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**Selecting Qualitative Cases Using Sequence Analysis:
A Mixed-Method Strategy for In-Depth Understanding
of Life Course Trajectories**

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Abstract

In this paper, we propose a sequence analysis-based method for selecting qualitative cases depending on quantitative results. Inspired by tools developed for cross-sectional analyses, we propose indicators suitable for longitudinal study of the life-course in a holistic perspective as well as a set of corresponding analysis guidelines. Two complementary indicators are introduced, marginality and gain, that allows labelling observations according to both their typicality within their own group and their illustrativeness of a given statistical relationship. They allow selecting a diversity of cases depending on their contribution to a given statistical relationship between trajectories and a covariate or a typology.

The method and its advantages are illustrated through an original study of the relationships between residential trajectories in the Paris region and residential socialization during childhood. Using the Biographies et Entourage [Event history and entourage] survey and qualitative interviews conducted with a subsample of the respondents, the analysis shows the contributions of the method not only to improve the understanding of statistical associations, but also to identify their limitations. Extension and generalization of the method are finally proposed to cover a wider scope of situations.

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- > Mixed methods
- > Sequential explanatory design
- > Sequence analysis
- > Case selection
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1. Introduction

In the social sciences, life histories or biographies are increasingly used to analyze individual behaviors and social processes. While sociologists, geographers and demographers may not analyze them in the same way, the dissemination of the life course perspective through various disciplines over at least three decades expresses the renewed interest in the individual actor and in the importance of time (and timing) across the social sciences (Hägerstrand, 1970; Elder, 1975; Abbott, 1990; Courgeau & Lelièvre, 1991; Bernardi, Huinink, & Settersten, 2019). The life course paradigm further stresses the importance of taking into account past experiences; the role of the socio-economic, historical and cultural contexts in which individuals live/have lived; the interdependence of individuals (linked lives); and connections between life domains (for example residential, family and occupational trajectories). The need to take so many relationships into account is highly demanding in terms of methods, and has stimulated many methodological developments.

Broadly speaking, two main methodological approaches can be distinguished. Some studies rely on qualitative methods and retrospective (sometimes called “narrative”) interviews, or longitudinal (i.e., repeated) interviews to understand changes over the life course. Other studies use quantitative methods and data, such as event-history surveys and panel data, reconstituting the trajectories of individuals in different life domains. While they are mostly used separately, these two approaches are highly complementary in life course research (Giele & Elder, 1998). For instance, quantitative analysis might reveal statistical regularities in the timing, succession and occurrence of some life events. However, it is often limited to understand how the meaning given to these transitions vary among different sub-populations (Heinz, 2003).

In this paper, we propose a sequence analysis-based method for selecting qualitative cases based on quantitative results, a strategy often called “case selection” (Seawright & Gerring, 2008), but also “purposive sampling” (Patton, 2002). Building on the work of Duvoisin (2019), our method relies on holistic and inferential approaches within the sequence analysis framework. More precisely, it allows cases to be selected according to their *representativeness* or *illustrativeness* of a given statistical relationship between, on the one hand, trajectories and, on the other hand, a covariate or typology. This procedure has several advantages. First, it allows qualitative data to be situated within the whole population, thus improving its representativeness. Second, a deeper understanding of statistical relationships can be achieved using qualitative material. Finally, by looking at divergent cases and counterexample, the

limitations of the statistical analysis can be identified. More broadly, the proposed method extends case-selection techniques to complex data such as trajectories by providing tools to identify cases illustrative of, and counterexamples to, a given statistical relationship.

While our presentation focuses on the study of the link between a single explanatory covariate and trajectories for the sake of simplicity, the method is much more general. In the final section, we discuss the inclusion of several explanatory variables. We also examine how it can be used in conjunction with a typology created using sequence analysis.

The method and its advantages are illustrated through an original study of the relationships between residential trajectories in the Paris region and residential socialization during childhood. Using the *Biographies et Entourage* [Event history and entourage] survey conducted in 2001 and qualitative interviews with a subsample of respondents, the analysis highlights the importance of localized social and family networks in the study of residential choices.

The article is organized as follows. We start by presenting our illustrative application and the data being used. We then review mixed-method strategies used in life course research before presenting the discrepancy analysis framework, which lay the methodological foundation of our method. Next, we propose two new indicators that can be used to situate or select qualitative interview based on quantitative results. We finally illustrate the benefit of the procedure for the interpretation of the qualitative interviews, before discussing extensions of the methodology.

2. Illustrative Application

We demonstrate the usefulness of our method by applying it to the study of residential trajectories and residential choices within the Paris region. We focus on the link between these trajectories and individuals' place of socialization during childhood. This link is generally explored in the literature either using qualitative approaches, or, in quantitative analysis, using the individual's place of birth. By combining quantitative and qualitative approaches, our method aims to allow a better understanding of individual trajectories.

2.1. Residential Choices in Cities

Large cities are places of multiple economic and cultural opportunities, but also the areas where social inequalities are the most striking. Many studies have highlighted the increase of

socio-economic segregation in cities (Massey, Rothwell, & Domina, 2009; Musterd, Marcińczak, van Ham & Tammaru, 2017)—a pattern to which the Paris region is no exception. During the second half of the 20th century, Paris underwent a profound urban transformation that increased urban segregation. Indeed, it produced a major redistribution of populations within the agglomeration, including the departure of a portion of the working and middle classes to the suburbs, the arrival of a new migrant working class, and the beginning of gentrification of the city center. The study of residential trajectories offers a key way to better understand these mechanisms and to highlight inequalities in access to housing and urban resources (Bonvalet & Brun, 2002; Dureau, Dupont, Lelièvre, Lévy & Lulle, 2000; Clark, 2009; Ohnmacht, Maksim & Bergman, 2009).

