the expense of increasing indebtedness (Crouch 2009) and a more uneven distribution across social and generational groups (Smith et al. 2022). In this context, housing markets become a central feature of wealth distribution and living conditions (Zavisca and Gerber 2016;

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Adkins, Cooper, and Konings 2019), which entails a renewed importance of NHW to study the recent patterns of social and spatial inequalities.

Since Rex and Moore (1967), homeownership has been widely debated in social science studies, especially by scholars trying to identify how it could define new systems of social stratification (Saunders 1984; Badcock 1989; Thorns 1989). Recently, Adkins, Cooper, and Konings (2019) have gone further, assuming a stratification based on NHW within an asset-based framework. They show how the current economical and political contexts impact housing prices, wealth distribution, and social inequalities. When the returns from the housing capital grew faster than labor incomes, as observed in the last decades by Piketty and Zucman (2014); Ryan-Collins and Murray (2021), social inequalities stemming from housing markets require to be addressed accurately to balance them with more extensively studied inequalities from labor markets.

Starting with Harvey (1978), there has been a particular attention on capital circulation and its influence on segregation and socio-spatial polarization (Smith 1987). As people relocate, they also relocate their capital. Surprisingly, recent empirical studies and methodological proposals taking into account both the social and spatial dimensions of inequalities generated by housing markets remain scarce (Wind and Hedman 2018; Arundel and Hochstenbach 2020). Furthermore, typical concerns regarding NHW inequality are primarily focused on variations within an existing housing stock (e.g., Garbinti, Goupille-Lebret, and Piketty 2021) and do not pay much attention on homeowner mobility as a source of differentiated NHW accumulation. Considering that homeowner mobility requires a change of principal residence, access to homeownership and price difference between purchased and sold properties could be paramount in gaining a deeper understanding of NHW accumulation.

Our paper aims to fill this gap by designing a new quantitative framework of NHW accumulation, which explicitly accounts for homeowner mobility. In addition to the usual suspects (capital gains and debt variations), we include two other NHW components related to differentiated homeownership access and differentiated housing price associated to homeowner mobility (i.e., from change of principal residence). This allows us to (i) decompose NHW determinants (between housing characteristics, location, and transaction timing), (ii) balance the effect of mobility with the more usual definitions of NHW accumulation, and (iii) down-scale NHW accumulation socially (between professional occupations) and spatially (between postal codes).

Our framework is applied to an original dataset from transactions of principal residences with information about the POs of buyers and sellers. These data are matched with household data from the French population census and subsidized mortgages, which both report POs of households. The datasets covers the French region *Bourgogne-Franche-Comté* from 1998 to 2017. This period is particularly relevant to document contrasted NHW accumulation between social groups and spatial entities, as the first decade 1998–2007 is characterized by a substantial increase in the regional housing price index (+130%), while the second decade 2008–2017 witnessed a slight decrease of this index (−3.6%). The quantitative framework we propose is nevertheless general and could also be applied in other regions or time periods.

Our approach leads to a regional NHW accumulation of 47.18 billion euros for owned principal residences over the two decades under study. This corresponds to about 175% of the regional GDP growth, which is in line with the high recent increase of the relative size of housing capital in western economies. While down-scaled net capital gains are proportional to initial NHW (without any clearly significant social or spatial patterns), we find contrasted mobility gaps across POs and spatial entities. Surprisingly, we obtain that differences in the characteristics of housing transactions (housing quality, period, and location) explain less than the half of the whole mobility gaps (i.e., the sum of the access and the price gaps). This finding reveals a direct role played by the socio-economic status of households on NHW accumulation that operates through homeowner mobility. Our results also show that mobility accounts for one third of the total NHW accumulation, and that mobility is regressive because the lowest socio-economic status benefit less from it. As a complementary outcome of our framework, the socio-spatial distribution of NHW accumulation could be mapped at the postal code level for each PO separately, in order to inform local public policies that could counteract housing market mechanisms in the distribution of NHW.

The following section 2 presents the literature and section 3 our quantitative framework. The case study, data, and methods are presented in section 4, followed by the results in section 5. The last section 6 concludes and present some perspectives.

2. Related literature

We first describe how our four components of net housing wealth (NHW) accumulation (capital gains, debt variations, homeownership access gaps, and housing price gaps) are usually defined and distributed across areas and social groups in the literature. We then review and discuss previous papers using professional occupations (POs) as proxies for social stratification, as we do in the proposed framework.

2.1. *Capital gains from homeownership*

NHW accumulation is usually described as capital gains or losses corrected for debt variations (Badcock 1994; Burbidge 2000; Bach, Calvet, and Sodini 2020). Given that housing is a fixed asset, these components are influenced by the varying conditions (in space and time) of surrounding housing transactions (Hochstenbach and Arundel 2020). Hence, NHW accumulation is a multifaceted process shaped by a complex interplay of elements that have profound implications for social inequalities (Forrest and Murie 1989). Through examining the interactions between these elements, researchers have shed light on the intricate mechanisms that contribute to the unequal NHW accumulation across social groups and its consequences.

Firstly, a recent spatial polarization of housing prices occurs through greater social segregation (e.g., Wind and Hedman 2018 for Sweden, Le Goix et al. 2020 for France, and Arundel and Hochstenbach 2020 for the Netherlands). This comes jointly to changing neighborhood conditions, as Fesselmeyer, Le, and Seah (2013) show a racial gap in terms of level and distribution of housing capital gains. Conversely, Wind and Hedman (2018) considers that, thanks to cultural and economic capital, upper social groups take advantage of local price dynamics to accumulate more wealth in their housing pathways. For Arundel and Lennartz (2020), homeownership access in the most favorable locations for capital gains strongly depends on income, employment position, and parental wealth transfers, which all drive the social reproduction.

Secondly, due to different pattern of fluctuations in housing prices over time, the returns on housing investments have been unequal across generations. Old housing insiders of the baby boom generation (born between 1950 and 1970) have especially benefited of low purchase prices, favorable housing taxation, and convenient monetary policies (Forrest and Hirayama 2015; Monnet and Wolf 2017). In turn, youth generations have been detrimentally affected by the decreasing housing affordability and the increasing indebtedness, which both have negative impacts on the rate of returns of housing investments (Wind, Lersch, and Dewilde 2017; Smith et al. 2022).

2.2. *Labor change, homeownership, and mobility*

The relationships between labor market outcomes and homeownership access or NHW accumulation have been already studied for some western economies (e.g., Allègre and Timbeau 2015; Arundel and Doling 2017). On the right hand, dualization of labor markets, rising income inequality, and precarious employment, coupled with stricter loan requirements after the 2008 crisis, have resulted in the exclusion of young and low-income households from homeownership (Forrest and Hirayama 2015). On the other hand, the dynamics of housing prices can either facilitate or hinder residential mobility depending on the insider or outsider positions (Arundel and Lennartz 2020). In times of inflation, less regulation and taxation has been linked to an increase in homeowner mobility (Cunningham and Engelhardt 2008), while declining equity slows down residential mobility (Ermisch and Washbrook 2012). Conversely, inflationary pressures on housing markets pose significant obstacles for affordability. Young tenants with low job experience, low incomes, and without a parental support are constrained in their ability to become homeowners (Causa, Wolosko, and Leite 2019).

To catch the impact of homeownership on NHW accumulation, it is essential to consider not only which groups increase homeownership rates but also where this takes place (Hochstenbach 2022). Basically, housing markets sort households in variegated spatial contexts according to their socio-economic position (Diamond and Gaubert 2022). Upper-income groups have the power to pay for their preferences, whereas lower groups are restricted to cheap and public subsidized areas (Harvey 1978; Clark 2006). In western countries, some middle and low-income groups have faced with gentrification and increasing prices in urban centers (Hochstenbach and Musterd 2018). Hence, as they move to suburban areas, their housing capital is increasingly concentrated on the outskirts of urban centers, with limited opportunities in terms of NHW accumulation (Sampson and Sharkey 2008). These patterns of residential mobility are mostly driven by housing markets, contribute to the amplification of spatial segregation, and then lead leading to increased NHW inequalities (Hamnett 2005).

Recognizing that housing and labor markets both determine local homeownership access and residential mobility (Doling, Karn, and Stafford 1986; Henley 2001), it becomes prominent to study them jointly as we propose in this article. But tracking homeowners across changes of principal residence becomes the main empirical challenge, principally because of sample attrition in wealth surveys (Garbinti, Goupille-Lebret, and Piketty 2021),[1] and data confidentiality in housing transactions (Kahn 2021).[2] The lack of knowledge about buyers and sellers characteristics along changes of principal residences is a strong limitation of previous studies, whereas focusing on housing transactions is particularly relevant because they correspond to a particular moment of NHW change along the accumulation pathway.

[1] In France, the main wealth survey *enquête patrimoine* drops all households with a structural change between two waves, concerning about 15% of the sample. This includes couple separation, geographical mobility, death of one person, budget separation, or on the opposite, arrival of a partner (INSEE 2021).

[2] Usual transaction data used to impute housing prices are sensible data that contain only few variables about buyers and sellers. It generally precludes researchers to follow households between transactions.

2.3. *Housing price differences*

In addition, there is a growing literature that examines the role of buyer and seller characteristics in determining housing prices. Recent studies have demonstrated that housing prices systematically vary according to family situation (Fagereng, Guiso, and Pistaferri 2022), gender (Waitkus and Minkus 2021; Goldsmith-Pinkham and Shue 2023), housing intermediary (Besbris and Korver-Glenn 2022), parental support (Arundel and Hochstenbach 2020), race (Bayer et al. 2017), and social group (Cohen Raviv and Lewin-Epstein 2021). Depending on the case under study and the variables used to control for housing characteristics, these results are alternately interpreted in terms of market segmentation (Galster 1996), price discrimination (Ihlanfeldt and Mayock 2009), or socio-spatial segregation (Quillian, Lee, and Honoré 2020).

However, it is often overlooked that systematic housing price differences from the social characteristics of buyers and sellers lead to unequal NHW accumulation (Kahn 2021). As systematic price differences in housing transactions involve a redistribution of wealth between social groups and spatial entities, the housing market is not neutral in terms of aggregate welfare (Kain and Quigley 1972; Gallin et al. 2021) and NHW accumulation (Eika, Mogstad, and Vestad 2020). This argument takes into account the fact that the sale of a principal residence has to be followed by a purchase for homeowners, which contrasts with other approaches considering that the gains for the seller could be canceled by the necessity to re-purchase a home, being in turn a buyer at a same price level (Buiter 2010; Bonnet et al. 2015). This literature generally obtain that mobility is roughly neutral in terms of NHW accumulation.

At a local scale, unequal levels and trends of housing prices implies different submarkets, as a recent study on the variegated effects of macroeconomic shocks in Parisian metropolitan area has shown (Coën, Pourcelot, and Malle 2022). So, we highlight here that homeowners who move to more expensive principal residences experience an increase in their NHW, while the reverse is true for those who move to less expensive housings. These price disparities may be attributed to better housing quality, location advantages, or other unexplained socio-economic variations in buying and selling prices for which we propose a decomposition framework (Gelbach 2016).

2.4. *Using professional occupations for social stratification*

Labor-based classifications have a rich historical background in both social and spatial stratification studies (Duncan and Duncan 1955; Blau, Duncan, and Tyree 1978). POs are often privileged as a proxy of educational attainment, family background, and labor market dynamics, all of which play a role in shaping individuals' incomes (Wright 2000; Rose and Harrison 2007) as well as contributing to various social and cultural group differences (Boterman, Musterd, and Manting 2021).

Despite some criticisms regarding disparities within POs in terms of wealth distribution, social capital, and cultural preferences (Savage et al. 2013), POs classification have proven to be more relevant for social stratification than indicators about activity sectors or incomes groups (Bourdieu 2005). The stability and versatility of this classification make it particularly useful to describe the impact of economic geographies on labor population in numerous western countries (Connelly, Gayle, and Lambert 2016; Williams 2017). They have been particularly utilized to capture the transformations of labor structures and the emergence of polarization within post-Fordist economies, in various case studies such as the United States (Autor and Dorn 2009; Baum-Snow, Freedman, and Pavan 2018), the EU (Vera-Toscano, Fana, and Fernández-Macías

2022), and France (Davis, Mengus, and Michalski 2020). By including retired persons as a separate PO, this classification also allows to grasp inter-generational issues, which are proven to be central for NHW accumulation in western countries.

In these different contexts, POs help to describe, on one hand, the structure of the new inequality patterns arising from the labor market while, on the other hand, they have a long-standing tradition of documenting the growth of the middle class and the social upgrading processes in global cities (Butler and Robson 2001; van Ham et al. 2020; Hamnett 2021). More particularly, we can mention that POs have been crossed with different spatial delineations in the examination of gentrification in the French context (Clerval 2022; Préteceille and Cardoso 2020), and to study different urban segregation dynamics in several EU countries (Musterd 2020; Tammaru et al. 2020), as well as in various other parts of the world (van Ham et al. 2021).

A recent literature has shown the relevance of linking POs to housing market outcomes to better grasp the importance of the latter in the production of wealth inequalities. For instance, authors were interested to test the hypothesis of whether the housing market produces an independent stratification or reproduces inherited labor market patterns. This was done through international comparison (Arundel and Doling 2017; Wind, Lersch, and Dewilde 2017; Smith et al. 2022), or through a spatially explicit analysis of housing markets at a local scale (Le Goix et al. 2019). It was also shown that restricted housing supply changes NHW from housing price impacts, and limits the movement of workers in high cost areas (Glaeser and Gyourko 2018).

3. Conceptual framework

The proposed framework derives from a dynamic equation of NHW accumulation across POs, introducing two original terms related to homeowner mobility. It offers a methodological contribution in the field of quantitative economic geography, by (i) relying mainly on usual data about population, mortgage, and housing transaction, (ii) delivering the possibility of replication across different scales in different countries, and (iii) introducing statistical decomposition methods to distinguish observed and unobserved determinants of NHW accumulation among social groups.

3.1. *Net housing wealth accumulation*

At the regional level, we note ΔW_k^e the aggregated NHW accumulation for the professional occupation $k \in \mathbb{K}$ over the decade $e \in \{I, II\}$.[3] For each PO k, S_k^e accounts for the number of stayers that are owners of the same housing at the beginning and the end of the decade e, C_k^e is the number of comers to homeownership, and L_k^e the number of leavers. As the household is our elementary unit of analysis, we use the PO of the reference person to match unequivocally households, POs, and principal residences.[4] NHW accumulation is the sum of average housing price variation Δp_k^e for stayers, minus debt variation from in-progress and newly contracted mortgages ΔB_k^e, plus average housing price bought by comers p_k^C, minus average housing price sold by

[3] Table A1 in Online Appendix (OA) summarizes all mathematical notations. Our empirical application is performed for two recent decades, respectively $e = I$ for 1998–2007 and $e = II$ for 2008–2017.

[4] This amounts to consider the PO of the reference person as the PO of the household and to neglect NWH distribution within households, minimizing gender bias as man are over-represented as reference persons.

leavers p_k^L. They are all defined for at the scale of the PO k through:

$$\Delta W_k^e = S_k^e \cdot \Delta p_k^e - \Delta B_k^e + C_k^e \cdot p_k^C - L_k^e \cdot p_k^L \tag{1}$$

The first two terms $S_k^e \cdot \Delta p_k^e$ and ΔB_k^e account for net capital gains, whereas the two remaining terms are related to homeowner mobility. To give more insights from these last terms, we rewrite them as the sums of an access gap and a price gap. Noting that $C_k^e \cdot p_k^C - L_k^e \cdot p_k^L$ both equals $(C_k^e - L_k^e) \cdot p_k^L + (p_k^C - p_k^L) \cdot C_k^e$ and $(C_k^e - L_k^e) \cdot p_k^C + (p_k^C - p_k^L) \cdot L_k^e$, the difference between the numbers of comers and leavers $(C_k^e - L_k^e)$ and the difference between the housing prices of buyers and sellers $(p_k^C - p_k^L)$ are factorized in both formulations (only the multiplicative terms associated to them differ). Hence, we define the access and price gaps in the following Equation 2 as the averages of both formulations, by noting $\overline{p}_k^e \equiv (p_k^C + p_k^L)/2$ and $\overline{M}_k^e \equiv (C_k^e + L_k^e)/2$. These multiplicative weights represent respectively the average transaction price and the average mobility flow, in order to avoid the arbitrary choice of one weighting schedule over the other:[5]

$$\Delta W_k^e = \underbrace{S_k^e \Delta p_k^e}_{\text{Capital}} - \underbrace{\Delta B_k^e}_{\text{Debt}} + \underbrace{\overline{p}_k^e (C_k^e - L_k^e)}_{\text{Access gap}} + \underbrace{\overline{M}_k^e (p_k^C - p_k^L)}_{\text{Price gap}}. \tag{2}$$

For each PO and decade under study, this main equation of socially differentiated regional NHW accumulation is the sum of four terms. In addition to the usual net capital gains from the first two terms, homeowner mobility generates access and price gaps though housing transactions. These original mobility gaps come from the simultaneous purchases and sales of principal residences, which are implied by homeowner mobility. As long as the four terms are additive, they can be downscaled spatially. For any partition of the designated area into spatial entities $c \in \mathbb{C}$,[6] this reads as:

$$\Delta W_k^e = \Sigma_c \, S_{ck}^e \Delta p_k^e - \Delta B_k^e + \Sigma_c \, \overline{p}_k^e (C_{ck}^e - L_{ck}^e) + \Sigma_c \, \overline{M}_{ck}^e (p_k^C - p_k^L). \tag{3}$$

The four decomposition terms can be readily distributed between spatial entities. Net capital gains $S_k^e \Delta p_k^e - \Delta B_k^e$ are recoverable by summing local numbers of stayers, corresponding housing price variations, and debt variations (respectively noted S_{ck}^e, Δp_k^e, and ΔB_k^e). Then, because the weights $\overline{p}_k^e$ are positive, the following summed terms $\overline{p}_{ck}^e (C_{ck}^e - L_{ck}^e)$ about local access gaps are positive when the number of homeowners of the PO k increases in the spatial unit c and are negative otherwise. These local access gaps represent the variations of the prevalence of each PO at local level, stemming from socio-spatial homeownership patterns (they could be easily mapped). The final terms, expressed as $\overline{M}_{ck}^e (p_k^C - p_k^L)$, represent the disparities between housing prices paid by newcomers and sold by leavers of the PO k, multiplied by the positive average mobility flows $\overline{M}_{ck}$ within the spatial unit c. These price gaps signify NHW accumulation resulting from the social dynamics of local housing markets, also at a fine spatial level.

[5]This leads to a kind of Fisher ideal price index that averages Laspeyres and Paasche price index as presented in, e.g., https://www.census.gov/construction/cpi/pdf/generalinformationaboutpriceindexes.pdf.