How and why people move is not a new topic (Rossi, 1955), but the phenomena involved are complex. Residential location choices were first modeled by economists; but those early analyses have since been challenged by work in other social sciences highlighting the diversity of factors involved, how residential choices can diverge from “rational” behaviors, and how they are made under uncertainty (Clark & Dieleman, 1996; Authier, Bonvalet & Lévy, 2010). The following factors, among others, are linked with a change of residence: the degradation of the residential environment, the desire for homeownership, the quest for comfort, the affirmation of a new social status, and the choice of a new lifestyle (Bonvalet & Dureau, 2000; Bonvalet & Brun, 2002). Research on residential mobility has demonstrated the role of the family life cycle in the decision to move: relocation decisions are broadly related to the stages of family formation and to the adaptation of housing to new family situations. The life course perspective enabled a more in-depth understanding of these processes by integrating past experiences and the interactions between different life domains (residential, family, professional, social) (Courgeau & Lelièvre, 1991; Bonvalet & Lelièvre, 2016). Qualitative research has also highlighted the agency of individuals and households in the decision process, and the diversity of strategies they may employ to become a homeowner, to stay in the neighborhood where they live, or to affirm a social position (Bonvalet & Fribourg, 1990).

In this article, we focus on the effect of individuals’ place of socialization during childhood on their adult trajectory. Following the life course perspective, we explore the hypothesis that past place experiences structure subsequent trajectories, as shown by qualitative analysis (Bonvalet & Gotman, 1993). We aim to show that by combining qualitative and quantitative approaches, the link between residential socialization during childhood and subsequent residential choices can be better assessed and understood.

2.2. Data and Definitions

We use the quantitative and qualitative data from the Biographies et Entourage survey conducted by INED (2001 for the quantitative component, 2002-2004 for the qualitative component) (Bonvalet & Lelièvre, 2016). Quantitative data was collected from 2,830 respondents from the 1930–1950 birth cohorts living in the Paris region (Île-de-France). Information on geographical, residential, occupational and family trajectories beginning at birth was collected retrospectively. A total of 141 in-depth interviews were conducted, all with respondents to the quantitative survey. In 2002, a first wave of 80 interviews was collected (30 in Paris, 50 in the suburbs). This corpus was subsequently supplemented by 25 interviews with non-citizens, and, in 2004, with persons who had lived in “social” rental housing (more precisely, subject to the “1948 law”¹).

Residential trajectories are multidimensional, including housing location, tenure (ownership or rental), type of dwelling (house, apartment) and an urban neighborhood. In this paper, we focus on the two main competitive elements of residential choices: location and housing tenure. Based on the retrospective survey, we measure residential trajectories using two parallel sequences covering the ages of 20 to 49 years for each respondent (49 being the age of the youngest respondents of the survey). We characterized the location trajectory according to the accessibility level of the municipalities of residence, which is a major criterion of location choices, using seven categories (Le Roux, Imbert, Bringé, & Bonvalet, 2020). The most accessible locations feature a dense distribution of subway stations, generally the Parisian *arrondissements* and some very well-connected municipalities of the inner suburbs. The other categories consist of different types of suburbs according to estimated travel times to central Paris via public transport or motorways. Residential trajectory is coded using four housing tenure categories: ownership, rental (private market), social housing, and being hosted by family or other types of tenure.

Our illustrative application focuses on the individual’s place of socialization during childhood. Most quantitative studies use place of birth as a proxy. However, this can be problematic, as some people spent little or no time in their place of birth. We therefore coded place of socialization as the municipality where the respondent spent the majority of their life before the age of 20. It is splitted into three categories, reflecting the major distinctions in urban context, lifestyles and representations (Pinçon & Pinçon-Charlot, 2008): socialized within Paris, in the rest of the Paris region, and outside the Paris region.

3. Mixed Methods in Life Course Research

The term “mixed methods” refers to a very large range of methods whose common point is combining quantitative and qualitative approaches during at least one step in the research process, from data collection to analysis for “breadth and depth of understanding and corroboration” (Johnson, Onwuegbuzie & Turner, 2007, p. 123). The lack of a consensus definition stems from debates on what “quantitative” and “qualitative” are, and what is meant by “mixing.” Exponential growth in the use of the term since the 1990s in the social sciences suggests the recent development of a “movement” toward a depolarization of these two forms of research methods (Bernard, 2014).

There are many different ways to combine qualitative and quantitative approaches. These combinations, often called “designs,” diverge in how the combination is implemented, but also in their purpose and aims (Shoonenboom & Johnson, 2017). Various typologies of designs have been proposed, and have a broad common core (Tashakkori & Teddlie, 1998; Johnson, Onwuegbuzie & Turner, 2007; Tariq & Woodman, 2013; Creswell & Plano Clark, 2017). We present below the typology of Hollstein (2014), which sums up common identified designs:

- *Parallel or concurrent design*: qualitative and quantitative data are produced and analyzed separately. Results are used for triangulation or as a complementary source of information, to gain more insight into the research question.
- *Sequential exploratory design*: a qualitative phase precedes a quantitative phase. The qualitative part is often used as a pretest to refine research questions and improve the subsequent quantitative data collection.
- *Sequential explanatory design*: a qualitative phase follows a quantitative phase. The qualitative phase is meant to deepen the results obtained by quantitative analysis. A case selection technique is often used to identify typical cases, and sometimes deviant cases or outliers.
- *Embedded or nested design*: the quantitative or qualitative part constitutes a small part focused on specific research objects with well-defined boundaries, and is collected before, in parallel with, or after the major part of the study.
- *Fully integrated design*: qualitative and quantitative strands are integrated dynamically at all stages of the research, by combining parallel and sequential approaches.

3.1. Confirmatory and Exploratory Approaches in Sequential Explanatory Design

Our aim in this paper is to propose a new methodology extending the “sequential explanatory design” to the study of longitudinal trajectories in a life course framework. In this design, passing from the usually large quantitative analysis sample to the small qualitative analysis sample is identified as a key step in linking the quantitative phase to the qualitative phase. It lays the foundation of this strategy: “The quantitative study serves to strategically place the qualitative sample by providing the topography of the structural conditions of the action place in question” (Kluge, 2001 cited in Heinz 2003, p. 85).

Case selection techniques aim to sequentially link quantitative and qualitative analyses by selecting qualitative cases according to the quantitative results (Lieberman 2005; Seawright & Gerring 2008; Palinkas, Horwitz, Green, et al., 2015). Several methods are available, depending on the specific aims of the analysis, but they can broadly be classified into two groups.

First, “confirmatory” techniques select observations identified as representative, typical or influential from a statistical point of view to confirm, deepen or reject the quantitative conclusions by looking at qualitative data. This can further be used to assess a “causal” interpretation of the quantitative relationship. For instance, interviewing someone who stayed in the same neighborhood for his whole life might help understanding why and how people tend to do this. It might confirm the role of having grown up in a specific neighborhood, or indicate a potentially spurious statistical relationship.

Second, “exploratory” case selection aims to select atypical, deviant or extreme cases to document the limitations of quantitative models and conclusions. It might typically reveal key variables omitted from the models, or clusters of cases following some different logic not captured by the statistical trends. For instance, it might help to understand why some people move out of the neighborhood where they grew up, even if all factors would have lead us to expect them to stay.

While case selection techniques are often thought to deepen quantitative results, the labeling of qualitative cases as “representative” or “deviant” may also strongly influence the reading of the qualitative material. For instance, knowing that a case is a statistical “counterexample,” we might focus the qualitative interpretation on why this individual followed an atypical path. For this reason, and despite the name, the use of case selection techniques is not restricted to the qualitative sample selection. These methods allow qualitative and quantitative interpretation to be linked as soon as quantitative information is available for the qualitative data. This link then

enables back-and-forth movements between qualitative and quantitative analyses, which has numerous advantages (Lieberman, 2005). By navigating through a variety of cases, the diversity of a studied phenomenon can be explored, as well as inconsistencies and limitations of the quantitative analysis. For example, this circular process might help to discover factors that should have been introduced into the statistical model. This may help to improve the quantitative analysis step by step.

There are many situations where quantitative information is available for the qualitative sample. First, we might select cases based on the quantitative sample prior to the qualitative phase, for instance using one of the many existing sampling procedures (Palinkas, Horwitz, Green, et al., 2015). Second, one might also collect the quantitative information during the qualitative data collection if it has been done in a parallel (or concurrent design). Third, it is often possible to go through qualitative material and systematically code the value of the quantitative variables through a process called “quantitization” (Sandelowski, Voils & Knafl, 2009). The qualitative sample is then “added” to the quantitative part before running the analysis.

For instance, the qualitative sample of our illustrative application was collected prior to any quantitative analysis. However, each qualitative case is also available in the quantitative database, allowing us to connect the two samples. We can thus use the qualitative data to deepen our understanding of the quantitative results, by building a bridge from the quantitative sample to the qualitative subsample (Ivankova, Creswell & Stick, 2006).

3.2. Case Selection in Life Course Research

Various life course studies have collected quantitative and qualitative data within a single project, but most have combined the information from the two in the interpretation phase using “triangulation” (Giele & Elder, 1998). We have found few contributions combining them in the analysis phase within a sequential explanatory design. These contributions can be classified according to their use of one of the two quantitative approaches to the study of life course trajectories, sequence analysis or event history analysis (Aisenbrey & Fasang, 2010; Billari, 2005; Courgeau & Lelièvre, 1991). Logically, the chosen case selection method depends on the quantitative approach taken.

First, sequence analysis, which is rooted in the *algorithmic* culture, takes an exploratory approach and a holistic perspective on trajectories. It is typically used to build a typology of

recurrent paths, where the types are thought to describe the main mechanisms driving the trajectories. A number of studies have used this quantitative approach in conjunction with qualitative interviews. Latcheva and Herzog-Punzenberger (2011) and Verd and Andreu (2011) used a typology established using sequence analysis to select respondents for the qualitative phase. Similarly, Abbott (1995), Heinz (2003), Gauthier & Valarino (2016) and Remillon & Lelièvre (2018) selected qualitative interviews to illustrate the life course patterns identified by the typology and further explore the mechanisms driving these trajectory types. However, in such approaches the selection is usually made by focusing on the most central observations from each type (i.e., the medoid). This approach has two main limitations. First, by using it, we tend to ignore trajectories lying at the margins of the typology. This tends to understate the diversity and complexity of the actual trajectories associated to each ideal-typical trajectory, which is crucial to evaluating the quality of the typology (Piccaretta & Studer, 2019). Second, this approach does not allow cases to be selected according to the relationship between trajectories and key covariates such as gender or cohort. For instance, in our application, we are interested in selecting cases that illustrate the relationships between socialization and future residential trajectories. What are the key differences between trajectories with different places of socialization, and how is this reflected in the life course of individuals? What can we learn about this by looking at the qualitative interviews?

Event history analysis, in contrast, is rooted in *statistical modeling* culture, and takes an explanatory perspective, aiming to estimate the relationships between covariates and the occurrence of events or transitions within the life course. In this perspective, case selection is generally used to gain a better understanding of statistical relationships and to offer a qualitative description of the underlying processes. The most common strategy is to stratify cases according to individual characteristics known to be associated with specific outcomes in the life course (such as gender, level of education, or occupation). Next, random sampling is conducted within each stratum to ensure maximum variation of cases (Heinz, Kelle, Witzel & Zinn, 1998; Weymann, 1999; Elliott, Gale, Kuh & Parsons, 2011). Selected cases are then explored to study a specific statistical association between an event, an outcome or a transition and individual characteristics, through the in-depth study of “on-the-line” cases (Lieberman, 2005), but also outliers (Portes & Fernández-Kelly, 2008). Here, case selection strategies are based on single events or transitions and not on the entire trajectories. However, the life course paradigm stresses the importance of situating events and outcomes within the whole trajectory. Furthermore, qualitative cases are generally not labeled using the quantitative results, which

might provide further information when analyzing the qualitative cases, as we will illustrate below.