[6]In the empirical application, we consider postal codes as the spatial unit of analysis. Depending on data availability, our quantitative framework can be applied to other discrete scale (e.g., municipalities, counties).

3.2. *Capital gains from housing price variations*

Capital gains are typically estimated from housing prices declared in different waves of wealth surveys (e.g., Garbinti, Goupille-Lebret, and Piketty 2021) or imputed from hedonic models of housing transactions (e.g., Fagereng et al. 2020).[7] Since households that remain in their principal residences, or "stayers", retain their homes by definition, implicit price fluctuations and latent capital gains can not be directly estimated from housing transactions. Instead of using declared values from repeated wealth surveys (subject to assessment bias), we favor the hedonic framework that uses a market price equation estimated on transactions of similar housing units. This approach is commonly used to build official housing price index (Gouriéroux and Laferrère 2009). One significant difference is that we leverage the information about the POs of buyers and sellers to identify PO-specific yearly housing price variations and, consequently, we produce socially-differentiated capital gains for stayers.

With $\mathbb{N}_e$ the set of transactions of principal residences during the decade e, we specify the following model for the socio-temporal patterns of observed housing prices:

$$p_i = \Sigma_k \left(\alpha_k^e + \theta_k^e \cdot t_i\right) \times \mathbf{1}[PO_i = k] + \epsilon_i. \tag{4}$$

For all transactions $i \in \mathbb{N}_e$, housing price p_i is the outcome and the term ϵ_i is the error. Each explanatory dummy variable $\mathbf{1}[PO_i = k]$ (for $k \in \mathbb{K}$) equals one if the PO of the buyer *or* if the PO of the seller is k (and zero otherwise). Hence, for each PO k, the unknown coefficients α_k^e and θ_k^e represent respectively initial housing prices and average annual capital gains.[8] In order to make these estimations more representative of stayers for which we aim to compute capital gains, we weight each transaction i by the number S_{kc}^e of stayers of each PO k, postal code c, and decade e. Noting N_{kc}^e the corresponding number of transactions, we estimate Equation 4 by weighted least squares using the normalized terms S_{kc}^e/N_{kc}^e in the weighting schedule.

The average capital gain implicitly earned by a homeowner of the PO k that does not change of principal residence during the decade e (i.e., a stayer), is easily recovered from the fact that $\Delta p_k^e = \theta_k^e \times 10$. These raw regression estimates first multiplied by 10 are then multiplied by the number of stayer S_k^e to obtain the aggregated capital gains reported in Equation 2. We consider other statistical specifications for housing prices in the empirical application (with repeated sales, spatial heterogeneous coefficients, different time trends, and alternative weighting schedules). As demonstrated in our results, we observe that the piecewise linear specification (4) closely matches the data and the corresponding results remain robust across specifications.

3.3. *Debt variations from subsidized mortgages*

The second term ΔB_k of Equation 2 is the aggregated housing debt variation for the PO k, which is of central importance to derive NHW accumulation. For the two decades of interest ($e = I, II$), this variation is the sum of repayments from mortgages contracted before 1998 (the first year of interest) and the balance of debts contracted after. Our method of estimation differs before and after 1998 because of data availability. We rely on micro-data only for loans contracted after 1998, which prevents us

[7]This latter approach uses econometric models to rely housing prices to housing characteristics and to predict a price for all residences (even those that are not sold). This approach assumes buyers and sellers anonymity such that, contrary to what we do here, their characteristics are not included in the regressions.

[8]This requires that the year of the transaction t_i is normalized to be zero at the beginning of the decade e.

from down-scaling loans contracted before 1998 (see Equation 3 above).

For the loans contracted before 1998, we consider the simplifying assumption of a constant maturity $\overline{m} = 20$ years in order to consider only two prior decades: 1978–1987 ($e = 1$) and 1988–1997 ($e = 2$) for the repayments done in $e = I, II$.[9] By noting $\overline{r}_1$ and $\overline{r}_2$ the corresponding average interest rates, aggregate repayments depend on the average yearly number of loans $\overline{a}_{ke}$ and their average values $\overline{b}_{ke}$ for each prior decade. Section A.2 in OA uses the typical formula of compound interests to show that the regional debt contracted in $e = 1$ repaid in $e = I$ is $\overline{B}_{kI} \equiv 2.75 \times \overline{B}_{k1}$ with $\overline{B}_{k1} \equiv \overline{a}_{k1}\overline{b}_{k1}(1 + \overline{r}_1)$. The loans contracted in $e = 1$ are totally repaid before $e = II$ and do not impact related debt variations. Using the same methodology for the loans contracted in the second prior decade $e = 2$, Section A.2 in OA also shows that the aggregate amount of this debt repaid during $e = I$ is $5 \times \overline{B}_{k2}$, and the amount repaid for this debt in $e = II$ is $2.75 \times \overline{B}_{k2}$.

For the loans contracted after 1998, we estimate the average values b_{kt} each year by summing the values of all subsidized mortgages from official statistics.[10] This allows us to maintain the social differentiation across POs, as the PO of the borrowing reference person is reported in the data, as the interest rate r_{kt}, and the maturity m_{kt}. This allows us to make fewer assumptions for the estimation of debt variations on 1998–2017 compared to before 1998. As presented in Section A.2 of OA (Table A2), the aggregated debt variation for the decade $e = I, II$ and the PO $k \in \mathbb{K}$ is:

$$\Delta B_k^e = \overline{a}_{ke} \cdot \left[\Sigma_{t \in e}\, b_{kt}(1 + r_{kt}) - \Sigma_{s<t}\, b_{ks}(1 + r_{ks})/m_{ks}\right] - \overline{B}_{ke}. \tag{5}$$

The first term within brackets is the sum of the average values of mortgages (interests included) contracted each year t of e by each PO k. They are multiplied by their quantities $\overline{a}_{ke}$ at the regional level. The second term corresponds to the repayment of these current loans, which enters negatively in the aggregate debt as it appears from the subtraction sign. The last term $\overline{B}_{ke}$ corresponds respectively to $\overline{B}_{kI} \equiv 2.75 \times \overline{B}_{k1} + 5 \times \overline{B}_{k2}$ for $e = I$ and $\overline{B}_{kII} \equiv 2.75 \times \overline{B}_{k2}$ for $e = II$. These are loan repayments for loans contracted prior to 1998, in order to incorporate socially differentiated debt changes occurring between 1998 and 2017, as illustrated in the main Equation 2.

3.4. *Access gaps from mobility*

The mobility part $(C_k^e - L_k^e)$ in the access gap of Equation 2 is the difference between the numbers of comers and leavers from homeownership for the PO k and the decade e at the regional level. As for the down-scaled version of Equation 3, we compute it directly from population census data (more details will be given in section 4). Then, to estimate the remaining part (i.e., the price weight $\overline{p}_k^e$), we use the fact that transactions of principal residences are representative of homeowner mobility.[11] We consider the following linear price model, estimated by OLS for both decades ($i \in \mathbb{N}$):

$$p_i = \tilde{\mu} + \Sigma_k\, \tilde{\phi}_k \times \mathbf{1}[POC_i = k] + \Sigma_k\, \tilde{\psi}_k \times \mathbf{1}[POL_i = k] + \tilde{\varepsilon}_i. \tag{6}$$

The dummy variable $\mathbf{1}[POC_i = k]$ equals one if the buyer in i is from the PO k (regardless the PO of the seller) and equals zero otherwise. The following dummy

[9] By the assumption about maturity, housing debts contracted before 1978 are totally reimbursed in 1998.

[10] As we argue in the empirical application, these data are quasi-exhaustive for new loans of principal residences.

[11] As reported in our statistical results, particularly noticeable from Figure C5 in OA.

$\mathbf{1}[POL_i = k]$ is the equivalent for the PO of the seller (i.e., the leaver). In this price equation without time dimension (contrary to Equation 4), estimated coefficients $\tilde{\phi}_k$ and $\tilde{\psi}_k$ are respectively average purchasing p_k^C and selling p_k^L prices for each PO k. They simply need to be averaged to obtain the price weights as $\overline{p}_k = (\tilde{\phi}_k + \tilde{\psi}_k)/2$.

In order to disentangle the effect of housing characteristics, housing location, and transaction timing from the direct effects of POs, we also estimate by OLS a linear model with three additional sets of control variables. Accordingly, a part of housing price differences across POs can be attributed to observed housing differences, which can be used to decompose mobility gaps. We note $\mathbf{X}_i$ the set of housing characteristics (e.g., living area, period of construction, number of rooms, more details are given in section 4), η_{c_i} the set of geographic fixed effects (at the postal code level to control for location), and γ_{t_i} the set of year fixed effects. This gives:

$$p_i = \mu + \Sigma_k\ \phi_k \times \mathbf{1}[POC_i = k] + \Sigma_k\ \psi_k \times \mathbf{1}[POL_i = k] + \mathbf{X}_i'\boldsymbol{\beta} + \eta_{c_i} + \gamma_{t_i} + \varepsilon_i. \quad (7)$$

The vector $\boldsymbol{\beta}$ of unknown coefficients contains the hedonic values of housing characteristics, whose introduction (jointly with space and time fixed effects) changes the value of other unknown coefficients and errors, now respectively noted μ, ϕ_k, ψ_k, and ε_i. In this more extensive specification, average buying and selling prices for each PO are controlled by housing characteristics, location and time. The resulting coefficients associated to the PO of buyers and sellers (ϕ_k and ψ_k) represent residual housing price differences across POs, which are not attributable to observed housing differences.

By comparing regression results from specifications (6) and (7), we distinguish the part of average housing price attributable to different housing characteristics (What_k^A), different locations (Where_k^A), and different timings (When_k^A) using the formulas of Gelbach (2016). Section A.2 in OA formally defines each term to show that:

$$\overline{p}_k = (\tilde{\phi}_k + \tilde{\psi}_k)/2 = \text{What}_k^A + \text{Where}_k^A + \text{When}_k^A + (\phi_k + \psi_k)/2. \quad (8)$$

Hence, the average housing price for a given PO k, which enters as a weight in the access gap of Equation 2, is itself decomposed between three explained parts and one unexplained part. In terms of NHW accumulation, multiplying differentiated access by the flux of homeownership $(C_k - L_k)$ gives the differentiated impacts of housing characteristics, locations, and timings on the whole access gap. There is also an unexplained part of average housing price noted $(\phi_k + \psi_k)/2$, which is related to the direct effect of being of the PO k (all other observed housing differences otherwise equal). As justified in subsection 2.4 above, these unexplained housing price variations can be viewed as coming from housing market segmentation, discrimination or segregation. We only interpret them as the direct effect of POs on the housing market, focusing on their consequences in terms of NHW accumulation (instead of their causes).

3.5. *Price gaps from housing transactions*

The last term of NHW accumulation (Equation 2) corresponds to the housing price gap. Like the access gap, it relates to homeowner mobility from transactions of principal residences. Nevertheless, it focuses on housing price differences between buyers and sellers for each PO (instead of average housing prices across POs). This gap accounts for the fact that, for a given PO and other things equal, purchasing at a higher price implies a positive price gap and a higher NHW accumulation.

To be consistent with the main decomposition of Equation 2, price differences are weighted by the average mobility flow $\overline{M}_k = (C_k + L_k)/2$ computed from population census data. The remaining part of the price gap is then estimated from the regression coefficients of Equation 6. Again, from the additive structure and the formulas of Gelbach (2016), Section A.2 in OA shows how decompose this part of the price gap into three explained and one unexplained price differences:

$$p_k^C - p_k^L = \tilde{\phi}_k - \tilde{\psi}_k = \text{What}_k^P + \text{Where}_k^P + \text{When}_k^P + (\phi_k - \psi_k). \tag{9}$$

The precise formulas for What_k^P, Where_k^P, and When_k^P are reported in Section A.2 of OA. The coefficients ϕ_k and ψ_k in the last part of Equation 9 come from the estimation of Equation 7. For each PO k, housing price differences between comers and leavers are explained by different housing characteristics (What_k^P), different locations (Where_k^P), and different timings (When_k^P). By multiplying these terms by the positive average mobility flows $\overline{M}_k$, we can recover the determinants of housing price gaps. It appears that POs in favorable situation on the housing market (i.e., with positive price gaps) accumulate more NHW, and that price gaps increase with the mobility flows and with the differences between buying and selling prices.

4. Case study

We now turn to the empirical application of our conceptual framework. This section presents the region *Bourgogne-Franche-Comté* (BFC) of France, and provides some descriptive statistics about the data used in the statistical analysis.

4.1. *Context*

The application draws on an administrative region covering eight *départements* in northeastern France (Figure C1 in OA).[12] Among the 12 regions of mainland France, BFC is of intermediate size in terms of population and exhibits housing price dynamics quite similar to the French average when excluding *Paris* (Figure C2 in OA). The region is characterized by a polycentric network structure of medium and small sized cities, with peripheral and inland rural areas in between. Suburban areas around major cities such *Dijon*, *Besançon*, *Belfort*, and *Montbéliard*, or close to the Switzerland border, have experienced population growth over the last two decades, as well as job creations in thriving economic sectors (INSEE 2018). In contrast, small towns and rural areas have seen job losses and population decline, in conjunction with an aging population. About the half of urban areas of the region, especially in the west side, have undergone a multifaceted shrinking process in recent decades, such that demographic and economic distributions tend to become more polarized spatially.

Compared with other context in western Europe, France has a high ownership rate and the BFC region presents an even higher rate of homeownership (63.2% instead of 57.1% nationally). This correlates with an old housing stock, a high rate of detached houses (compared to apartments), a high average living surface, and a low average housing price. Nevertheless, the dynamics of homeownership are close to the national ones, with an increase from 1982 to 2008 followed by a stagnation in the following decade. Whereas most of spatially explicit works on housing markets have focused on

[12]For geographical compacity, we add the contiguous *département* of *Haute-Marne* of the region *Grand-Est*.

attractive metropolitan areas, more common and less attractive places, encompassing urban, peri-urban, and rural settings are under-studied. Finally, the two decades under study (1998-2007 and 2008-2017) allow us to investigate the differentiated patterns of NHW distribution implied by the price trend break of the 2008 financial crisis (Figure C2 in OA).

Our statistical analysis relies on three data sources over two decades. We use population census (*Recensement de la Population* 1997, 2007, 2017),[13] subsidized mortgages (1998–2017), and housing transactions (1998–2017). At the household scale, these data distinguish homeowners, the postal code of their main housing, and their professional occupation according to the half century-old classification of *groupes socio-économiques* (Desrosières and Thévenot 1988; Thaning and Hällsten 2020). These POs come from the French official classification of jobs, grouped in six aggregated items, plus two items (Inactive and Retired). This classification is processed by hand from open question about the main job in the census, loan contract, and sale deeds. As the household is our elementary unit of analyses, we consider the PO of the person of reference in terms of Farmer, Independent, Senior Staff, Intermediate, Clerk, Blue Collar, Inactive, and Retired. The categories of Farmer, Clerk, and Blue Collar are well known in the international literature about social stratification. Independent includes business owners in addition to the more usual craftsmen and merchants, Senior Staff includes executives, managers, and other intellectual professions, and Intermediate is more defined by elimination from other POs and may contain diverse back-office jobs, foremen, freelance nurses, self-employed sports instructors, or technicians.

4.2. *Population census*

The three waves of population census come from the French National Bureau of Statistic (INSEE).[14] In order to compute the mobility flows of homeowners for each PO and postal code, we use the census question about the date of arrival in the principal residence. The stayers are all homeowners that were already in place 10 years ago.

The descriptive statistics of Table 1 show that the BFC region does not present a dualization of POs between high and low status as in major European metropolitan areas. Higher socio-economic status (Senior Staff and Independent) represent about 12% of households, which is particularly low compared to major metropolitan areas. Lower socio-economic status (Blue Collar and Clerk) counts for more that 30% of all regional households. Table B1 of OA displays the detailed dynamics between the three census waves. The region faces to an aging population with an increase from 33% to 38.5% of Retired, and post-industrial patterns with a decrease of Blue Collar (from 23% to 18%) and an increase of Senior Staff (from 6.5% to 7.5%). In the same time, there is a low growth of Clerk (from 9.5% to 10%). All POs present an increasing homeownership rate in the first decade and a stagnation in the second, from 58.75% to 63.2% over the period. In 2007, Table 1 shows 45.26% of homeowners are Retired, which represents about 365.45 thousand households. POs of low socio-economic status are under-represented in homeownership, as the shares of household they represent is above the average (with homeownership rates of respectively 42% and 57% for Blue Collar and Clerk in 2007, compared to 62% for all POs). Inversely, POs of high socio-economic status are over-represented in homeownership.

[13]We obtain the values for 1997 from the linear interpolation of the closest 1990 and 1999 census waves.

[14]We aggregate statistics about homeowners at the postal code level, thanks to the raw individual census files and the secure data access center (CASD, cited in the acknowledgments).

Table 1.: Descriptive statistics about census, mortgage, and transaction data

	ALL	*Differences across Professional Occupations (POs)*							
		Farmer	Indep.	S.Staff	Interm.	Clerk	B.Collar	Inactive	Retired
Census data									
Households	1302.7	1.95%	4.32%	7.5%	13.09%	10.02%	21.17%	5.75%	36.2%
Homeowners	807.47	2.54%	5.08%	8.53%	12.88%	6%	16.93%	2.78%	45.26%
Stayers	499.62	2.72%	4.11%	5.9%	9.03%	4.33%	12.81%	3.06%	58.04%
Comers	307.85	2.27%	6.64%	12.8%	19.13%	8.7%	23.61%	2.33%	24.52%
Leavers	236.37	4.58%	9.94%	9.14%	19.4%	9.02%	32.31%	9.54%	6.07%
Mortgage data									
Debtors	87.29	1.3%	2.85%	9.1%	21.28%	29.25%	31.86%	1.05%	3.31%
Debtors' income	26.99	91.2%	111.2%	127.1%	103.7%	96%	94.8%	89%	84.1%
Loan value	111.83	88.3%	108.1%	124.9%	105.3%	99.4%	90.6%	86.9%	94.3%
Loan length	16	110.3%	99.8%	85.4%	97%	101.6%	104.1%	85.5%	107.3%
Loan share	93.08%	88.59%	92.84%	88.31%	91.91%	92.56%	96.97%	73.7%	88.24%
Interest rate	4.99%	5.27%	5.17%	4.77%	4.84%	4.86%	5.23%	5.22%	5.11%
Transaction data									
# Buyers	100.48	0.97%	5.98%	17.49%	29.55%	18.42%	14.78%	2.11%	10.7%
Buying Price	139.89	92.6%	108.6%	126.9%	99%	88.2%	83.3%	85.3%	100.9%
# Sellers	100.48	0.72%	7.74%	12.95%	23.4%	15.6%	14.13%	2.85%	22.61%
Selling Price	139.89	81.8%	111.6%	125.1%	101.5%	91.8%	89.3%	88.7%	94.5%

Notes: Reported values are about the region as a whole in the first column and are distributed across POs in the followings. The top panel reports the average quantities in thousands households for 2007, a more extensive picture of the three waves of the population census is provided in Table B1 of OA. The middle panel reports the main characteristics of subsidized loans over the 1998–2017 period. Debtors are in thousand of households, average debt and debtors' income are in thousand euros. For instance, the average annual income of a farmer is 91.2% of the regional income, so about 24.62 thousand euros. The bottom panel reports the quantities of buyers and sellers (in thousand) and the average buying and selling prices (in thousand euros) from transaction data. Independent sells at 111.6% of the regional price, so an average housing price of 156.12 thousand euros. More details about the sample of housing transactions are available in Table B2 of OA.
Sources: *Recensements de la population (INSEE), PTZ (SGFGAS), Perval (Notaires).*

Thanks to the dates of arrival from the different waves of population census,[15] the top panel of Table 1 shows that the turn-over in homeownership of principal residence is important in the BFC region. Only 62% of homeowners in 2007 were present in the same principal residence in 1997 (the value is 80% for Retired). Looking at the distribution across POs, homeowners of low socio-economic status are relatively less inclined to residential mobility. Table B2 of OA shows the number of stayers is higher in the second decade 2008–2017 relatively to the first 1998–2007, and this increase concerns both low and high status POs (except small-sized Farmer and Inactive).