In this paper, we propose a new case selection method based on sequence analysis that can be used in either an explanatory or exploratory perspective. It allows cases to be selected according to their statistical illustrativeness or representativeness for a given statistical relationship between trajectories and a covariate or a typology.

4. Case Selection Using Sequence Analysis

Case selection techniques aim to situate each case according to a statistical relationship. Our goal is to extend it to the study of the link between trajectories coded as state sequences and a categorical covariate. The latter can be a sequence analysis typology, in an exploratory perspective, or an explanatory covariate, such as place of socialization, as in our illustrative application.

We develop two indicators to situate individual cases. The first indicator measures the centrality of each case according to the statistical results. It allows common and uncommon trajectories with respect to the relationship under study to be distinguished. The second indicator measures each case's contribution to the statistical relationship. It can be used to detect cases that are illustrative of or discordant with a given statistical relationship.

The rest of this section is organized as follows. We start with a brief review of discrepancy analysis, which seeks to measure the statistical relationship between trajectories and a typology or a covariate. Next, using this framework, we present the mathematical development of our two indicators. We then turn to a discussion on their interpretation and use in conjunction with qualitative analysis.

4.1. Discrepancy Analysis of Sequences

The association between trajectories coded as state sequences and a categorical covariate or typology can be studied using discrepancy analysis (Studer et al., 2011). This framework provides methods to study the strength and statistical significance of relationships.

Conceptually, this framework is based on the study of the discrepancy between (or variation among) the trajectories. This discrepancy is measured using the same distances or dissimilarities used to create a typology of trajectories. The underlying idea is that high average

distances are associated with large discrepancies (variations) among the sequences, while low average distances are linked to lesser discrepancy between trajectories. Extending the ANOVA (analysis of variance) framework, the method then computes the share of the discrepancy between the sequences that is explained by a given covariate. The statistical significance of the relationship is estimated using permutation tests.

As in cluster analysis, where the aim is to create a typology of trajectories, the framework requires a distance measure. This measure quantifies the similarity between trajectories, with respect to timing, the time spent in each state, and the sequencing of the states. Several distance measures are available, and the choice of which to use should be grounded in the particular research questions being pursued. The question of their selection is beyond the scope of the present paper. Interested readers are referred to Studer and Ritschard (2016), who provide a detailed discussion and guidelines. In our illustrative application, we use multichannel distance based on optimal matching (OM) with constant costs. This allows us to jointly study geographical and residential trajectories (Pollock, 2007; Gauthier, Widmer, Bucher, & Notredame, 2010).

We now turn to a very brief presentation of discrepancy analysis. Interested readers are referred to Studer, Ritschard, Gabadinho and Müller (2011) for the full presentation.

The ANOVA is based on the analysis of the sum of squares. The total sum of squares, SS_T can then be decomposed into within (SS_W) and between-group (SS_B) sums of squares, leading to the following relationship.

$$SS_T = SS_B + SS_W$$

Importantly, the sum of squares can be computed using the squared Euclidean distance between observations. By replacing the squared Euclidean distance by another distance measure relevant for sequences, such as optimal matching, we can generalize the ANOVA framework to the sequence analysis case.

These pseudo-sums of squares can then be computed as follows:

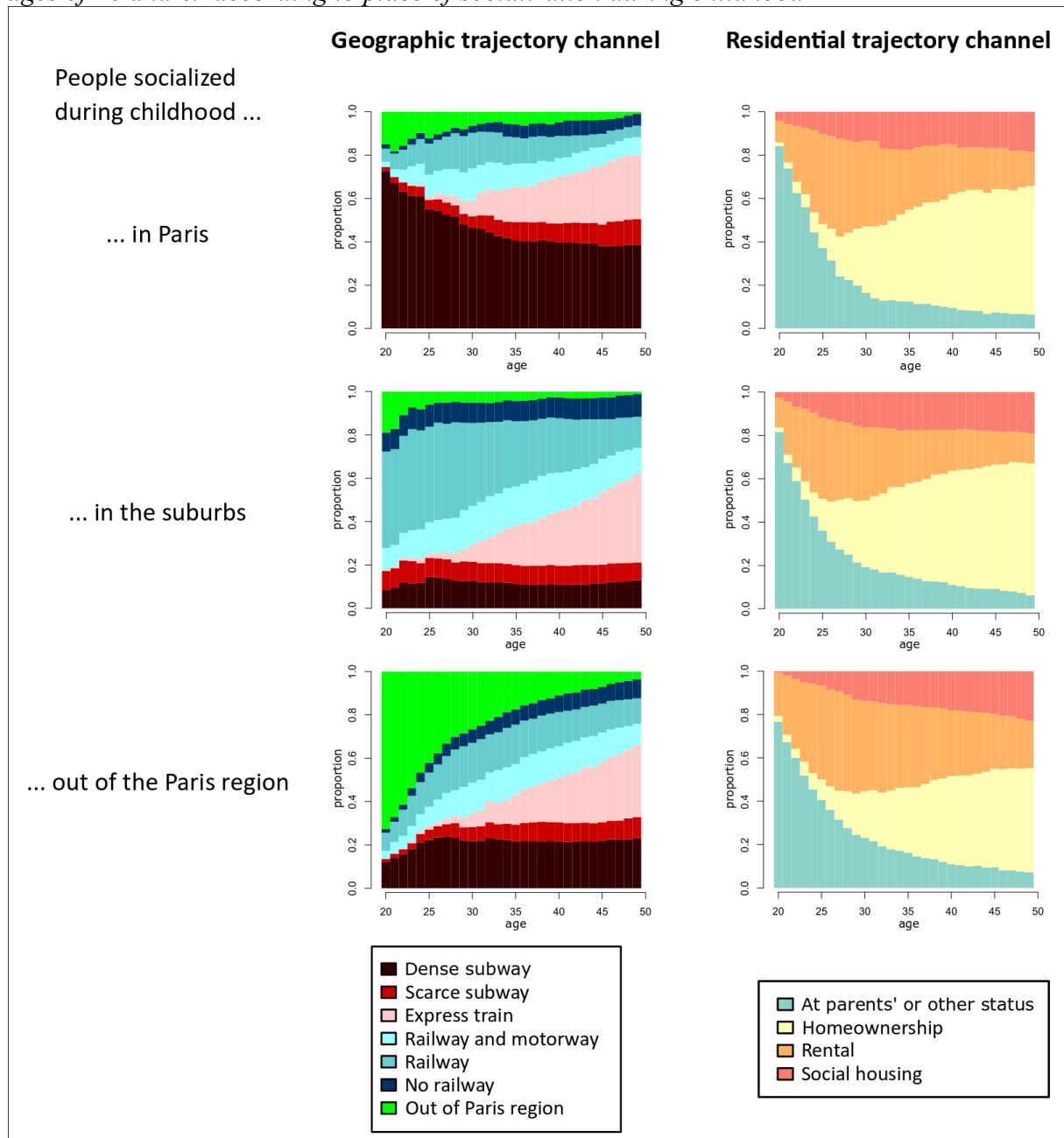
$$\begin{aligned} SS_T &= tr(\mathbf{G}) \\ SS_B &= tr(\mathbf{HG}) \\ SS_W &= tr[(\mathbf{I} - \mathbf{H})\mathbf{G}] \end{aligned} \quad (1)$$