4.3. *Subsidized mortgages*

Data used to estimate housing debt variations come from an administrative source, established to manage the French interest-free loan policy (PTZ for *Prêts à Taux*

[15] By noting $H^{t_2}_{ck}$ the quantity of homeowners of the PO k in the postal code c at the end of the period and $S^{t_2}_{ck}$ the quantity of them that were already in place 10 years before, all homeowners at the end of the period are stayers or comers. Hence, the quantity of comers $C^{t_2}_{ck}$ is computed from $H^{t_2}_{ck} = S^{t_2}_{ck} + C^{t_2}_{ck}$. Then, as homeowner mobility between the first year t_1 and the last year t_2 of the period is the difference between the quantity of comers and leavers, the quantity of leavers is computed from $H^{t_2}_{ck} - H^{t_1}_{ck} = C^{e}_{ck} - L^{e}_{ck}$, also defined for each postal code c, PO k, and decade e.

Zéro). These data contain all subsidized housing purchases of principal residence since 1995, with numerous variables about purchased housings (e.g., type, price, size, age, location) and about loan conditions (e.g., amount, interest rate, duration, monthly repayments). Many borrower characteristics are also reported (age, composition, martial status), including the PO of the borrower and its current annual income. While the access to subsidized mortgage is conditioned by income caps, Sotura (2020) finds that about 85% of French tenants are eligible in 2018. Moreover, Figure C4 in OA shows the number of new PTZ loans is strongly correlated with the number of coming households computed from census data at the postal code level. For the most prevalent POs (Retired, Blue Collar, Intermediate, and Senior Staff) the linear dependencies between loans quantities and the quantities of comers are equal to 70–80%, without any particular social pattern that would bias the statistical analysis.

With more than 85,000 loan contracts financed by PTZ in the BFC region over the period 1998–2017, we consider data from subsidized mortgages are sufficiently reliable to provide aggregate variations of housing debts. The middle panel of Table 1 shows that average loan values are correlated with the average housing prices of buyers across POs, except for Retired that are basically less present on the mortgage market and use more personal equities and savings for housing purchase. Furthermore, average loan values follow debtors' income as the access and the amount of loans are mostly based on households' income in France (neither housing values nor market perspectives are taken into account). In particular, the distribution of incomes provides an illustration of the socio-economic hierarchy of POs: Farmer and Inactive are the lowest (with 10% less than the average income), followed by Blue Collar and Clerk (5% less), Intermediate (4% more), Independent (11% more) and Senior Staff (27% more).[16] The maximum income gap of 35% between Inactive and Senior Staff represents about 9,500 euros by year between both POs (representing about 35.2% of the average income).

The middle panel of Table 1 also shows that low-status POs are the main beneficiaries of subsidized mortgages for the access to homeownership. Clerk and Blue Collar count for about 60% of contracts whereas Farmer, Inactive, and Retired count for less than 6%. Senior Staff has the highest average loan value and a low loan-to-value (88.31%), testifying both the high value of purchased housings and the high repayments. They have a shortest repayment terms and the lowest interest rates, which is justified by high income and personal equity to the purchase. At the opposite, low-status POs have a low average loan values jointly with higher interest rates and longer repayment terms. For Retired and Inactive, loan values are not correlated with the corresponding housing prices (from the bottom panel), no more than the quantity of comers with the number of loans (Figure C4 in OA). Farmer is a small and specific socio-economic status for which mortgage data should be interpreted with caution.

4.4. *Housing transactions*

The third and last data source we use is a sample of about 400,000 housing transactions over the two decades of interest, obtained from the chamber of notaries.[17] After usual

[16]Retired has an average income of only 85% of the regional average, but they could have received different incomes (with a different position in the hierarchy) during their period of professional activity. We interpret principally this PO as a proxy for the generational inequalities of NHW accumulation.

[17]These *Perval* data are private and commercialized with an average sampling intensity of 50% of all transactions. They are used to compute the official French housing price index (Gouriéroux and Laferrère 2009).

data cleaning and selection operations,[18] we obtain a final sample of 295,199 housing transactions (see Table B2 in OA for all descriptive statistics distributed across POs). Each housing transaction is characterized by the usual variables concerning characteristics (e.g., transaction price, location, and date of mutation), in addition to some buyer and seller characteristics. Importantly, these data report the POs of both buyers and sellers, which allow us to study socially differentiated price dynamics from the decomposition presented in the conceptual framework of the previous section.

The bottom panel of Table 1 displays descriptive statistics about average housing price differences and the shares of each PO across the buyers and sellers. Except for Retired with twice as many sellers, all other POs have a greater rate of buyers. For instance, Senior Staff represents 17.5% of all buyers and 13% of all sellers. This gap is much lower for Blue Collar with 14.8% of buyers and 14.1% of sellers. On the average over the whole period, Senior Staff has the higher price gap between buyers and sellers, whereas the opposite is found for Blue Collar. In sum, Retired, Farmer, Senior Staff and Independent have average buying prices higher than average selling prices, whereas Intermediate, Blue Collar and Clerk have the opposite pattern.

Beyond these descriptive statistics, the transaction data deliver the full information on housing characteristics, time, and location (Table B2 in OA). These variables are used as controls for housing prices in order to describe the three dimensions of housings (the What, When, and Where) that we define in the conceptual framework for the decomposition between observable and unobservable mobility gaps. We describe each underlying variables from transaction data in Table B2 of OA. It shows that high-status POs have higher living areas, higher number of rooms, and more parkings, balconies, elevators, etc. As for the subsidized mortgage data, Figure C5 in OA shows strong correlations between the quantities of comers and leavers from census data and the quantities of respectively housing purchases and sales across POs and postal codes. This provides an additional support about the consistency of the data merged in this analysis. Again, the results for Farmer have to be interpreted with caution due to their low quantity in the population and their particular spatial distribution.

5. Results

In this section, we present the results from the empirical analysis. Firstly, we report capital gains of stayers estimated from housing price regressions (Equation 4). Secondly, we compute debt variations from the formulas detailed in Section A.2 of OA (Table A2). Thirdly, we derive the two mobility gaps (access and price) and decompose them from the formula of Gelbach (2016) detailed in Section A.3 of OA.

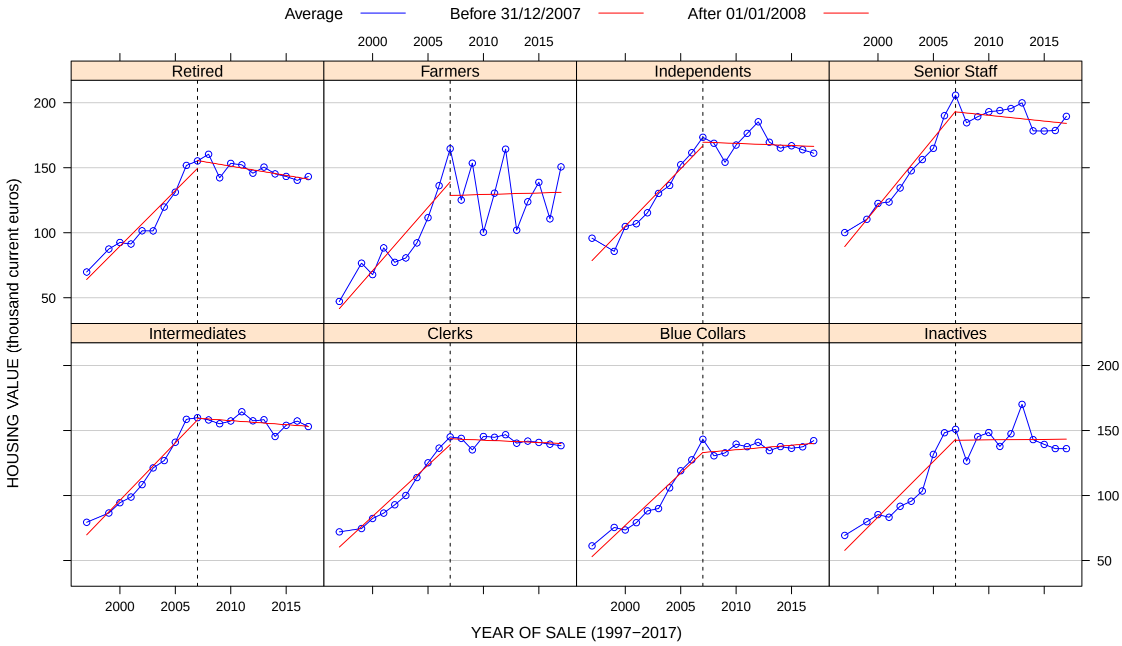
5.1. *Capital gains*

According to our conceptual framework, the first component of NHW accumulation is related to latent capital gains made by stayers from housing price variations. For each PO and each decade, we estimate initial housing prices and their average variations over time from housing transactions. The regressions of housing prices on PO fixed effects and their interaction with time trends provide the piecewise linear trends reported in Figure 1. They display the well-known housing price break from the financial

[18] We keep only transactions of principal residences between private persons, and drop transactions with omitted or extreme values on the variables of interest, i.e., outside their 2.5% interquartile ranges.

crisis of 2008, which we differentiated between POs (Table B3 in OA reports the raw coefficients of each regression, with the R^2 ranging from 0.23 for the first decade to 0.09 for the second). For the BFC region under study, it appears that the piecewise linear time trends fit average housing prices rather well, with a striking symmetry across POs.[19] Table B3 in OA also reports the raw coefficients from alternative econometric specifications, where including postal code fixed effects is shown to not change the estimated trends (indicating that they are robust to spatial heterogeneity).

Figure 1.: Latent capital gains from housing price dynamics and linear trend models



Notes: The blue dots represent average housing prices (in thousand euros) for all PO × year couples. They are estimated from housing price regressions with interacted PO × year fixed effects. The depicted piecewise linear time trends are drawn from the coefficients α_k^e and θ_k^e of Equation 4 by considering separately each decade. The underlying raw coefficients and usual summary statistics are reported in Table B3 of OA. All regressions are weighted by the quantity of stayers divided by the quantity of transactions, for each PO and postal code. Sources: *Perval (Notaires) and Population census (INSEE).*

From the intercepts and the slopes of the time trends reported in Table B3 of OA, Table 2 displays average housing prices, annual nominal gains, and annual growth rates for each PO and each decade. As expected, average housing prices follow the hierarchy of the socio-economic status, ranging from 54.53 thousand euros for Blue Collar to 104.27 thousand euros for Senior Staff (for 1998). The housing boom of the first decade has enlarged the distribution of average housing prices, as indicated by the differences of average nominal gains. They are significantly higher than the regional average for Independent and Senior Staff (of respectively +920 and +540 euros by year), and significantly lower for other POs (only Farmer and Inactive do not have significant differences with the regional average). In contrast, when annual capital gains are converted to growth rates (expressed as % of initial housing prices), the hierarchy between social group changes and Senior Staff earns 10.42% each year whereas Blue Collar earns 17.13%. Noting that capital gains from homeownership are

[19]The higher variability around the trend of Farmer is due to the small quantity of housing transactions.

quite high on this decade (13.97% by year on average on the region), differentiated NHW accumulation across POs are regressive in nominal terms and progressive in relative terms (while they are less statistically significant in the latter case).

Table 2.: Differences in initial housing prices, nominal gains, and growth rates

	Differences across Professional Occupations (POs)							
	Farmer	Indep.	S.Staff	Interm.	Clerk	B.Collar	Inactive	Retired
Decade I (1998–2007) [$N = 49,849$; $R^2 = 0.22$]								
Initial Price	−20.59***	+0.66	+30.34***	+2.41	−9.23***	−19.4***	−14.81***	−8.47***
(Region= 73.93)	*(3.63)*	*(2.29)*	*(2.01)*	*(1.82)*	*(1.92)*	*(1.92)*	*(2.9)*	*(1.84)*
Nominal Gain	−0.08	+0.92**	+0.54***	−0.68**	−1.39***	−0.99***	−0.87	−0.71**
(Region= 10.33)	*(0.64)*	*(0.39)*	*(0.23)*	*(0.31)*	*(0.33)*	*(0.33)*	*(0.5)*	*(0.31)*
Growth Rate	+5.24	+1.12	−3.55**	−1.34	−0.15	+3.16***	+2.02	+0.72
(Region= 13.97)	*(3.51)*	*(1.6)*	*(1.75)*	*(1.36)*	*(1.22)*	*(1.15)*	*(2.12)*	*(1.31)*
Decade II (2008–2017) [$N = 50,608$; $R^2 = 0.09$]								
Initial Price	−33.03***	−3.35	+34.68***	−5.17**	−19.91***	−31.37***	−25.18***	−12.82***
(Region= 168.7)	*(4.11)*	*(2.57)*	*(2.25)*	*(2.04)*	*(2.15)*	*(2.16)*	*(3.82)*	*(2.03)*
Nominal Gain	+2.38***	+2.15***	+0.07	+0.42	+0.28	+0.84**	−0.16	−0.45
(Region= -0.91)	*(0.74)*	*(0.45)*	*(0.38)*	*(0.34)*	*(0.36)*	*(0.36)*	*(0.61)*	*(0.34)*
Growth Rate	+1.62	+1.29**	+0.12	+0.24	+0.12	+0.49	−0.2	−0.33
(Region= -0.54)	*(1.24)*	*(0.56)*	*(0.38)*	*(0.37)*	*(0.31)*	*(0.29)*	*(0.79)*	*(0.32)*

*** *denotes different from zero with at least 99% confidence,* ** *for 95% and* * *for 90%.*
Notes: For each decade in row panels and PO in columns, the table displays the *differences from regional averages* in terms of housing prices (in thousand euros), annual nominal gains (in thousand euros), and annual growth rates (in percent points). Reported values are computed from the raw regression coefficients of columns (2) and (5) of Table B3 in OA, where each housing transaction of principal residence is weighted according to the corresponding number of stayers of each PO in each postal code and each decade. Growth rates are computed by dividing nominal gains by price averages. For instance, average housing prices for Farmer during the 1998–2007 period is $73.93 - 20.59 = 53.34$ thousand euros, with a growth rate of about $(10.33 - 0.08)/53.34 = 19.21\%$, so about 5.25 percent points more than the regional average of 13.97%. It is also interesting to note that this regional value is very close to the 14.1% found from the official wealth survey reported in Figure C3. Standard errors reported in parenthesis are clustered within postal codes to account for spatial autocorrelation of errors, and standard errors associated to growth rates are computed from the Delta's method.
Sources: *Perval (Notaires) and Population census (INSEE).*

The second row panel of Table 2 shows that housing price differences across POs are slightly more marked during the second decade. The differences with the regional average are distributed from −31.37 thousand euros for Blue Collar to +34.68 thousand euros for Senior Staff (a range of more than one third of the average initial price). While the average nominal gain and the average growth rate are slightly negative at the regional scale (albeit not significant), three POs present significantly different nominal gains (Farmer, Independent, and Blue Collar). The Independent also presents a significantly higher growth rate (of 1.29% by year) and, quite surprisingly, nominal gains and growth rates are more homogeneous across POs after 2008. Some POs of low socio-economic status (Blue Collar and Farmer) even present relatively high (but not significant) growth rates. In both decades, Retired are relatively disadvantaged in terms of capital gains from homeownership, both expressed as nominal gains and growth rates. In sum, these results show that capital gains from the housing market are deeply linked to the decenial conjuncture, while there are some differentiated social patterns across POs (price boom seems to increase the dispersion in nominal terms, whereas the stagnation following 2008 has modestly reduced it).

5.2. *Debt variations*

The second component of NHW accumulation is related to the variations of housing debts (Equation 2). The methodology used to compute socially differentiated debt variations is described in subsection A.2 of OA and summarized in Table A2. Debt variations, noted ΔB_k^e in Equation 8, are directly computed from the values of parameters reported in Table 3. For each decade and each PO, it shows that the quantities of loans decrease from 1978 to 2007 and increase after 2008, and that their average values follow closely housing prices (reported in the bottom row panel of Table 3). Across POs, average loan values are also closely related to the average housing prices previously reported (Table 2), whereas the quantities of loans are much more socially differentiated (Blue Collar, Intermediate, and Clerk are over-represented). Some dynamics of debt across POs are different from the regional ones, as Senior Staff, Intermediate, and Clerk increase the quantities of loans between the decades 2 and I, and Independent, Inactive, and Retired decrease them between I and II.

Table 3.: Values of parameter for the imputation of regional debt variations

		Distribution across Professional Occupations (POs)							
	ALL	Farmer	Indep.	S.Staff	Interm.	Clerk	B.Collar	Inactive	Retired
Decade 1 (1978–1987) [$\overline{r}_1 = 12.56\%$]									
Quantity of loans [$\overline{a}_1$]	86.85	1.66	3.55	7.57	20.86	13.41	35.35	1.52	2.95
Average loan value [$\overline{b}_1$]	66.94	53.77	70.02	75.45	71.8	70.6	72.95	49.59	71.36
Decade 2 (1988–1997) [$\overline{r}_2 = 7.88\%$]									
Quantity of loans [$\overline{a}_2$]	82.78	1.67	3.5	7.65	18.54	11.71	35.08	1.25	3.39
Average loan value [$\overline{b}_2$]	77.22	68.1	84.35	90.59	83.88	74.79	79.21	57.26	79.61
Decade I (1998–2007) [$\overline{r}_I = 5.32\%$]									
Quantity of loans [$\overline{a}_I$]	80.46	0.95	3.08	9.79	21.08	12.35	29.18	1.09	2.94
Average loan value [$\overline{b}_I$]	79.44	72.2	83.18	98.92	85.26	79.23	68.81	73.61	74.28
Std. Dev. of loan values	12.58	11.39	16.12	13.06	12.14	11.02	13.27	10.42	13.24
Decade II (2008–2017) [$\overline{r}_{II} = 4.64\%$]									
Quantity of loans [$\overline{a}_{II}$]	82.51	1.03	2.91	9.29	23.77	12.5	29.53	0.93	2.56
Average loan value [$\overline{b}_{II}$]	129.64	127.11	144.2	154.31	133.5	127.55	120.02	105.46	125.01
Std. Dev. of loan values	10.52	10.77	12.8	12.45	10.93	11.09	9.4	6.25	10.44

Notes: The table displays the quantities of new loans (from census before 1998 and from PTZ after) and their average values in thousand current euros (from transactions before 1998 and from PTZ after). They are distributed according to their contraction decade in rows and to the PO of the borrower in columns. Reported interest rates for the two prior decades ($e = 1, 2$) come from historical OCDE data (`https://data.oecd.org/fr/interest/taux-d-interet-a-long-terme.htm#indicator-chart`) and interest rates for the following decades are computed from PTZ data. Because we have the values at the loan contract level only for PTZ data, standard deviation across postal codes is only available for the two recent decades I and II.
Sources: *PTZ (SGFGAS) and population census (INSEE).*

Figure C2 in OA reports the resulting accumulation of aggregated debts across POs. It shows that debt variations are important in absolute values for four POs (Senior Staff, Intermediate, Clerk, and Blue Collar). The repayments from the loans contracted during the periods 1978–1987 and 1988–1997 linearly decrease over the two decades of interest (by assumption) and become zero in 2008 and 2018, respectively. The new loans contracted in 1998 are lower than the sums of repayments for Farmer, Independent, Blue Collar, and Retired, which indicates that the corresponding aggregated debts decrease ($\Delta B_k^e < 0$). The increase of new loans over the period 1998–2018 (observed for all POs except Inactive) produces an increase of the aggregate debts

($\Delta B_k^e > 0$) over the two decades of interest. Only Independent, Senior Staff, and Inactive present some small decreases of their aggregated debts at the end of the period.

5.3. *Decomposing average housing prices*

Turning to the first mobility gap, the access gap is the average of buying and selling prices multiplied by the difference between the quantities of comers and leavers (Equation 2). As the net flows of homeowners are directly computed from the census data reported in Table B1 of OA, this subsection is about the average housing price term of the access gap and it decomposes it according to the characteristics of housing transactions (i.e., What, When, and Where components of subsection 3.4). These price weights are crucial to interpret the demographic flows in terms of NHW accumulation.

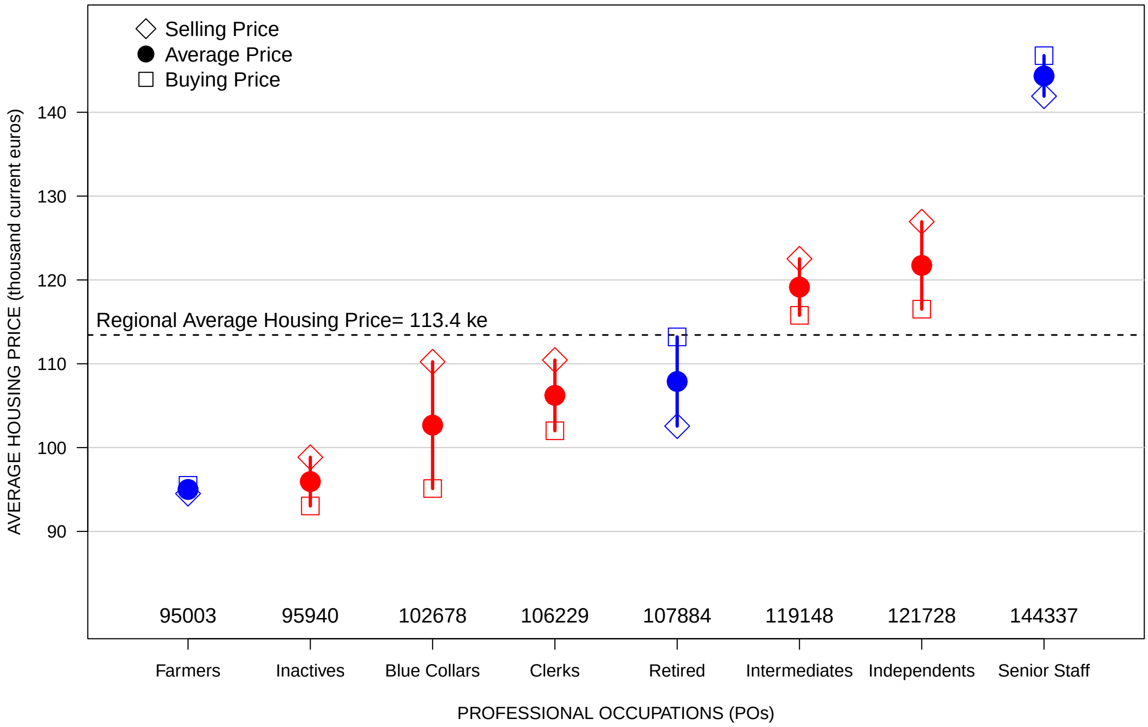
We estimate the price weights of the access gap from the regression coefficients of Equation 6, which are heterogeneous according to the POs of buyers and sellers. Figure 2 displays in filled dots these average price weights, from which we retrieve the hierarchy of POs from previous Table 2 (even if the regression equations are different). As expected, POs are ordered from Farmer to Senior Staff, and Retired holds an intermediate position. NHW accumulation for one additional Blue Collar comer is about 102.5 thousand euros, whereas it is about 144.3 thousand euros for one Senior Staff. By definition of the access gap, one additional leaver has the symmetric effect than one additional comer on NHW accumulation. Figure C7 in OA shows that this hierarchy of POs is very stable between the two decades, which justifies that we do not differentiate price weights between the two periods under study.

Going further into the determinants of these average housing prices variations, we decompose them according to housing characteristic (What), transaction year (When), housing location (Where), and an unexplained term $(\phi_k + \psi_k)/2$ related to the direct effect of POs. The formulas used to derive this decomposition are presented in Section A.3 of OA. Practically, we add the control variables and fixed effects about the What, When, and Where components in previous regressions as in Equation 7. The raw coefficients and their statistical significance are reported in Table B4 of OA. It shows that the What variables are about housing type, construction date, living area, lot size, number of pieces, and the presence of dependencies (e.g., cave, parking, balcony). The When and Where components are respectively specified by year and postal code fixed effects (unreported in the table for clarity). Including all these terms simultaneously produces a R^2 of about 0.72, and decreases the unreported fixed effects associated to the POs of buyers and sellers. From the coefficients and their standard errors, it appears that almost all housing characteristics have a significant effect and that postal code fixed effects controlling for location increase the R^2 of about 0.15.[20]

Table 4 reports the decomposition of housing price differences across POs in terms of What, Where, When components, and a unexplained part from the remaining PO fixed effects (i.e., the direct effects). It is important to note that the hierarchy of the different components is not stable across POs. Senior Staff buys and sells at a higher price than other POs, mostly because of better location (35%) and better housing quality (25%). At the opposite, location has a negative effect for Farmer, Blue Collar, Inactive, and Retired, suggesting that these POs tend to be involved in transactions away from best locations. Clerk does not have a significant Where component, which

[20]For instance, the first three coefficients of the first row of Table B4 in OA indicate that the houses are less valuable than the apartments, while they present a price premium of about +33 thousand euros after including spatial fixed effects. This suggests that the first coefficients do not account for the worse location of houses.

Figure 2.: Average housing prices and housing price difference across POs



Notes: This figure displays the average housing prices $\overline{p}_k$ by filled dots (reported in euros at the bottom of the panel). They are computed from average buying (empty square) and selling (empty diamond) prices, respectively noted $\tilde{\psi}$ and $\tilde{\phi}$ in Equation 6. The dots and lines are colored in red when the selling price is higher than the buyer price (i.e., this indicates a decrease of NHW) and in blue otherwise. All the reported values are significantly different from zero at 95% confidence, the intervals are not reported for clarity.
Sources: *Perval (Notaires) and Population census (INSEE).*

indicates that they are better located than the other low-status POs. However, jointly with Retired, Inactive and Intermediates, their intrinsic housing characteristics are of lower quality than the regional average (whereas Farmer and Blue Collar have better characteristics, Table B2 in OA). Despite the presence of many explanatory variables, time and space fixed effects in these housing price models, the PO fixed effects still have a strong statistical significance and produce quite high unexplained components (in absolute values) for each PO. They reach respectively +13 thousand euros (41.9% of average price) for Senior Staff and −6.25 thousand euros (58.2%) for Blue Collar. This indicates that there are *ceteris paribus* differences in housing prices according to the socio-economic status of homeowners. In the literature, these unexplained PO effects are almost always neglected in price imputations used to estimate NHW.

5.4. *Decomposing average housing price differences*

In addition to the previous average housing price differences across POs, homeowner mobility impacts NHW accumulation from the price gaps, i.e., from the differences between selling and buying prices within POs, weighted by the average mobility flows (i.e., the third term of Equation 2). Coming back to Figure 2, we see that POs are separated between those that sell housings at a higher price than they buy (Inactive,

Table 4.: Decomposition of average housing prices across POs

	Differences across Professional Occupations (POs)							
	Farmer	Indep.	S.Staff	Interm.	Clerk	B.Collar	Inactive	Retired
Housing Price (Reg= 113.4)	-18.43^{***} *(-16.2%)*	$+8.29^{***}$ *(7.3%)*	$+30.9^{***}$ *(27.2%)*	$+5.71^{***}$ *(5%)*	-7.2^{***} *(-6.4%)*	-10.76^{***} *(-9.5%)*	-17.49^{***} *(-15.4%)*	-5.55^{***} *(-4.9%)*
What_k^A	$+1.71$ *[-9.3%]*	$+4.8^{***}$ *[57.9%]*	$+7.49^{***}$ *[24.2%]*	-2.19^{***} *[-38.3%]*	-3.96^{***} *[55%]*	$+2.49^{***}$ *[-23.1%]*	-5.32^{***} *[30.4%]*	-2.86^{***} *[51.5%]*
When_k^A	-2.18^{***} *[11.8%]*	-0.13 *[-1.6%]*	-0.24^{**} *[-0.8%]*	$+1.01^{***}$ *[17.7%]*	$+0.34^{***}$ *[-4.8%]*	$+0.09$ *[-0.8%]*	-3.76^{***} *[21.5%]*	-0.2^{**} *[3.6%]*
Where_k^A	-11.37^{***} *[61.7%]*	$+0.49^{**}$ *[5.9%]*	$+10.71^{***}$ *[34.7%]*	$+5.53^{***}$ *[96.8%]*	-0.23 *[3.2%]*	-7.08^{***} *[65.8%]*	-3.92^{***} *[22.4%]*	-3.93^{***} *[70.8%]*
$(\phi_k + \psi_k)/2$	-6.6^{***} *[35.8%]*	$+3.14^{***}$ *[37.8%]*	$+12.95^{***}$ *[41.9%]*	$+1.36^{***}$ *[23.8%]*	-3.36^{***} *[46.6%]*	-6.26^{***} *[58.2%]*	-4.49^{***} *[25.6%]*	$+1.44^{***}$ *[-25.9%]*

*** *denotes different from zero with at least 99% confidence,* ** *for 95% and* * *for 90%.*
Notes: The top panel of the table reports the average housing prices differences across POs (expressed in thousand euros of *differences from the regional average*). The bottom panel reports the Gelbach (2016)'s decomposition of these differences across POs, both expressed in thousand euros and in percent of the first row. The respective components concern housing characteristic (What_k^A), transaction year (When_k^A), housing location (Where_k^A). The direct PO effect noted $(\phi_k + \psi_k)/2$ corresponds to the unexplained part of differences (subsection A.3 in OA reports the formulas we use).

Blue Collar, Clerk, Intermediate, and Independent), and those that buy at a higher price than they sell (Retired and Senior Staff). The buying and selling prices are significantly different for all POs (top panel of Table 5) and these differences are more marked for Blue Collar (with an average decrease of about 15.12 thousand euros for each transaction) and for Retired (with a corresponding increase of 10.64 thousand euros). Such contrasted price gaps produce heterogeneous NHW accumulation that our conceptual framework allows to balance with the three others NHW components.[21]

Table 5.: Decomposition of average housing price differences within POs

	Differences across Professional Occupations (POs)							
	Farmer	Indep.	S.Staff	Interm.	Clerk	B.Collar	Inactive	Retired
Price Diff.	$+0.99^{***}$ *(0.9%)*	-10.44^{***} *(-9.2%)*	$+4.84^{***}$ *(4.3%)*	-6.74^{***} *(-5.9%)*	-8.44^{***} *(-7.4%)*	-15.12^{***} *(-13.3%)*	-5.81^{***} *(-5.1%)*	$+10.64^{***}$ *(9.4%)*
What_k^P	$+1.92^{***}$ *[193.4%]*	$+1.89^{***}$ *[-18.1%]*	$+5.89^{***}$ *[121.7%]*	$+1.35^{***}$ *[-20%]*	-2.59^{***} *[30.7%]*	-3.01^{***} *[19.9%]*	-10.49^{***} *[180.7%]*	-4.09^{***} *[-38.5%]*
When_k^P	-0.29^{***} *[-29%]*	-0.92^{***} *[8.8%]*	$+0.4^{***}$ *[8.3%]*	-0.57^{***} *[8.5%]*	-0.18^{***} *[2.1%]*	-0.97^{***} *[6.4%]*	$+2.6^{***}$ *[-44.8%]*	-0.26^{***} *[-2.5%]*
Where_k^P	-3.33^{***} *[-335.3%]*	-5.4^{***} *[51.7%]*	-2.83^{***} *[-58.4%]*	-2.82^{***} *[41.9%]*	-2.25^{***} *[26.7%]*	-5.35^{***} *[35.4%]*	$+1.34^{***}$ *[-23%]*	$+3.65^{***}$ *[34.3%]*
$(\phi_k^P - \psi_k^P)$	$+2.69^{***}$ *[270.9%]*	-6.02^{***} *[57.6%]*	$+1.38^{***}$ *[28.4%]*	-4.69^{***} *[69.6%]*	-3.42^{***} *[40.5%]*	-5.79^{***} *[38.3%]*	$+0.74^{***}$ *[-12.8%]*	$+11.35^{***}$ *[106.7%]*

*** *denotes different from zero with at least 99% confidence,* ** *for 95% and* * *for 90%.*
Notes: The top panel reports average price difference between buying and selling prices (in thousand euros) and the bottom panel reports the Gelbach (2016)'s decomposition both in thousand euros and in percent of the first row. The components are about housing characteristic (What_k^P), transaction year (When_k^P), housing location (Where_k^P), and direct PO effect $(\phi_k^P - \psi_k^P)$ (i.e., the unexplained part). subsection A.3 in OA reports the formulas we use.

[21] The demographic weights $\overline{M}_k^e$ used in the price gaps are directly computed from census data over the two decades, they can be easily recovered from the mobility flows reported in Table B1 of OA.

The What component of housing price differences within POs is positive for those that increase the intrinsic quality of their housing during mobility (Farmer, Independent, Senior Staff, and Intermediate), it is negative for others (Table 5). The When component gives the effect of the transactions timing (differences between years of purchase and sale), it appears to be particularly detrimental for Independent and Blue Collar (probably more constrained in their mobility timing). The Where component represents the location effect of mobility in terms of housing price differences, a positive value indicating a location upgrade (observed only for Retired) whereas all other POs present a downgrade. This is particularly observed for Blue Collar, with a location loss of about 5.35 thousand euros for each homeowner mobility. The unexplained part accounts for about one third of price difference within POs (in absolute values), and they are positive for Retired, Senior Staff, Farmer, and Inactive. We interpret them as the direct effects of POs on the housing market, which produce *ceteris paribus* NHW losses for the others POs (Independent, Intermediate, Clerks, and Blue Collar).

5.5. *Regional net housing wealth accumulation*

By summing the four previous components of regional NHW accumulation separtely for each PO (Equation 2), Table 6 displays a regional NHW accumulation of 47.18 billion current euros over the last two decades. This corresponds to an average accumulation of 2.359 billion euros by year. To get an order of magnitude, the regional annual GDP (also in current euros) was 51 billions in 1997 and 78 billions in 2017.[22] Our estimate of NHW accumulation represents about $47.18/27 = 175\%$ of this yearly nominal increase of the regional value added. Net capital gains (including debt variations) account for 70% of the regional NHW accumulation, and the mobility gaps (access and price) account for the remaining 30%. It is important to note that the increase in the quantity of new loans over the two decades increases the aggregate debt and decreases the NHW accumulation of about 22%. The gross impact of the aggregated price gaps (−2.43 billion euros) is negative because the POs that sold housings at a higher price that they buy (i.e., all POs except Senior Staff and Retired) are over-represented in the mobility flux accumulated over the two decades.

Retired obtains the majority of NHW accumulation (76%), from net capital gains (65.5%) and mobility (34.5%). It is the only PO with four positive NHW accumulation terms and negligible debt variations. Senior Staff earns 10.1% of the regional NHW accumulation, followed by Blue Collar with 6.8%. The structure of these accumulations are nevertheless very different. Blue Collar earns about the double of Senior Staff in terms of capital gains (they are more numerous, and capital gains are balanced across POs), but Senior Staff presents the second highest mobility gap after Retired (whereas Blue Collar has the lowest). Clerk and Intermediate do not present particularly significant NHW accumulation, their capital gain are counter-balanced by their debt increase, despite their positive mobility gap. More anecdotally, Inactive has negative NHW accumulation because their positive capital gain is lower than their negative mobility gap (for a non significant decrease of debt). It is also interesting to note that Independent earns only about 2.5% of regional NHW accumulation because of negative mobility gaps (−30%), despite an average income of 111.2% of the regional average (Table 1). Homeownership does not seem to be so important for this PO.

To try to give some insights at the individual (household) level, NHW accumulation could be alternatively divided by the total quantities of households or only the quan-

[22]Source: https://www.insee.fr/fr/statistiques/5020211.