Where \mathbf{G} is the “Gower matrix”, defined as $\mathbf{G} = -\frac{1}{2}(\mathbf{I} - \frac{1}{n}\mathbf{1}\mathbf{1}')\mathbf{D}(\mathbf{I} - \frac{1}{n}\mathbf{1}\mathbf{1}')$, $\mathbf{H} = \mathbf{X}(\mathbf{X}'\mathbf{X})^{-1}\mathbf{X}'$ the idempotent “hat matrix,” $\mathbf{1}$ is a vector of ones of length n , \mathbf{I} the $n \cdot n$ identity

matrix, \mathbf{D} the $n \cdot n$ matrix of distances, and \mathbf{X} the $n \cdot m$ matrix with the values of m covariates using contrasts for coding factors and including a first column of ones for the intercept.

These pseudo-sums of squares can then be used to compute a pseudo- R^2 measuring the share of the variation among the sequences explained by a given covariate. For our illustrative application, the pseudo- R^2 for the place of socialization during childhood equals 2.9%, and the relationship is statistically significant. In other words, place of socialization explains 2.9% of the diversity of residential and geographical trajectories. It should be noted that pseudo- R^2 are generally low and depend on the sample size. This can be explained by the fact that trajectories are complex objects measured using many variables, and the share of diversity explained by a given variable is thus usually low.

Figure 1: Chronograms of individual geographical and residential trajectories between the ages of 20 and 49 according to place of socialization during childhood



Source: Biographies et Entourage survey (INED, 2001)

Plots are generally used in order to interpret the relationships between the covariate and the trajectories. Figure 1 presents chronograms of the trajectories of our sample application for the different places of socialization. Individuals socialized in Paris clearly have the highest proportion in the most central locations. Those socialized in the suburbs tend to stay there and access homeownership more frequently, even more so after 30 years. Finally, those socialized outside the Paris region occupy an intermediate position in terms of residential location, but access homeownership less frequently.

4.2. Case Selection Indicators for Sequence Analysis

Seawright and Gerring (2008) review different indicators for case selection. These indicators work as follows. A numerical value is computed for each observation, and then a selection is made according to the value of these indicators. Here we extend this work to sequence analysis by developing two indicators, each corresponding to a different aim of the mixed methods design. First, *marginality* aims to distinguish typical and deviant cases. Second, the *gain* indicator is built to allow the highlighting of both illustrative cases and counterexamples of a statistical relationship.

4.2.1 Marginality

When a case study follows a regression or a bivariate analysis, *typical* or *deviant* cases can be selected using regression residuals (Seawright and Gerring, 2008).

Observations with a low residual are then considered as typical of the studied cross-case relationship and representative of the population if the model is correctly specified. These observations can be used to deepen our understanding of whether and how the statistical cross-case relationship operates within each observation. It is therefore mainly used in a *confirmatory* perspective (Seawright and Gerring, 2008).

Similarly, one might select deviant cases using high regression residuals. These observations can illustrate diversity that is not captured by the statistical model. As such, these are mainly useful for *exploratory* purposes. As pointed out by Seawright and Gerring (2008), these observations are, by definition, not representative of the population, and should therefore not be interpreted as such when analyzing the qualitative material. Deviant cases can shed light on forgotten covariates, model misspecification, or limitations of the statistical association. They allow the variation of the selected cases to be maximized. As such, they may also bring out new research questions to be tested quantitatively.

We propose to use the same approach in the discrepancy analysis framework. According to equation (1), the diagonal elements of $(\mathbf{I} - \mathbf{H})\mathbf{G}$ can be interpreted as the contribution of each sequence to the within sum of squares.¹ They are therefore directly linked to the concept of

¹ In a linear model, those values could be interpreted as the square of the residual of the fitted model.

contribution to the residual discrepancy and residuals (Studer et al., 2011). They can even be linked to a measure of distance between a given sequence and the center of gravity of one of the groups (Batagelj, 1988; Studer et al., 2011).