Table 6.: Regional net housing wealth accumulation and its components

		Distribution across Professional Occupations (POs)							
	ALL	Farmer	Indep.	S.Staff	Interm.	Clerk	B.Collar	Inactive	Retired
Housing wealth	+47.18 *(100%)*	+1.11 *(2.4%)*	+1.96 *(4.1%)*	+4.76 *(10.1%)*	+0.81 *(1.7%)*	+0.1 *(0.2%)*	+3.22 *(6.8%)*	−0.58 *(-1.2%)*	+35.8 *(75.9%)*
Capital gain	+43.51 *(100%)* *[92.2%]*	+1.57 *(3.6%)* *[141%]*	+2.6 *(6%)* *[133%]*	+2.89 *(6.6%)* *[60.7%]*	+4.04 *(9.3%)* *[497.6%]*	+1.76 *(4%)* *[1791%]*	+5.94 *(13.7%)* *[184.7%]*	+1.32 *(3%)* *[-226.8%]*	+23.39 *(53.8%)* *[65.3%]*
Debt variation	−10.48 *(100%)* *[-22.2%]*	+0.14 *(1.3%)* *[12.3%]*	−0.06 *(-0.5%)* *[-2.9%]*	−1.78 *(-17%)* *[-37.4%]*	−6.91 *(-66%)* *[-851.6%]*	−2.84 *(-27.1%)* *[-2894%]*	+0.7 *(6.7%)* *[21.7%]*	+0.19 *(1.8%)* *[-33.2%]*	+0.08 *(0.8%)* *[0.2%]*
Access gap	+16.58 *(100%)* *[35.1%]*	−0.61 *(-3.7%)* *[-54.8%]*	−0.17 *(-1%)* *[-8.7%]*	+3.34 *(20.1%)* *[70.1%]*	+4.4 *(26.5%)* *[541.9%]*	+1.61 *(9.7%)* *[1639%]*	−1.32 *(-8%)* *[-41.1%]*	−1.96 *(-11.8%)* *[336.8%]*	+11.29 *(68.1%)* *[31.5%]*
Price gap	−2.43 *(100%)* *[-5.1%]*	+0.02 *(0.7%)* *[1.4%]*	−0.42 *(-17.2%)* *[-21.4%]*	+0.31 *(12.9%)* *[6.6%]*	−0.71 *(-29.4%)* *[-87.9%]*	−0.43 *(-17.7%)* *[-436.8%]*	−2.1 *(-86.5%)* *[-65.4%]*	−0.14 *(-5.6%)* *[23.2%]*	+1.04 *(42.8%)* *[2.9%]*

Notes: The first column of the table reports the regional variations of net housing wealth and their components (in billion current euros). The following columns report the distribution across POs (in billion current euros). The percents reported in parenthesis are defined by rows (i.e., they sum to 100 in rows) and those reported in brackets are defined by columns (i.e., as percents of the first row).
Sources: *Recensements de la population (INSEE), authors' computations.*

tities of homeowners.[23] Regionally, each homeowner virtually earned on average 58.42 thousand euros of NHW over the two decades, so about 2,921 current euros by year. Retired homeowner earns on average 4,900 euros by year, Senior Staff 3,455 euros, and Blue Collar 1,177 euros. These numbers represent respectively 167%, 120%, and 40% of the regional average. In terms of all households, the social differences are even more marked with 3,796, 2,436, and 584 euros by year (respectively 210%, 135%, and 32.2% of the regional average for the POs in the same order). The net yearly housing wealth attributed to mobility is 876 euros by homeowner and 553 euros by household at the regional scale. The distribution across the main POs is respectively 1,687 and 1,307 euros for Retired, 530 and 374 euros for Senior Staff, and −1,250 and −605 euros for Blue Collar. Accounting for mobility has strong consequences in terms of NHW inequalities, as it appears regressive across POs (i.e., access and price gaps are less positive or more negative for low-status POs).

5.6. *Down-scaling net housing wealth accumulation*

We conclude the presentation of our results by an illustration of down-scaling the distribution of NHW accumulation at the postal code level (Equation 3), knowing that this could be applied on other regions or time periods. The maps of Figure 3 show that the direction of the NHW terms (i.e., their signs) is quite homogeneous within each panel. It describes positive capital gains and access gaps, and negative

[23]Because of the demographic changes over the two decades (Table B1 of OA), we consider the quantities of 2007. These values have the interest to be balanced between those of 1997 and those of 2017, whereas the orders of magnitude of the results do not change if we use the three-year averages.

price gaps.[24] Capital gains split the region in two, the southeastern part presents higher values than the northwestern part. Moreover, the capital gains are highly concentrated in main cities. A rather similar split of the region is observed for the access gaps, while the spatial patterns are more spread around main cities. This indicates that the surrounding areas are attractive for homeowner mobility (with a Switzerland's border particularly visible around the city of *Pontarlier*). Moreover, the distribution of the price gaps gives a first impression of symmetry with the access gaps, where attractive areas (highly positive access gaps) are detrimental for low-status POs (highly negative price gaps) (as observed in Figure C8). Because the access gap prevails in absolute values, the balance on NHW accumulation is generally positive. Looking into the details, some differences appear between the north and the northwest parts of the region, where some low access gaps match with some high price gaps. These postal codes present both a low attractiveness and an amplification NHW differences across POs. Hence, homeowners mobility could produce negative NHW accumulation despite positive capital gains.

Figure C8 in OA reports the distribution of the two mobility gaps across postal codes for the four main POs. It shows that Retired presents high access gaps in the attractive southeastern part of the region, and in the western part close to the cities of *Nevers* (south) and *Sens* (north). The associated price gaps (panel B) are more evenly distributed across postal codes despite the presence of high values in the main cities (and secondary southern cities such as *Beaune* and *Lons-le-Saunier*). The access gaps for Senior Staff display negative values for the two main cities of *Dijon* and *Besançon*, whereas the surrounding postal codes (or secondary cities) present high positive values. This contrasts with the positive price gaps that appear concentrated around the main cities. As indicated by Table 6, the relatively small quantity of Senior Staff leavers makes the price gap relatively unimportant for this PO. Clerk displays a rather homogeneous distribution of access gaps, with strong loss of NHW observed in main cities and some highly negative price gaps (panel F). This pattern is also observed for Blue Collar, with negative access and price gaps in main cities that spread to surrounding postal codes. Blue Collar moves even further from the cities than Clerk, principally close to the Switzerland border and in the northwest part of the region.[25] It is also interesting to note that the price gaps of Blue Collar are inversely related from the attractiveness presented in panel B of Figure 3, i.e., they are more negative in the more attractive southeastern part of the region (Switzerland border).

6. Discussion and conclusion

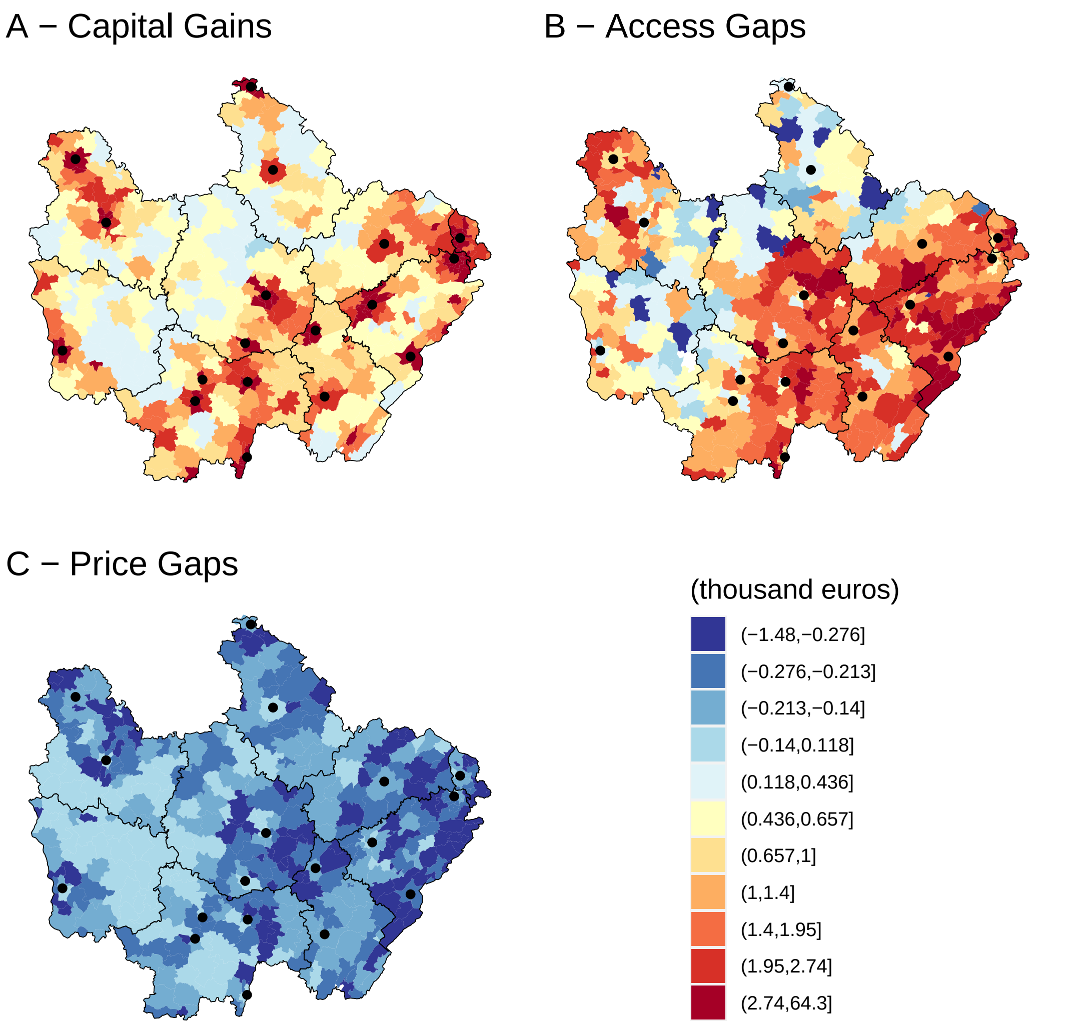
The results from our regional case study indicate a strong regressivity of NHW redistribution associated to housing market dynamics. In particular, the main POs (Senior Staff, Clerk, Blue Collar, and Retired) receive respectively 12.11%, 5.45%, 4.67%, and 66.15% of regional *gross*[26] accumulation (Table 6), whereas they represent 8.53%, 6%, 16.93%, and 45.26% of all homeowners (Table 1). The ratios of these values correspond respectively to +42%, −10%, −72.5%, and +46% of what would be an equal

[24]There are exceptions of negative access gaps in some remote postal codes along a diagonal from the north east to the south west.

[25]By car, the city of Paris is about one hour and half from the city of *Sens* at the northwest of the region.

[26]High negative NHW variations from debt accumulation of Clerk (Table 6) cancels their gross housing wealth accumulation over the period. Because the estimation of debt variations is more uncertain, considering gross housing wealth accumulation provides a more balanced summary of general inequalities across POs.

Figure 3.: Distribution of housing wealth accumulation between postal codes



Notes: The figure displays the spatial distribution of the three terms of gross housing wealth accumulation over the two decades (in thousand current euros by homeowner of 2007). The borders of the eight *départements* are reported in black, and the 16 dots mark the municipalities of the region with more than 15,00 inhabitants. The legend is common for the three maps, representing the decile of the pool of the three mapped variables.
Sources: Authors' computations.

distribution (i.e., where the share of wealth accumulation would be equal to the share of homeowners). The underlying effect of homeowner mobility is striking, as capital gains of stayers are quite homogeneously distributed (Table 2, in accordance with the official wealth survey of Figure C3 in OA). These insights highlight the importance of taking into account changes of principal residences to study NHW inequalities.

Thanks to the labor-based stratification we use, the differentiated NHW accumulation we obtain could be related to labor market outcomes both at an aggregate scale (e.g., desindustrialization is detrimental for Blue Collar and tertiarization is favorable for Senior Staff, as it appears in Figure 2) and at more local scales (e.g., decrease of unitary transportation costs allows the labor force to live further from urban centers,

Figure 3, and Switzerland offers higher unskilled wages, Figure C8 in OA). Nevertheless, our results also indicate a strong inter-generational redistribution of NHW, with 76% of accumulation earned by Retired (Table 6). This contrasts with the expected life-cycle transformation of NHW into consumption (as observed by Glaeser and Gyourko 2018 in the United States), and suggests a reinforcement of the generational NHW gap. A next step would be to study the role that taxation could have to mitigate the inequality generated by inter-generational transfers (Kopczuk 2013). Moreover, the context of aging population is barely investigated in occidental fields, whereas its predicts next issues in the following decades, as some works on Japan has recently exposed (Uto, Nakagawa, and Buhnik 2023).

Conceptually, this paper defines and estimates two original gaps that are shown to be determinant for NHW accumulation. These price and access gaps are related to homeowner mobility by recognizing that a change of principal residence implies a housing purchase sale, a housing purchase, or both. Thereby, for a given social group in a given spatial entity, increasing the number of comers or the average buying price lead to a *ceteris paribus* increase of NHW, as a decrease of the number of leavers or the average selling price (Equation 2). In addition, while POs and spatial entities are merely control variables in most studies about NHW, our conceptual framework put them at the forefront of the analysis and provides a complementary picture of wealth redistribution operated by the housing markets. We hope that this approach would gain to be replicated for other regions, social classifications, or time periods.

In terms of limitations, the selection of this particular French region and the available data raises the usual concern regarding the ability to extrapolate the findings to broader observations on inequalities. The choice of BFC specifically enables us to characterize ordinaries instances of inequality in territories comprised of small and medium-sized urban networks. This case study diversifies and enhances the extensive body of international literature that predominantly concentrates on metropolitan regions. It is pivotal as almost all western countries have such under-studied mixed areas. Moreover, we consider NHW accumulation only from main residences that are occupied by owners. Taking into account inheritance and parental wealth (Hochstenbach 2018), as well as multi-ownership (Kadi, Hochstenbach, and Lennartz 2020), would probably reinforce our results. For instance, multiple ownership exhibits a strong spatial concentration, predominantly held by a small group of wealthy individuals (André and Meslin 2021). As this pattern is correlated with the value of owners primary residence and income (INSEE 2021), it would intensified the disparities observed.

In line with most social stratification approaches in France, the quantitative evidences provided in this paper consider POs as a proxy for the socio-economic status of households. POs are expected and shown to describe sufficiently differentiated situations to be translated in significant NHW differences. Notwithstanding that the focus on POs has a strong social meaning in the literature, POs are not directly related to purchasing power (such as income) or live-cycle position (such as age), and perhaps less suited for international comparisons. But the methodological framework and the estimation process we propose can be applied in other context on several social groups (income, gender, age, racial) that may be present in other usual data sources (housing transactions, mortgage contract, population census). Reproducing such work from a gender perspective would be particularly enlightening to study housing wealth inequalities as a patriarchal social reproduction system (Bessière and Gollac 2023).

We also note that our study of mobility in terms of an access and a prices gap is mostly descriptive and does not attempt to disentangle their causes. For the access gap, both replacement and displacement phenomenon based on labor and housing markets dynamics could help to highlight the underlying social process. For the price gap, we refer to the direct influence of the socio-economic status of buyers and sellers on the housing market. Instead of looking for a market price of a given housing, our focus shifts towards understanding price-induced inequalities. Considering social groups does not necessarily lead to a clear interpretation of the mechanism in this study, and our results should cross other studies to highlight more precise socio-spatial phenomenon. Prices gaps would have other causalities in terms of capital circulation, investments strategies, and consumption across social groups, but also in terms of housing markets segmentation. This lead to different hypothesis, including capital switching between housing and other markets as well as between places in mobility pathway of social groups. Regardless of these underlying reasons, we show that significant housing price gaps across social groups or spatial entities have distinct patterns of NHW accumulation. This paved the way to future research looking to give a better understanding of the inequalities generated by residential mobility.

In terms of perspectives, we now know that COVID-19 crisis has had significant repercussions on housing markets. The surge in demand for housing, driven by changing preferences due to lockdown and remote work, coupled with supply chain disruptions, has led to rising housing prices. Additionally, central banks and policymakers have responded with accommodative monetary policies, resulting in increased interest rates to curb inflationary pressures. As a consequence, credit access for homeownership have become more challenging, particularly for young households and lower social groups. Looking towards the long run, a critical consideration is the demographic landscape of European Western countries. The aging population and the increasing number of retirees massively homeowners could lead to even more marked NHW imbalances. With fewer new entrants into homeownership and a decline in demand from younger generations, there might be a relative surplus of housing assets in certain regions. This potential surplus and the prospect of housing asset depreciation carry significant implications, particularly for peripheral areas and neighborhoods with lower socioeconomic statuses. As seen in Japan, such depreciation tends to primarily affect less valued housing stock, exacerbating housing inequalities and urban disparities.

Lastly, our focus on a widespread immobile asset (housing) allows us to provide a both socially and spatially explicit analysis of NHW inequalities. This could be view as a step toward the better integration of social and spatial phenomena into the usual macro-economic analysis of the dynamics of wealth inequality. The quantitative framework and statistical estimations we propose provide a consistent decomposition of the economic importance of each term of accumulation, which would allow researchers to balance NHW with other sources of wealth, but also with other regions or other time periods. The conceptual framework we propose appears sufficiently versatile to be replicated in future studies and to inform local public policies.

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Homeowner Mobility and Housing Wealth Accumulation across Professional Occupations

Online Appendix (not for publication)

Appendix A. Additional technical material

A.1. *Index of mathematical notations*

Table A1.: Description of mathematical notations

Theoretical notations	
ΔW	Regional net housing wealth accumulation
S	Quantity of stayers (homeowners that keep their principal residence)
C	Quantity of comers (households that arrive to homeownership)
L	Quantity of leavers (households that go out of homeownership)
Δp	Average capital gains (housing price variations for stayers)
ΔB	Regional debt variations related to homeownership
p^C	Average price of housings bought by comers
p^L	Average price of housings sold by leavers
$\overline{p}$	Average housing price used as weight in the access gap $= (p^C + p^L)/2$
$\overline{M}$	Average mobility flow used as weight in the price gap $= (C + L)/2$
m, r	Respectively loan maturity and interest rate
a, b	Respectively annual quantity and average value of newly contracted loan
B	Cumulative stock of debt from contracted loan
Indexing notations	
k	Professional occupations, with $\mathbb{K}$ the set of all considered POs
e	Decades, with $e = 1, 2, I, II$ for 1978–1987, 1988–1997, 1998–2007, 2008-2017
c	Spatial entities, with $\mathbb{C}$ the set of all considered postal codes
i	Transactions of principal residences, with $\mathbb{N}$ the whole considered sample
t, s	Years, used both for housing transactions and debt imputation
Empirical notations	
p	Housing price observed from individual housing transaction
PO	Dummy variable about the professional occupation of buyer *or* seller
POC	Dummy variable about the professional occupation of buyer/comer
POL	Dummy variable about the professional occupation of seller/leaver
α, ϕ, ψ	Average housing prices between PO, from associated dummy variable
θ	Average annual capital gain for stayer
μ	Intercept in the second regression model of housing price
ϵ, ε	Errors in both regression models of housing price
$\boldsymbol{X}$	Set of control variables about housing characteristics in regression model
$\boldsymbol{\beta}$	Hedonic values, from the associated variables of housing characteristics
η, γ	Spatial and temporal fixed effects, used to control for location and timing

A.2. *Imputation of debt variations*

We are interested in estimating regional housing debt variations ΔB_k^e for each PO $k \in \mathbb{K}$ and each decade $e = I, II$. By noting $\overline{B}_{kt_1}$ the aggregated stock of debt for the PO k the first year t_1 of the decade e and by noting t_2 the last year of the same decade, we have simply $\Delta B_k^e = \overline{B}_{kt_2} - \overline{B}_{kt_1}$. Hence, an increase in the stock of debt (from a new loan contracted by the PO k during the decade e) impacts positively ΔB_k^e, whereas a repayment of an existing loan contract impacts negatively the variation ΔB_k^e.

For the loans contracted before 1998 (the first year of $e = I$ for which we compute net housing wealth accumulation), debt variation is only impacted by repayments and corresponding decreases of the stock. Considering separately each decade $e = 1, 2$ (respectively 1978–1987 and 1988–1997), we estimate socially differentiated (i) loan values $\overline{b}_{ke}$ from average housing prices and (ii) numbers of new loans $\overline{a}_{ke}$ from aggregate numbers of comers in population census. For a given interest rate $\overline{r}_1$, a same amount $\overline{B}_{ke} \equiv \overline{a}_{ke}\overline{b}_{ke}(1 + \overline{r}_e)$ is contracted each year of each prior decade $e = 1, 2$.

These prior loans imply an annual repayment of $\overline{B}_{ke}/20$ each year in the next $\overline{m} = 20$ years (i.e., loans from $e = 1$ are repaid in $e = 2, I$ and loans from $e = 2$ are repaid in $e = I, II$). More precisely, the annual repayments $\overline{B}_{k1}/20$ from the decade $e = 1$ are paid 10 times in 1998, nine times in 1999, and so on. Hence, the total repaid amount during the decade $e = I$ is $2.75 \times \overline{B}_{k1}$ (because $(10 + 9 + \cdots + 1)/20 = 2.75$). For the loans contracted during the second prior decade $e = 2$, the annual amount contracted is $\overline{B}_{k2} \equiv \overline{a}_{k2}\overline{b}_{k2}(1 + \overline{r}_2)$, which is repaid 10 times each year of the decade $e = I$, for a total repayment of $5 \times \overline{B}_{k2}$ (because $10 \times 10/20 = 5$). For the second decade $e = II$ of interest, loans from the first prior decade ($e = 1$) are totally repaid (as the maturity is assumed to be fixed at $\overline{m} = 20$ years), and the repayments from debt contracted during the second prior decade ($e = 2$) count for $2.75 \times \overline{B}_{k2}$.

The following Table A2 displays the structure of our computations. We report both the contracted loans and the repayment according to the corresponding decades of both contraction and repayments. For the first and the second rows, there is no increase of the aggregated debt during the repayment periods of interest (by definition).

For the loans contracted during the two decades of net housing wealth accumulation ($e = I, II$), we compute annual increase of debt from individual data about subsidized loans contracted by each PO (as reported in the main text, obtaining subsidized loans was not really restrictive and we assume they are representative). For each year t and each PO k, we compute both average loan amounts b_{kt}, average interest rates r_{kt}, and average maturities m_{kt}. As for prior decades, we obtain the total numbers of loans $\overline{a}_{ke}$ from the numbers of comers in the population census. The additional debt (interest included) from new loans of the PO k during the current decades $e = I, II$ are then computed from the formula $\overline{a}_{ke}\ \Sigma_{t\in e} b_{kt}(1 + r_{kt})$.

The yearly repayments from the loans contracted in $e = I, II$ are $\overline{a}_{ke} \cdot b_{ks}(1 + r_{ke})/m_{ks}$ with s the year of contraction (different from the year t of repayment). As long as households only repay for loans contracted before t, the decadal repayments from these recently contracted loans are cumulatively equal to $\overline{a}_{ke} \cdot \Sigma_t \Sigma_{s<t}\ b_{ks}(1 + r_{ke})/m_{ks}$. Finally, the aggregate debt variations are the sums of the values of contracted loans minus repayments that appear in Table A2 to recover the Equation 8 of the main text:

$$\Delta B_k^e = \overline{a}_{ke} \cdot \left[\Sigma_{t\in e}\ b_{kt}(1 + r_{ks}) - \Sigma_{s<t}\ b_{ks}(1 + r_{ks})/m_{ks}\right] - \overline{B}_{ke}.$$

This last formula provides the regional variation of housing debts for each PO k over the decade e.

Table A2.: Contracted loans and repayments for aggregated debt imputations

Contraction decade	*Repayment decade* 1998–2007 ($e = I$)	2008–2017 ($e = II$)
1978–1987 ($e = 1$)	Yearly contracted debt: $\overline{B}_{k1} \equiv \overline{a}_{k1}\overline{b}_{k1}(1 + \overline{r}_1)$ Decadal repayment: $\overline{B}_{1I} = 2.75 \times \overline{B}_{k1}$	No repayment
1988–1997 ($e = 2$)	Yearly contracted debt: $\overline{B}_{k2} \equiv \overline{a}_{k2}\overline{b}_{k2}(1 + \overline{r}_2)$ Decadal repayment: $\overline{B}_{2I} = 5 \times \overline{B}_{k2}$	Yearly contracted debt: $\overline{B}_{k2} \equiv \overline{a}_{k2}\overline{b}_{k2}(1 + \overline{r}_2)$ Decadal repayment: $\overline{B}_{2II} = 2.75 \times \overline{B}_{k2}$
1998–2007 ($e = I$)	Decadal loan contraction: $\overline{a}_{kI}\Sigma_{t\in I}b_{kt}(1 + r_{ks})$ Decadal repayment: $\overline{a}_{kI}\Sigma_{t\in I}\Sigma_{s<t}b_{ks}(1 + r_{ks})/m_{ks}$	Decadal repayment: $\overline{a}_{kI}\Sigma_{t\in II}\Sigma_{s<t}b_{ks}(1+r_{ks})/m_{ks}$
2008–2017 ($e = II$)	No repayment	Decadal loan contraction: $\overline{a}_{kII}\Sigma_{t\in II}b_{kt}(1 + r_{kt})$ Decadal repayment: $\overline{a}_{kII}\Sigma_{t\in II}\Sigma_{s}b_{ks}(1 + r_{ks})/m_{ks}$

A.3. *Gelbach's decomposition*

The main principle of Gelbach's decomposition is to compare the regression coefficients of some dummy variables (about the POs of buyers and sellers in Equation 6 and Equation 7 of the main text) with and without including control variables (about housing characteristics, locations, and years of transaction here). The two main advantages of this decomposition is to be uniquely defined with correlated control variables (which is not the case for the analysis of variance that requires a factorial design) and to be independent from the sequence of inclusion of control variables (which is not the case for the partial-R^2 used in classical regression analysis). From the terminology of Gelbach (2016), Equation 6 (without controls) is the *base* model and Equation 7 (with controls) is the *full* model. Formulas provided by Gelbach (2016) allow to decompose the differences between $\tilde{\phi}_k$ and ϕ_k, and between $\tilde{\psi}_k$ and ψ_k for each PO k.

The empirical implementation is rather simple. From the full model (Equation 7), we obtain (for each transaction) partial housing price predictions according to housing characteristics ($\mathbf{X}_i\widehat{\boldsymbol{\beta}}$), housing locations ($\widehat{\eta}_{c_i}$), and transaction years ($\widehat{\gamma}_{t_i}$). These partial predictions do not account for the POs of buyers and sellers, so they represent housing price variations from observed explanatory variables. Separately regressing each of these partial predictions (i) on the dummy variables about the POs of buyers ($\mathbf{1}[POC_i = k]$ in the main text) and (ii) on the dummy variables about the POs of sellers ($\mathbf{1}[POL_i = k]$ in the main text), we obtain six sets of coefficients from each two separate regressions and each three partial predictions.[27]

Each set of coefficients is the average of predicted housing prices from the three sets of observed housing and transaction differences between each PO $k \in \mathbb{K}$ (both for buyers and sellers). Gelbach (2016) formally establishes that [equation (12), p.522, adapting his notations to ours]:

$$\tilde{\phi}_k - \phi_k = \delta_{\phi k}^{\text{What}} + \delta_{\phi k}^{\text{Where}} + \delta_{\phi k}^{\text{When}} \quad \text{and} \quad \tilde{\psi}_k - \psi_k = \delta_{\psi k}^{\text{What}} + \delta_{\psi k}^{\text{Where}} + \delta_{\psi k}^{\text{When}}.$$

Then, since $\overline{p}_k = (\tilde{\phi}_k + \tilde{\psi}_k)/2$ (from the definition of the access gap in the main paper) and $p_k^C - p_k^L = \tilde{\phi}_k - \tilde{\psi}_k$ (from the definition of the price gap), the decomposition terms reported in Equation 8 and Equation 9 of the main text are recovered from:

$$\begin{aligned}
\text{What}_k^A &= (\hat{\delta}_{\phi k}^{\text{What}} + \hat{\delta}_{\psi k}^{\text{What}})/2 & \qquad \text{What}_k^P &= \hat{\delta}_{\phi k}^{\text{What}} - \hat{\delta}_{\psi k}^{\text{What}} \\
\text{Where}_k^A &= (\hat{\delta}_{\phi k}^{\text{Where}} + \hat{\delta}_{\psi k}^{\text{Where}})/2 & \qquad \text{Where}_k^P &= \hat{\delta}_{\phi k}^{\text{Where}} - \hat{\delta}_{\psi k}^{\text{Where}} \\
\text{When}_k^A &= (\hat{\delta}_{\phi k}^{\text{When}} + \hat{\delta}_{\psi k}^{\text{When}})/2 & \qquad \text{When}_k^P &= \hat{\delta}_{\phi k}^{\text{When}} - \hat{\delta}_{\psi k}^{\text{When}}
\end{aligned}$$

Table 4 of the main text reports the terms of the first column and Table 5 reports the terms of the second column from the equations above. Because $\overline{p}_k = \text{What}_k^A + \text{Where}_k^A + \text{When}_k^A + (\phi_k + \psi_k)/2$ and $p_k^C - p_k^L = \text{What}_k^P + \text{Where}_k^P + \text{When}_k^P + (\phi_k - \psi_k)$, we can safely express them in differences from the regional average. Standard errors are computed according to the formulas provided by Gelbach (2016).

[27] We note the six sets of obtained coefficients respectively $\delta_{\phi k}^{\text{What}}$ for the regression of partial predictions from housing characteristics on dummies about the POs of buyers, $\delta_{\psi k}^{\text{What}}$ for the regression of partial predictions from housing characteristics on dummies about the POs of sellers, $\delta_{\phi k}^{\text{Where}}$ for the regression of partial predictions from housing locations on dummies about the POs of buyers, and so on.

Appendix B. Additional Tables

Table B1.: Descriptive statistics about the three census waves and inter-census periods

		Distribution across Professional Occupations (POs)							
	ALL	Farmers	Indep.	S.Staff	Interm.	Clerks	B.Collar	Inactive	Retired
First wave of population census (1997)									
# Households	1252.9	32.28	62.84	80.3	156.21	118.05	294.57	97.26	411.43
	(100%)	*(2.6%)*	*(5%)*	*(6.4%)*	*(12.5%)*	*(9.4%)*	*(23.5%)*	*(7.8%)*	*(32.8%)*
# Homeowners	736	24.4	44.03	51.1	90.98	42.95	140.39	37.83	304.31
	(100%)	*(3.3%)*	*(6%)*	*(6.9%)*	*(12.4%)*	*(5.8%)*	*(19.1%)*	*(5.1%)*	*(41.3%)*
	[58.7%]	*[75.6%]*	*[70.1%]*	*[63.6%]*	*[58.2%]*	*[36.4%]*	*[47.7%]*	*[38.9%]*	*[74%]*
Variations during decade I (1997–2007)									
# Stayers	499.6	13.57	20.54	29.49	45.13	21.63	64.02	15.28	289.96
	(100%)	*(2.7%)*	*(4.1%)*	*(5.9%)*	*(9%)*	*(4.3%)*	*(12.8%)*	*(3.1%)*	*(58%)*
	[61.9%]	*[66%]*	*[50.1%]*	*[42.8%]*	*[43.4%]*	*[44.7%]*	*[46.8%]*	*[68%]*	*[79.3%]*
# Comers	307.8	6.98	20.45	39.4	58.9	26.79	72.67	7.18	75.48
	(100%)	*(2.3%)*	*(6.6%)*	*(12.8%)*	*(19.1%)*	*(8.7%)*	*(23.6%)*	*(2.3%)*	*(24.5%)*
	[38.1%]	*[34%]*	*[49.9%]*	*[57.2%]*	*[56.6%]*	*[55.3%]*	*[53.2%]*	*[32%]*	*[20.7%]*
# Leavers	236.4	10.83	23.48	21.61	45.84	21.33	76.37	22.56	14.34
	(100%)	*(4.6%)*	*(9.9%)*	*(9.1%)*	*(19.4%)*	*(9%)*	*(32.3%)*	*(9.5%)*	*(6.1%)*
	[29.3%]	*[52.7%]*	*[57.3%]*	*[31.4%]*	*[44.1%]*	*[44.1%]*	*[55.9%]*	*[100.4%]*	*[3.9%]*
Second wave of population census (2007)									
# Households	1302.7	25.39	56.29	97.74	170.52	130.53	275.73	74.91	471.59
	(100%)	*(1.9%)*	*(4.3%)*	*(7.5%)*	*(13.1%)*	*(10%)*	*(21.2%)*	*(5.8%)*	*(36.2%)*
# Homeowners	807.5	20.54	40.99	68.89	104.03	48.42	136.69	22.46	365.44
	(100%)	*(2.5%)*	*(5.1%)*	*(8.5%)*	*(12.9%)*	*(6%)*	*(16.9%)*	*(2.8%)*	*(45.3%)*
	[62%]	*[80.9%]*	*[72.8%]*	*[70.5%]*	*[61%]*	*[37.1%]*	*[49.6%]*	*[30%]*	*[77.5%]*
Variations during decade II (2007–2017)									
# Stayers	573.9	11.97	23.69	37.37	63.15	27.63	67.69	11.54	330.84
	(100%)	*(2.1%)*	*(4.1%)*	*(6.5%)*	*(11%)*	*(4.8%)*	*(11.8%)*	*(2%)*	*(57.7%)*
	[66.2%]	*[67%]*	*[55.6%]*	*[50.3%]*	*[49.1%]*	*[46.6%]*	*[53%]*	*[66.3%]*	*[82.8%]*
# Comers	293.2	5.9	18.94	36.9	65.39	31.62	59.95	5.85	68.64
	(100%)	*(2%)*	*(6.5%)*	*(12.6%)*	*(22.3%)*	*(10.8%)*	*(20.4%)*	*(2%)*	*(23.4%)*
	[33.8%]	*[33%]*	*[44.4%]*	*[49.7%]*	*[50.9%]*	*[53.4%]*	*[47%]*	*[33.7%]*	*[17.2%]*
# Leavers	237.9	8.52	17.3	31.55	41.53	21.94	69.1	10.91	37.05
	(100%)	*(3.6%)*	*(7.3%)*	*(13.3%)*	*(17.5%)*	*(9.2%)*	*(29%)*	*(4.6%)*	*(15.6%)*
	[27.4%]	*[47.7%]*	*[40.6%]*	*[42.5%]*	*[32.3%]*	*[37%]*	*[54.1%]*	*[62.8%]*	*[9.3%]*
Third wave of population census (2017)									
# Households	1371.5	21.61	57.75	103.06	195.91	139.1	248.31	77.34	528.44
	(100%)	*(1.6%)*	*(4.2%)*	*(7.5%)*	*(14.3%)*	*(10.1%)*	*(18.1%)*	*(5.6%)*	*(38.5%)*
# Homeowners	867.1	17.87	42.63	74.27	128.54	59.24	127.64	17.39	399.48
	(100%)	*(2.1%)*	*(4.9%)*	*(8.6%)*	*(14.8%)*	*(6.8%)*	*(14.7%)*	*(2%)*	*(46.1%)*
	[63.2%]	*[82.7%]*	*[73.8%]*	*[72.1%]*	*[65.6%]*	*[42.6%]*	*[51.4%]*	*[22.5%]*	*[75.6%]*

Notes: The table details the regional variations in terms of quantities of households, homeowners, stayers, comers, and leavers (in thousands). The percents reported in parenthesis are defined by rows (i.e., they sum to 100 in rows) and the percents reported in brackets are defined by columns (i.e., as percents of all households for homeowners and as percents of homeowners for other rows). The region counts 1.253 millions of households in 1997, with a homeownership rate of 58.7%, from which 3.3% are Farmer (about 24.4 thousand households). Sources: *Recensements de la population 1997, 2007, and 2017 (INSEE).*