To distinguish this indicator from the residuals of a regression analysis, we call it *marginality*. It measures the typicality of cases within each group of the explanatory covariate. It can also be used with a typology. In this case, a low value indicates cases close to the relevant ideal type. A high value, in contrast, would be interpreted as a case that falls in between types, or at the border of the typology.

4.2.2 Gain

Marginality allows us to identify cases that are more or less close to the “usual” or most common situation within each group. However, these cases are not necessarily illustrative of the link between the sequences and the studied covariate, as will be exemplified below. We therefore propose a second indicator, named *gain*, which aims to select cases either illustrative of, or discordant with, a statistical association.

The diagonal elements of the Gower matrix \mathbf{G} can be interpreted as the residuals of the null model—i.e., when no covariates are included in the model. A high value means that a sequence is far from the overall center of gravity of the entire sample, i.e., the most common situation. A low value, on the other hand, means that the sequence is close to the center of gravity. These are residuals in the null model, i.e., the model without any covariates.²

By combining the residual of the null model and marginality (the residual of the “fitted” model), we can identify the sequences that are better represented when using the model than without it. These are the diagonal elements of the matrix $\mathbf{G} - (\mathbf{I} - \mathbf{H})\mathbf{G} = \mathbf{H}\mathbf{G}$. Logically, according to Eq. (1), these are also the sequences’ contributions to the between sums of squares, a concept directly linked to the explained discrepancy. We call this contribution the *gain* of a sequence, as it measures the statistical information gain for each case when taking the covariate into account. A positive gain value means that the corresponding sequence is better represented when the explanatory factor is taken into account. The corresponding cases can therefore

² In a linear model, those values could be interpreted as the square of the residual of the null model.

illustrate the statistical relationship, as we statistically gained information on these cases with our quantitative analysis. A negative value, in contrast, means that the sequence is less well represented when using the covariate. These sequences are therefore discordant with the quantitative relationships.

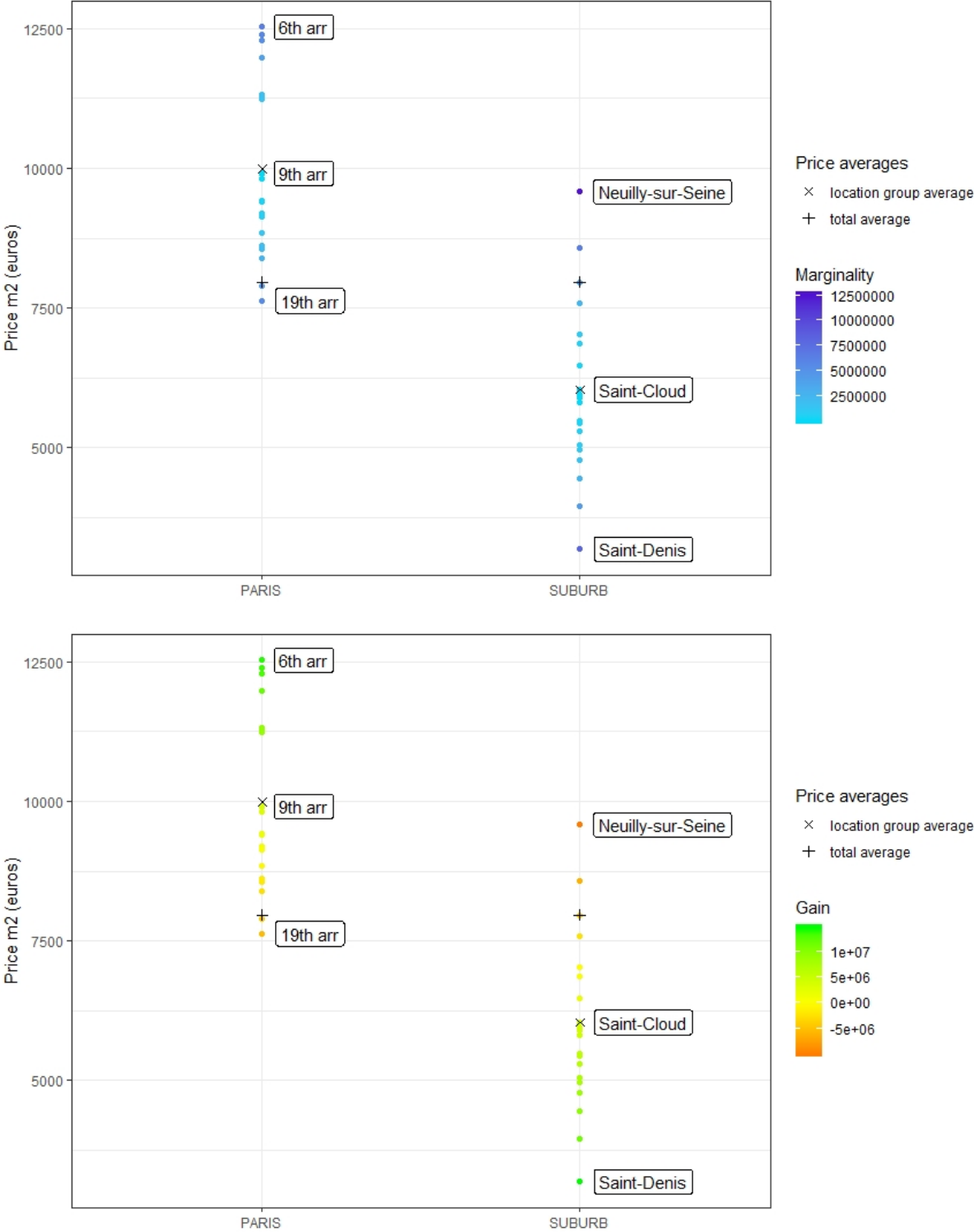
4.2.3 A Simple Example

Before using these two indicators on our sequence data, let us illustrate their functioning using a simple numerical example. We compare the average price of apartments in Parisian *arrondissements* (i.e., within the municipal limits of the city of Paris itself) in 2019 with those of the adjoining municipalities of the inner suburbs. It is well known that the average price is much higher within Paris than in the suburbs. Using our two indicators, we can identify which municipalities are typical or atypical of this association. .