Table B2.: Statistics about housing transactions according to the POs of sellers

	Farmers	Indep.	S.Staff	Interm.	Clerks	B.Collar	Inactiv.	Retired
Housing price (in hundred current euros)								
min	10.6	10.06	10.16	10.2	10.06	10.18	10.06	10
mean	93.69	126.18	141.04	121.89	109.58	109.66	97.75	101.59
st.dev.	71.92	87.98	91.08	70.41	62.38	59.48	69.44	67.99
max	772.5	975.67	989.5	952	708.65	686	996	850
Living Area (in square meters)								
min	9	5	5	5	6	5	8	5
mean	95.74	100.48	102.09	93.17	91.13	95.01	95.06	92.86
st.dev.	49.49	55.39	54.55	46.19	43.89	42.2	48.29	46.92
max	480	2675	1454	2260	2448	2010	1990	3070
Lot size (in square meters)								
min	0	0	0	0	0	0	0	0
mean	2347.04	1127.89	992.54	858.98	867.94	926.3	1392.38	1386.91
St.dev.	6805.37	3410.49	3221.34	3012.47	2454.86	2356.99	4378.65	3966.43
max	94260	86230	98205	265487.95	97510	109577.68	98035	131014
Number of pieces (continuous)								
min	1	1	1	1	1	1	1	1
mean	4.05	4.35	4.48	4.21	4.13	4.29	4.2	4.12
St.dev.	1.93	1.96	2.03	1.76	1.66	1.58	1.81	1.79
max	15	15	15	15	15	14	15	15
Construction date (dummies)								
Before 1850	758 (28)	3,313 (17)	4,984 (15)	7,234 (14)	5,174 (14)	4,008 (15)	2,904 (19)	19,080 (17)
1851–1913	563 (21)	2,876 (15)	4,337 (13)	6,550 (13)	4,654 (13)	3,769 (14)	2,582 (17)	17,617 (16)
1914–1947	321 (12)	2,233 (12)	3,481 (10)	5,254 (10)	3,998 (11)	3,041 (11)	1,980 (13)	14,510 (13)
1948–1969	338 (12)	3,159 (16)	5,930 (18)	9,827 (19)	7,193 (20)	4,735 (17)	3,172 (21)	24,472 (22)
1970–1979	349 (13)	2,947 (15)	5,873 (18)	9,102 (18)	6,754 (18)	4,543 (17)	2,425 (16)	21,595 (20)
1980–1991	189 (7)	1,867 (10)	3,889 (12)	5,559 (11)	4,031 (11)	3,064 (11)	1,066 (7)	7,665 (7)
1992–2000	112 (4)	1,380 (7)	2,546 (8)	3,564 (7)	2,176 (6)	1,670 (6)	446 (3)	3,198 (3)
2001–2010	89 (3)	1,272 (7)	2,026 (6)	3,372 (7)	2,414 (7)	2,080 (8)	432 (3)	1,895 (2)
After 2011	10 (0)	193 (1)	156 (0)	390 (1)	298 (1)	311 (1)	64 (0)	140 (0)
Additional attributes (dummies)								
Cave	1,502 (55)	10,927 (57)	20,778 (63)	31,261 (61)	22,098 (60)	15,142 (56)	9,012 (60)	70,970 (64)
Parking	1,290 (47)	10,833 (56)	20,114 (61)	29,663 (58)	21,504 (59)	16,240 (60)	8,290 (55)	64,691 (59)
Balcony	115 (4)	1,293 (7)	3,095 (9)	4,310 (8)	2,691 (7)	1,592 (6)	864 (6)	7,583 (7)
Cellar	335 (12)	2,456 (13)	4,301 (13)	6,589 (13)	4,775 (13)	3,412 (13)	1,638 (11)	14,392 (13)
Terrace	137 (5)	1,902 (10)	3,601 (11)	4,758 (9)	3,157 (9)	2,265 (8)	1,003 (7)	8,150 (7)
Elevator	138 (5)	1,387 (7)	3,903 (12)	5,278 (10)	3,303 (9)	1,595 (6)	1,066 (7)	8,728 (8)
Garden	34 (1)	514 (3)	858 (3)	1,520 (3)	928 (3)	706 (3)	269 (2)	1,603 (1)
Loggia	68 (2)	599 (3)	1,710 (5)	2,502 (5)	1,715 (5)	930 (3)	579 (4)	4,630 (4)

Notes: This table provides the main descriptive statistics about retained housing transactions of the 1997–2017 period, according to the POs of sellers (in columns). The data count 295,199 housing transactions of principal housings between private persons. Some filters are applied before performing the econometric analysis, about dropping observations without a geo-referenced identifier, omitted values on a variable of interest, and housing prices higher than one millions euros or lower than 10 thousands. The raw data, before filtering, counted exactly 387,831 transactions.
Source: *Perval (Notaires)*.

Table B3.: Raw regression coefficients for housing prices and capital gains

	Dep. var.: Housing price in thousand current euros					
	Decade I: 1998–2007			**Decade II: 2008–2017**		
	(1)	(2)	(3)	(4)	(5)	(6)
Farmer	-22.08***	-20.59***	-26.98***	-25.36***	-33.03***	-29.17***
	(4.691)	(3.625)	(6.576)	(5.108)	(4.110)	(6.751)
Independent	1.567	0.6579	-1.606	8.839***	-3.355	-4.639
	(2.149)	(2.290)	(3.297)	(2.246)	(2.573)	(3.833)
Senior Staff	20.75***	30.34***	21.19***	31.89***	34.68***	26.73***
	(1.915)	(2.012)	(4.025)	(1.982)	(2.249)	(3.320)
Intermediate	-6.427***	2.413	-4.720*	-7.561***	-5.172**	-7.646**
	(1.803)	(1.823)	(2.835)	(1.898)	(2.040)	(3.013)
Clerk	-12.87***	-9.229***	-10.64***	-20.69***	-19.91***	-19.05***
	(1.836)	(1.919)	(2.571)	(1.914)	(2.154)	(2.721)
Blue Collar	-20.70***	-19.40***	-18.17***	-25.64***	-31.37***	-30.04***
	(1.917)	(1.922)	(2.769)	(1.990)	(2.164)	(2.596)
Inactive	-16.47***	-14.81***	-8.770**	-20.22***	-25.18***	-10.51
	(2.928)	(2.905)	(3.426)	(3.481)	(3.822)	(6.423)
Retired	-12.92***	-8.465***	-2.916	-7.383***	-12.82***	-7.037***
	(1.838)	(1.837)	(3.190)	(1.957)	(2.031)	(2.695)
time	9.463***	10.33***	10.23***	-0.0296	-0.9084*	-0.0239
	(0.4523)	(0.4831)	(0.7889)	(0.5000)	(0.5322)	(0.7297)
Farmer × time	0.8483	-0.0823	1.162	1.942**	2.380***	0.9645
	(0.8308)	(0.6387)	(1.169)	(0.9477)	(0.7432)	(1.362)
Independent × time	0.9273**	0.9239**	0.7770	0.5900	2.152***	1.646**
	(0.3623)	(0.3889)	(0.6377)	(0.4121)	(0.4478)	(0.7779)
Senior Staff × time	1.795***	0.5401	0.3966	0.1300	0.0671	-0.4459
	(0.3223)	(0.3454)	(0.6558)	(0.3539)	(0.3797)	(0.5754)
Intermediate × time	-0.0259	-0.6843**	-0.3298	0.0674	0.4238	-0.1466
	(0.3039)	(0.3094)	(0.5015)	(0.3370)	(0.3422)	(0.4900)
Clerk × time	-1.268***	-1.387***	-1.275***	-0.1645	0.2836	-0.1018
	(0.3078)	(0.3258)	(0.4583)	(0.3395)	(0.3594)	(0.4703)
Blue Collar × time	-0.8250**	-0.9880***	-1.205**	0.4186	0.8421**	0.6665
	(0.3209)	(0.3254)	(0.5012)	(0.3532)	(0.3613)	(0.4446)
Inactive × time	-0.9674*	-0.8732*	-0.8887	0.0775	-0.1558	-0.7435
	(0.5047)	(0.5025)	(0.6680)	(0.5796)	(0.6083)	(0.9488)
Retired × time	0.4851	-0.7128**	-1.011*	-0.9373***	-0.4467	-0.6902
	(0.3119)	(0.3111)	(0.5392)	(0.3442)	(0.3448)	(0.4766)
(Intercept)	83.75***	73.93***		167.7***	168.7***	
	(2.692)	(2.842)		(2.793)	(3.146)	
Postal code fix. eff.	No	No	Yes	No	No	Yes
Weighting schedule	No	Yes	Yes	No	Yes	Yes
Observations	49,849	49,849	49,849	50,608	50,608	50,608
R^2	0.23011	0.22187	0.46229	0.08678	0.08503	0.37459
Within R^2			0.22123			0.07031

Notes: This table reports the raw coefficients α_k^e and θ_k^e from the regression equation (4 of the main text) with different estimation methods. The columns (1) and (4) reports simple OLS regressions of housing prices on PO dummies interacted with a time trend. Columns (2) and (5) are WLS regressions accounting for the distribution of stayers across decades, POs, and postal codes through the weights S_{ck}^e/N_{ck}^e. Then, the columns (3) and (6) are also WLS with the same weights but with postal code fixed effects accounting for spatial heterogeneity. Models of columns (2) and (5) are used in Table 2 of the main paper to compute capital gains.

Table B4.: Raw regression results for the full models of housing prices

	Dep. Var.: Housing price in current euros					
	(1)	(2)	(3)	(4)	(5)	(6)
Housing type [house]	-5,179.9***	-5,108.5***	-1,986.0*	33,572.8***	33,442.6***	33,699.4***
	(1,068.8)	(971.3)	(968.5)	(969.8)	(977.4)	(988.7)
Construction date [< 1913]	-3,153.0***	-3,225.8***	-2,829.3***	-4,719.4***	-4,640.6***	-4,299.8***
	(949.7)	(913.7)	(911.6)	(734.4)	(712.4)	(721.0)
Construction date [1914, 1947]	2,148.4*	2,467.9**	2,417.4**	-5,446.9***	-5,132.4***	-4,900.3***
	(1,112.4)	(1,136.2)	(1,097.6)	(945.0)	(916.9)	(934.4)
Construction date [1948, 1969]	3,317.8***	3,757.8***	4,449.0***	-8,378.1***	-8,181.6***	-7,574.4***
	(932.6)	(990.7)	(980.3)	(1,260.4)	(1,275.0)	(1,261.1)
Construction date [1970, 1979]	7,314.5***	7,621.9***	8,315.0***	-2,527.1*	-2,670.2**	-2,263.2*
	(1,016.0)	(1,007.5)	(1,002.2)	(1,228.2)	(1,228.9)	(1,202.3)
Construction date [1980, 1991]	19,279.2***	19,301.2***	19,234.2***	1,099.1	881.3	1,108.9
	(947.6)	(912.2)	(949.1)	(973.1)	(977.9)	(981.3)
Construction date [1992, 2000]	33,830.5***	33,400.2***	32,940.8***	13,743.8***	13,225.7***	13,378.7***
	(1,224.7)	(1,126.8)	(1,147.7)	(1,229.9)	(1,164.7)	(1,168.9)
Construction date [2001, 2010]	35,425.1***	34,788.3***	35,135.2***	22,108.8***	21,159.9***	21,638.9***
	(1,447.3)	(1,415.1)	(1,411.6)	(1,310.8)	(1,338.0)	(1,317.2)
Construction date [> 2011]	52,677.9***	49,925.6***	51,214.1***	36,670.0***	34,539.4***	35,495.6***
	(3,103.5)	(2,554.3)	(2,711.2)	(2,825.6)	(2,541.2)	(2,599.4)
Living area [squared meters]	840.8***	820.9***	794.2***	820.6***	809.2***	793.0***
	(33.3)	(31.8)	(31.3)	(34.2)	(33.1)	(32.7)
Living area square	-0.386***	-0.377***	-0.364***	-0.378***	-0.373***	-0.365***
	(0.039)	(0.037)	(0.036)	(0.038)	(0.037)	(0.036)
Lot size [squared meters]	1.78***	1.61***	1.72***	6.14***	6.03***	5.97***
	(0.352)	(0.345)	(0.335)	(0.460)	(0.461)	(0.449)
Lot size square	-0.000	-0.000	-0.000	-0.000	-0.000	-0.000
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Number of pieces [continuous]	8,625.8***	9,199.9***	9,241.3***	11,712.6***	11,827.2***	11,860.0***
	(962.5)	(928.1)	(927.3)	(1,039.0)	(998.7)	(1,001.7)
Number of pieces square	29.5	-21.9	-63.8	-367.8***	-375.5***	-395.7***
	(89.9)	(85.7)	(85.1)	(91.1)	(87.6)	(87.6)
Cave	6,375.3***	6,233.5***	6,056.6***	2,849.8***	2,791.4***	2,797.3***
	(685.6)	(644.5)	(644.5)	(425.0)	(418.6)	(407.0)
Parking	11,079.1***	11,188.2***	10,935.5***	11,259.9***	11,082.4***	10,808.1***
	(713.1)	(679.9)	(688.8)	(642.5)	(617.6)	(620.3)
Balcony	2,141.4***	2,373.5***	2,440.6***	3,076.8***	2,870.2***	2,698.7***
	(728.0)	(647.5)	(719.8)	(538.2)	(494.0)	(530.1)
Cellar	1,518.9*	1,665.7**	1,610.0**	4,234.8***	4,237.4***	4,113.7***
	(800.1)	(777.2)	(765.5)	(573.7)	(568.6)	(568.5)
Terrace	10,743.5***	10,693.7***	10,149.2***	10,616.6***	10,560.7***	10,249.4***
	(832.3)	(767.6)	(812.9)	(712.5)	(695.8)	(714.2)
Elevator	1,161.5	565.9	567.6	477.1	-299.0	-281.5
	(775.3)	(739.1)	(698.8)	(624.1)	(644.0)	(613.0)
Garden	-610.3	-310.1	660.4	9,442.5***	9,455.1***	9,527.0***
	(944.1)	(928.2)	(885.5)	(1,055.6)	(1,028.0)	(1,045.2)
Loggia	-5,844.2***	-6,630.7***	-5,630.3***	2,814.7***	1,855.4***	2,126.5***
	(540.4)	(540.4)	(523.3)	(500.4)	(478.5)	(496.9)
Year fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
PO of seller fixed effects	Yes	No	Yes	Yes	No	Yes
PO of buyer fixed effects	No	Yes	Yes	No	Yes	Yes
Spatial fixed effects	No	No	No	Yes	Yes	Yes
Observations	91,817	91,817	91,817	91,817	91,817	91,817
R^2	0.54953	0.55817	0.57107	0.71212	0.71606	0.72005
Within R^2	0.47376	0.46936	0.46539	0.56502	0.56060	0.55046

Notes: This table reports the coefficients associated to the "What" variables in the hedonic models of housing prices (Equation 7 of the main paper). The two first columns concern the models with (unreported) year fixed effects (the "When" component) and with (unreported) PO fixed effects successively for sellers and the buyers. The third column concern the model with time, PO of sellers, and PO of buyers fixed effects. Finally, the models from the last three columns have the same structure than the first three column, except that (unreported) postal code fixed effects (the "Where" component) are included. The coefficients from the last column (6) are used to estimate total net housing wealth accumulation in the main text.

Appendix C. Additional Figures

Figure C1.: The region *Bourgogne-Franche-Comté* + *Haute-Marne* under study
Source: GEOFLA (IGN)

Figure C2.: National and regional housing price index (base 100 in 2015)
Sources: *INSEE-Notaires* for France, and authors' computation from *Perval* for BFC

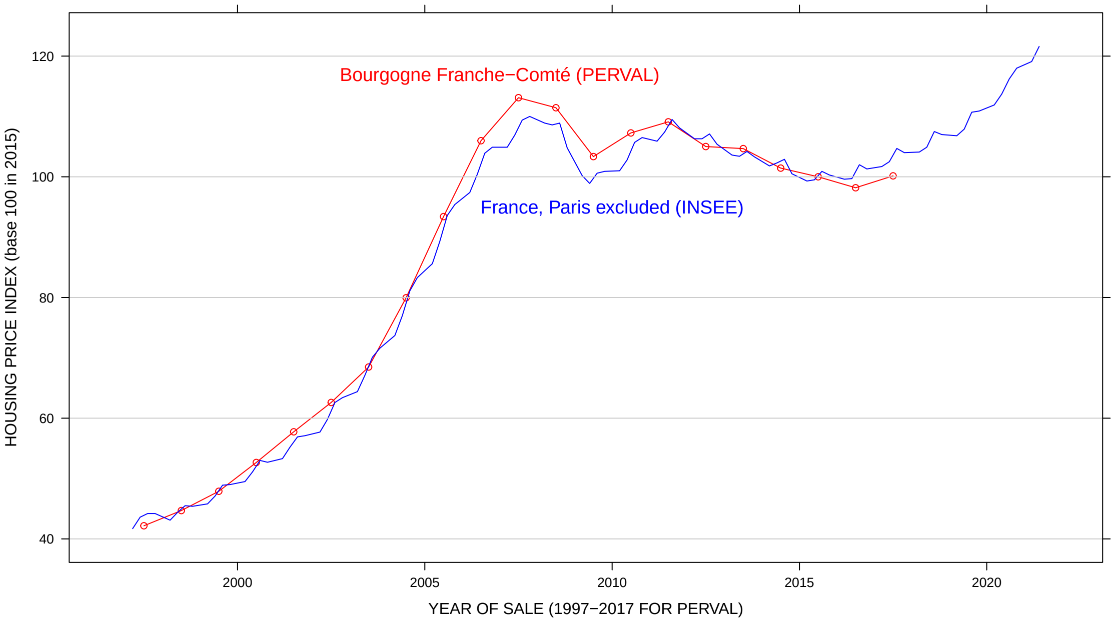


Figure C3.: Housing wealth accumulation from the official french survey
Sources: *Enquêtes Patrimoine 1997-98, 2003-04, 2009-10, 2014-15 et enquête Histoire de vie et Patrimoine 2017-2018 (INSEE)*
https://www.insee.fr/fr/statistiques/5371281?sommaire=5371304

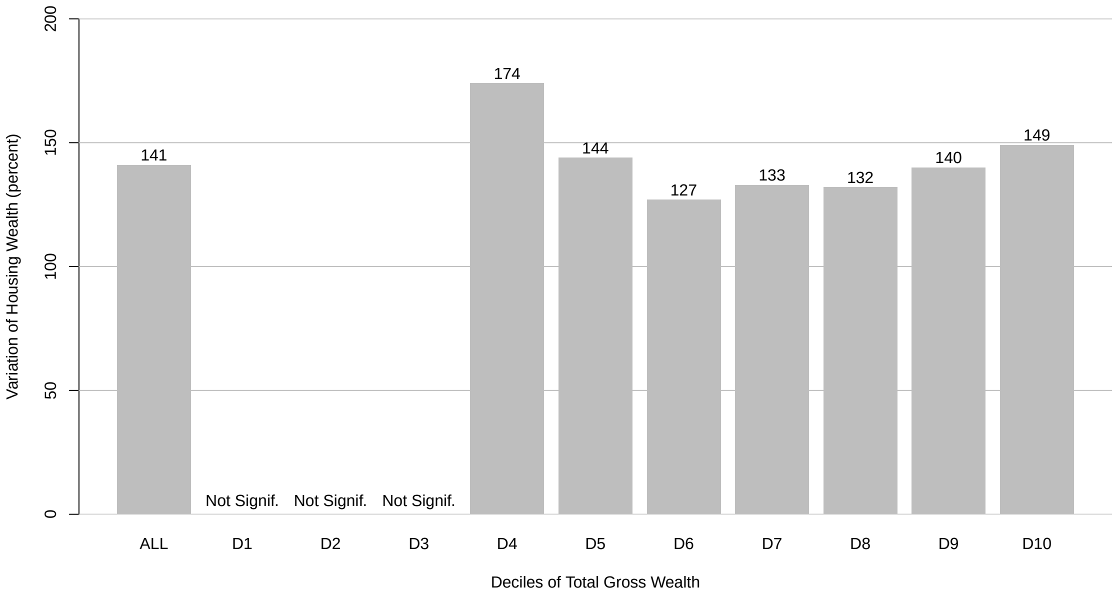
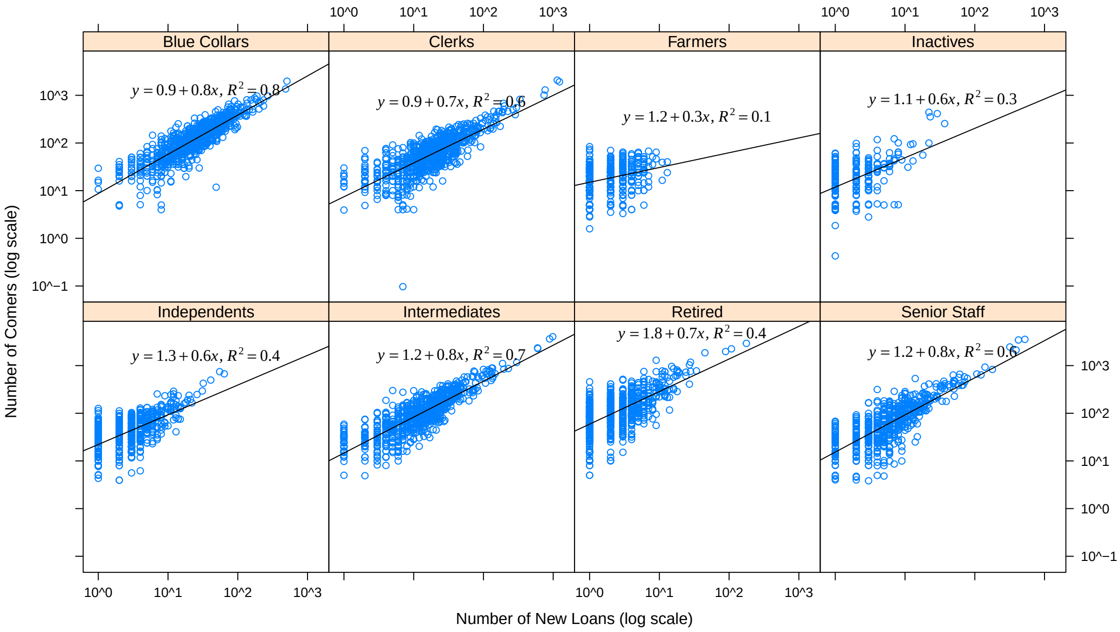