Figure 2 presents dot plots of these average prices separately within and outside Paris. In the first plot, cases are colored according to their *marginality*. Cases with low marginality are close to the average of their location (Paris or suburb). On the contrary, cases with high marginality are far from this average, whatever the direction: either higher or lower than the average. Selecting cases with low marginality illustrates *arrondissements* (e.g., 9th arr.) or municipalities (e.g. Saint-Cloud) that are typical of their location, in the sense that they have average prices close to the average in Paris or to the average outside Paris, respectively. Cases with high marginality are also informative, as we will see in introducing the gain indicator.

In the second plot, cases are colored according to their *gain*. Cases with high positive gain values (in green) can serve as an illustration of the relationship. These are the *arrondissements* with the highest prices in Paris (e.g., the 6th arr.), and municipalities with the lowest average prices in the suburbs (e.g., Saint-Denis), which in a way illustrate the difference between the two locations. On the contrary, cases with low negative gain (in red) are discordant cases, such as Paris *arrondissements* with lower average prices (e.g., the 19th arr.), or suburbs with high average prices (e.g., Neuilly-sur-Seine). These cases are closer to the total average than to their location average and, in a way, are not satisfactorily explained by the covariate. While gain might select cases exemplifying the studied relationship, these cases can be typical or deviant depending on their marginality. This information should therefore also be taken into account in the interpretation of the qualitative material.

Figure 2: Marginality and gain for municipal average apartment prices explained by location (Paris/suburb)



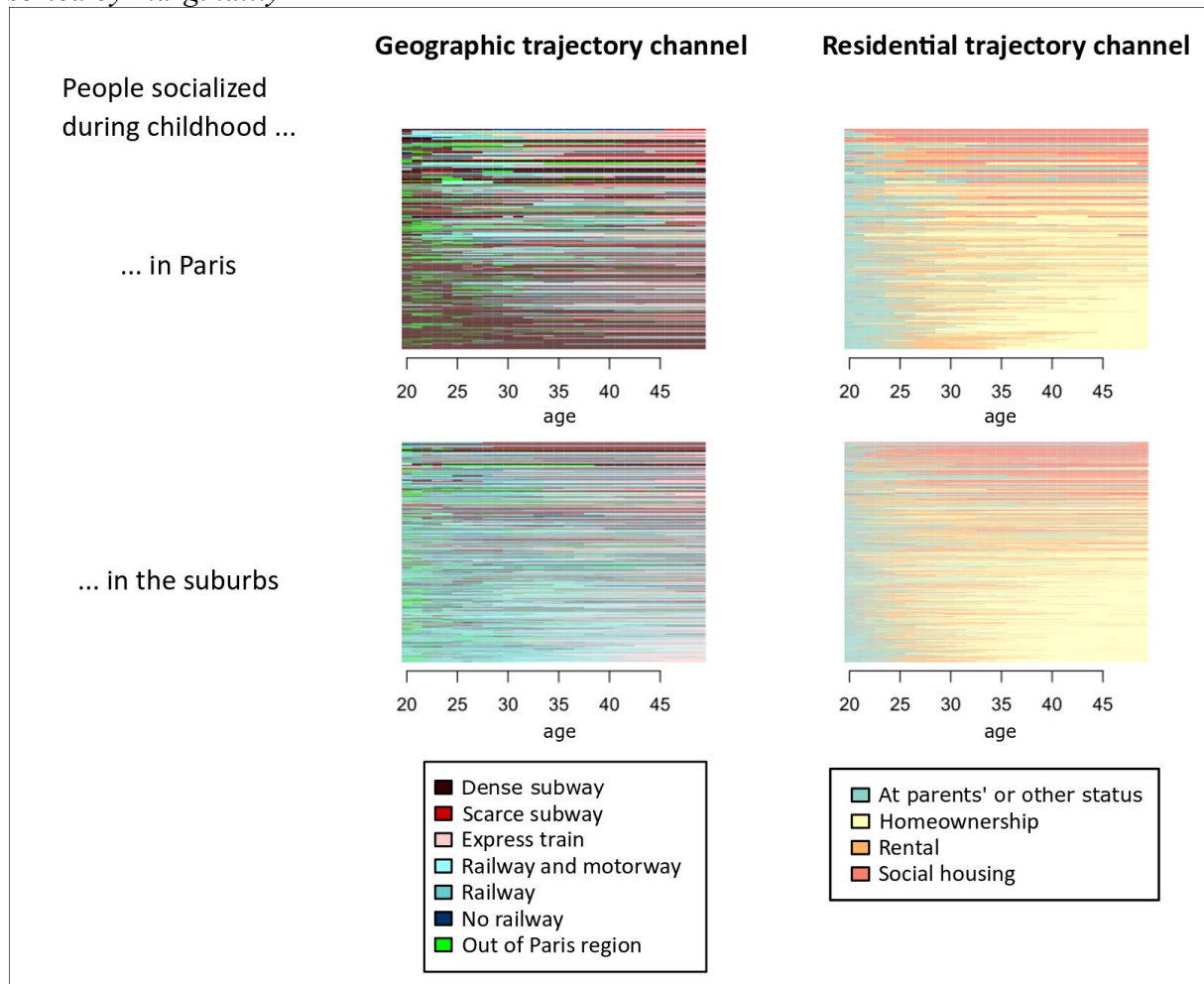
Source: Price of apartments per sq. m., *Chambre des notaires de Paris*, 2019.