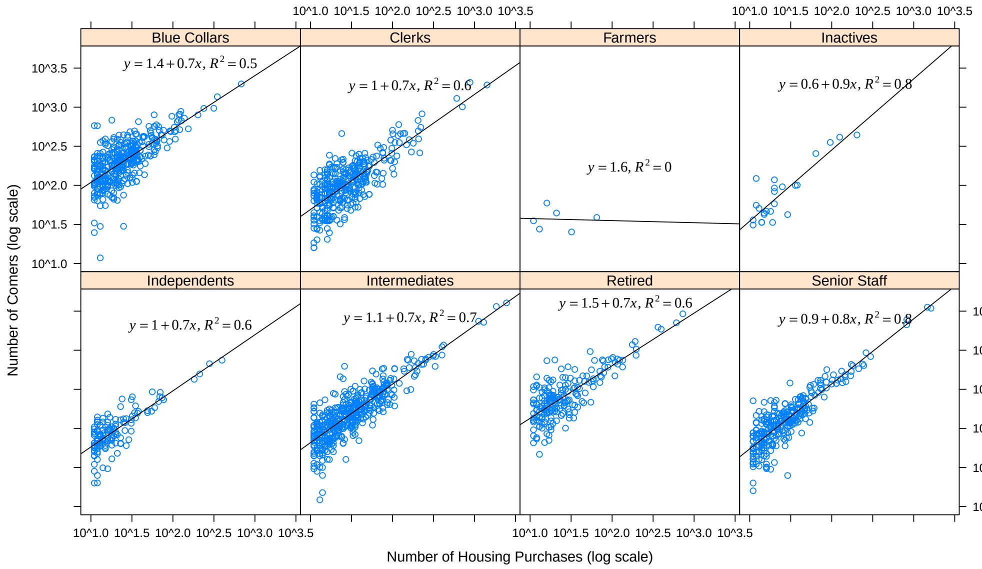
Figure C4.: Comparison of mobility frequencies between mortgage and census data
Sources: *Population census (INSEE) and PTZ (SGFGAS)*



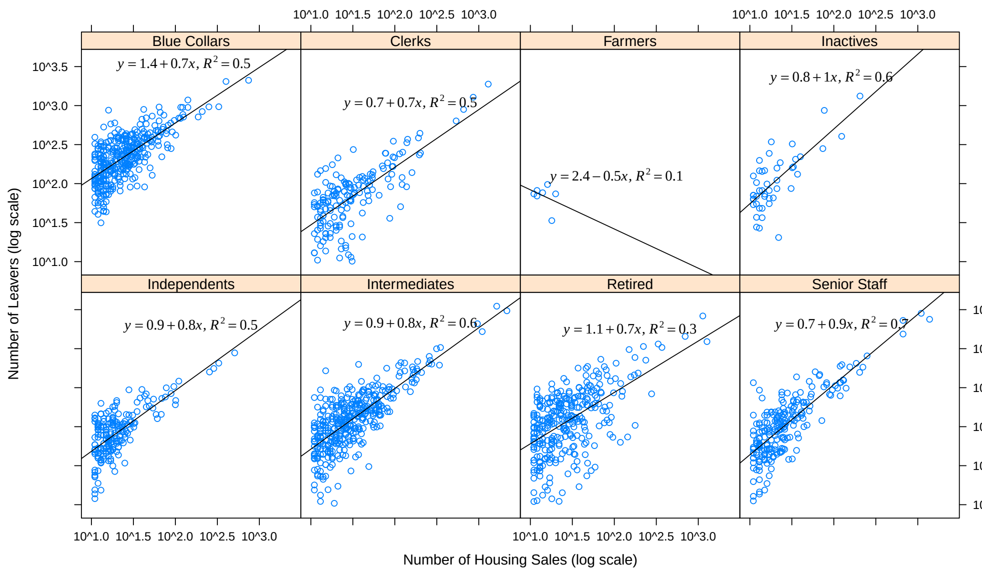
Notes: This figure displays the correlations between the quantities of new subsidized loans (x-axis, from PTZ) and the quantities of comers (y-axis, from INSEE) between postal codes over the two decades of interest. Additional unreported analysis shows that these correlations are not driven by the uneven distribution of the overall population between postal codes because the same orders of magnitude are obtained from regressions with postal code fixed effects.

Figure C5.: Comparison of mobility frequencies between transaction and census data
Sources: *Population census (INSEE) and Perval (Notaires)*

(a) Correlations between housing purchases and quantities of comers

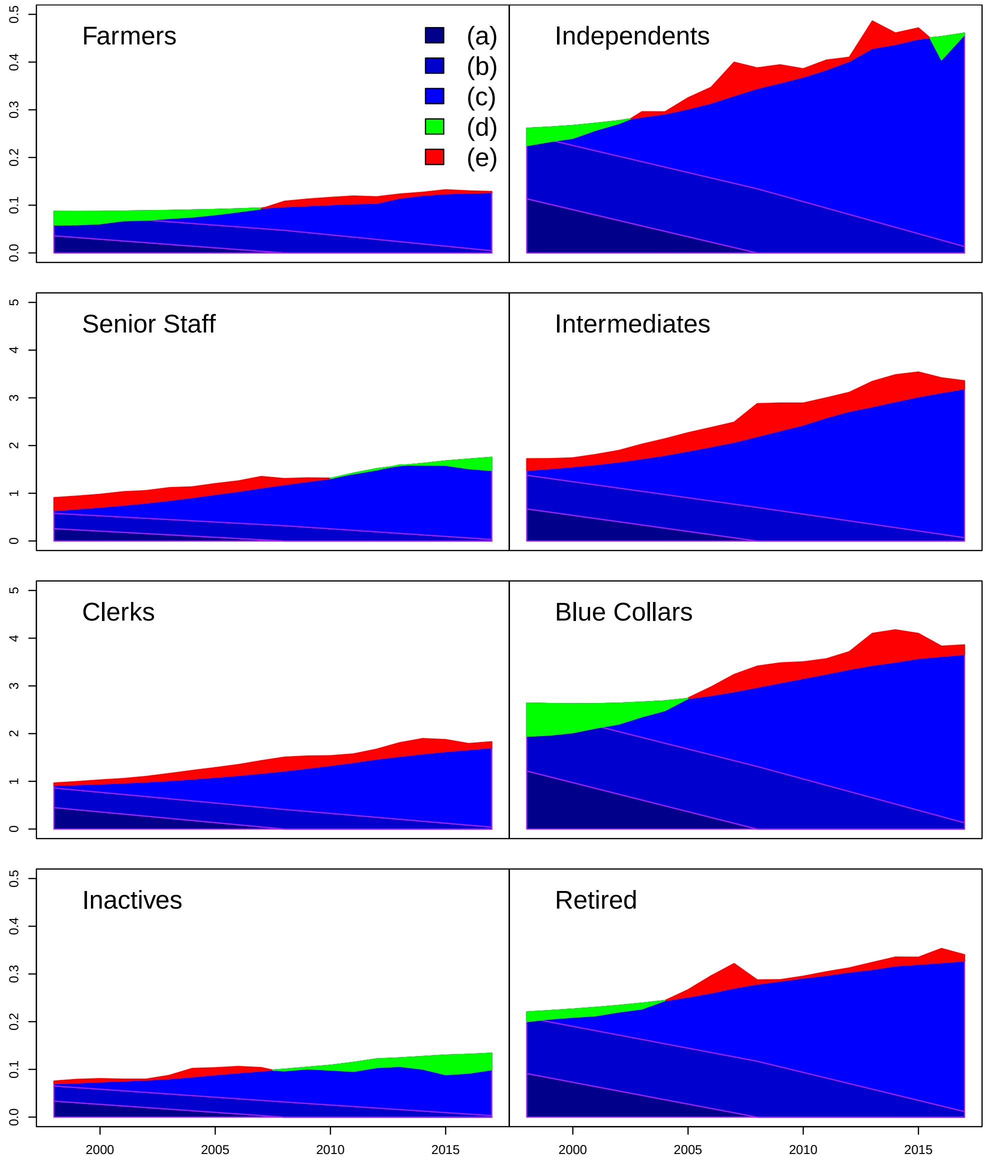


(b) Correlations between housing sales and quantities of leavers



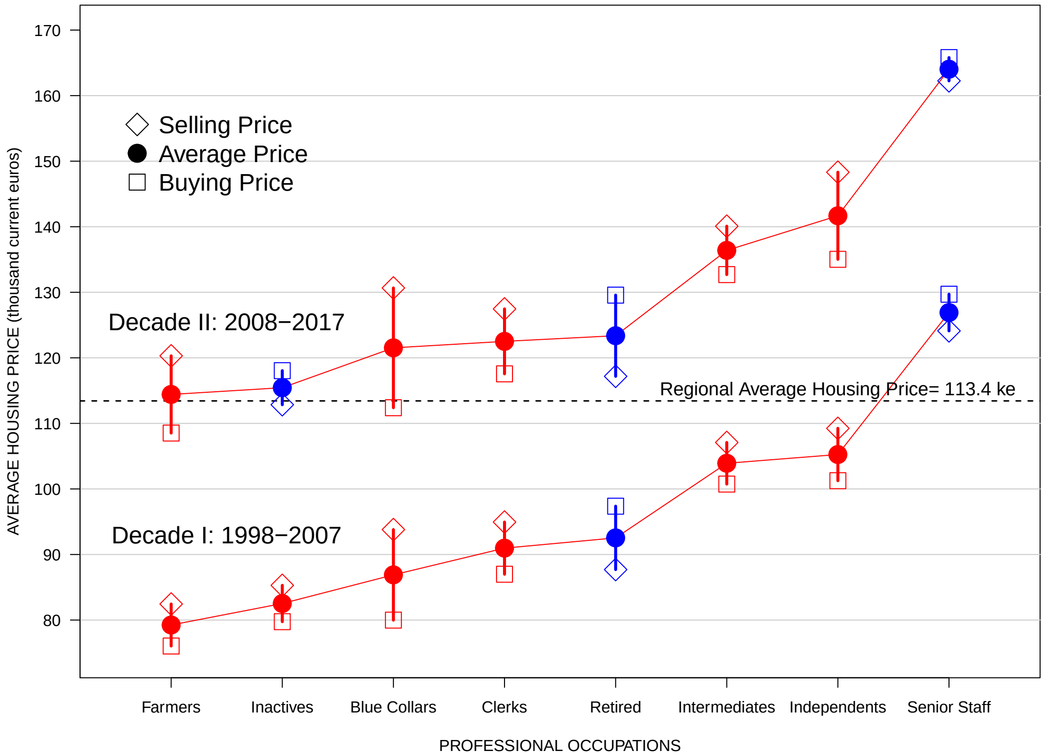
Notes: Top and bottom panels display the correlations between the numbers of housing transactions (x-axis) and the numbers of movers (y-axis) between postal codes over the two decades of interest. Additional unreported analysis shows that these correlations are not driven by the uneven distribution of the overall population between postal codes because the same orders of magnitude are obtained from regressions with postal code fixed effects.

Figure C6.: Values of repayments and newly contracted loans at the regional scale
Sources: *Population census (INSEE), Perval (Notaires), and PTZ (SGFGAS)*



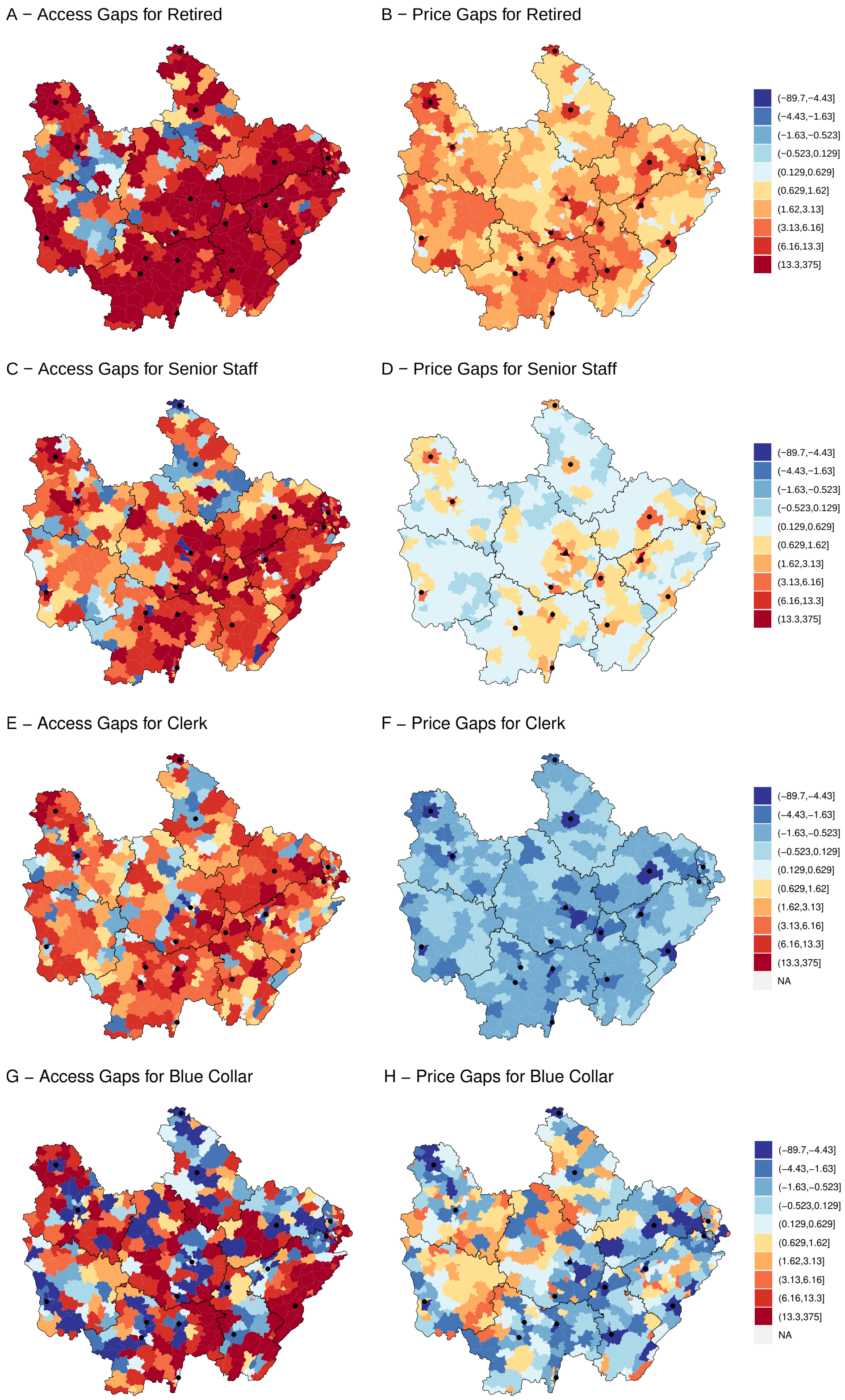
Notes: For each PO in panels, the figure displays the values of repayments and of newly contracted loans (i.e., gross variations of the aggregate debt) and the balance between them according to the formulas of Section A.2 in OA (Table A2). The considered period appears on the x-axis (between 1998 and 2017) and the y-axis are scaled heterogenously to represent millions of euros at the regional scale. The areas noted (a) and (b) respectively depict the annual repayments from the loans contracted during the 1978–1987 and the 1988–1997 periods. The former are totally reimbursed in 2008 and the latter in 2018, with parallel decreasing trends by design. The three other areas are defined from the two curves at the top of each panel, representing respectively the total amounts of repayments (whatever the period of contraction) and the total amounts of new loan contracts. When the repayments are higher, the areas (d) indicate a decrease of the aggregated debt. When the amounts of new loans are higher, the areas (e) indicate an increase of the aggregate debt. The last area (c) represents annual reimbursement of the loans contracted during the 1998–2017 period, they are zero in 1998 by definition. The reading of the Figure is complexified by the balance between repayments and new loan contracts from the areas (d) that partially hide total repayments when newly contracted loans are low.

Figure C7.: Average housing prices and housing price differences for each decade



Notes: This figure displays the average housing prices $\overline{p}_k$ by dots (reported in euros at the bottom of the panel). They are computed from average buying (square) and selling (diamond) prices. The bottom curve is for the decade I (1998–2007) and the top curve is for the decade II (2008–2017). The lines are colored in *red* when the selling price is higher than the buyer price (indicating a decrease of housing wealth) and in *blue* otherwise. All the reported values are significantly different from zero with a 5% confidence, we do not report the intervals for the clarity of the figure.

Figure C8.: Down-scaled access and price gaps from NHW accumulation across POs



Notes: for the four main POs, the figure displays the spatial distribution of the two mobility gaps over the two decades (in thousand current euros by homeowner of 2007). The borders of the eight *départements* are reported in black, and the 16 dots mark the municipalities of the region with more than 15,00 inhabitants. The legend is common for the eight maps, representing the deciles of the pool of the mapped variables.