4.2.4. Illustrative Application

In order to further highlight the behavior of the proposed indicators, we now apply them to our illustrative example of residential trajectories. As a reminder, we are interested in the relationship between geographical and residential trajectories, on the one hand, and place of socialization during childhood, on the other. To keep our presentation simple, we focus on those who lived in either Paris or the suburbs during their childhood.

Figure 3 presents index plots of these trajectories separately for each category (socialized during childhood in Paris or in the suburbs), where the sequences are ordered according to their marginality. The sequences at the bottom are the most typical of their group. In Paris, these are trajectories moving from their parents' home, to private rental, before homeownership, while staying in a central location. In the suburbs, the pattern is slightly different, as people reach homeownership sooner, but also tend to stay in locations outside the center. Note that in the case of multichannel sequences, marginality (like gain, below) structures the sorting of the two channels in different ways. In our application, lower marginality is mainly determined by the tenure sequence and its most frequent states.

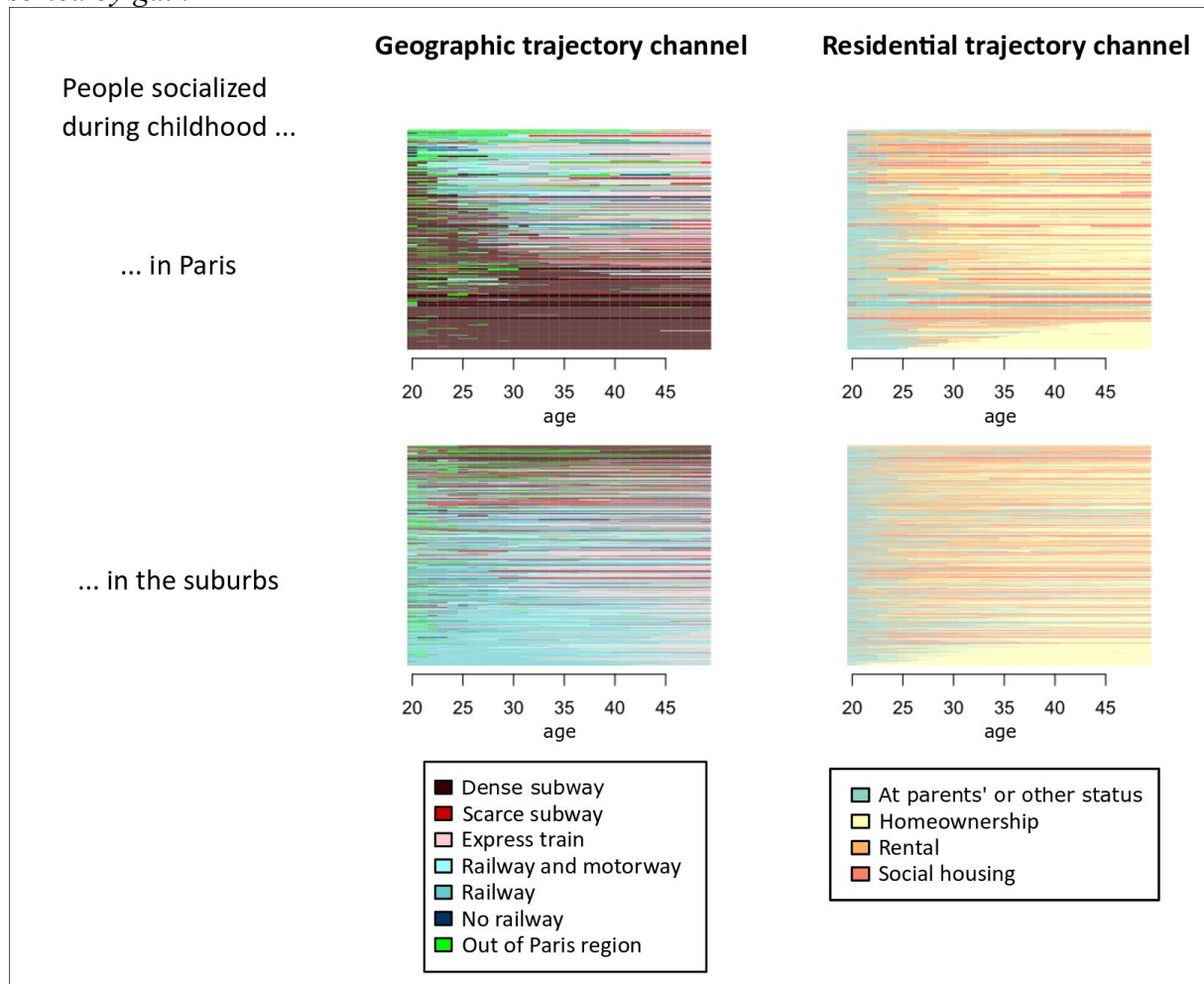
Figure 3: Individual trajectories by place of socialization during childhood (Paris, suburbs), sorted by marginality



Source: Biographies et Entourage survey (INED, 2001)

Figure 4 presents the same index plots, but ordered according to the gain of each (multichannel) sequence. Sequences with high gain are located at the bottom of the plot. Recall that these are sequences for which the quantitative analysis brought useful information: in other words, they are the most illustrative of the statistical relationship. In Paris, these sequences show a clear trend in geographical trajectories, with individuals socialized in Paris tending to remain in the center. Similarly, those who spent their childhood in the suburbs tend to stay in similar locations in terms of accessibility. However, looking at residential trajectories, the picture is less clear. Individuals in both groups tend to reach homeownership relatively quickly². At the same time, other kinds of residential trajectories are located toward the bottom of each plot. For instance, some trajectories consisting predominantly of social housing can be seen in both groups.

Figure 4: Individual trajectories by place of socialization during childhood (Paris, suburbs), sorted by gain



Source: Biographies et Entourage survey (INED, 2001)

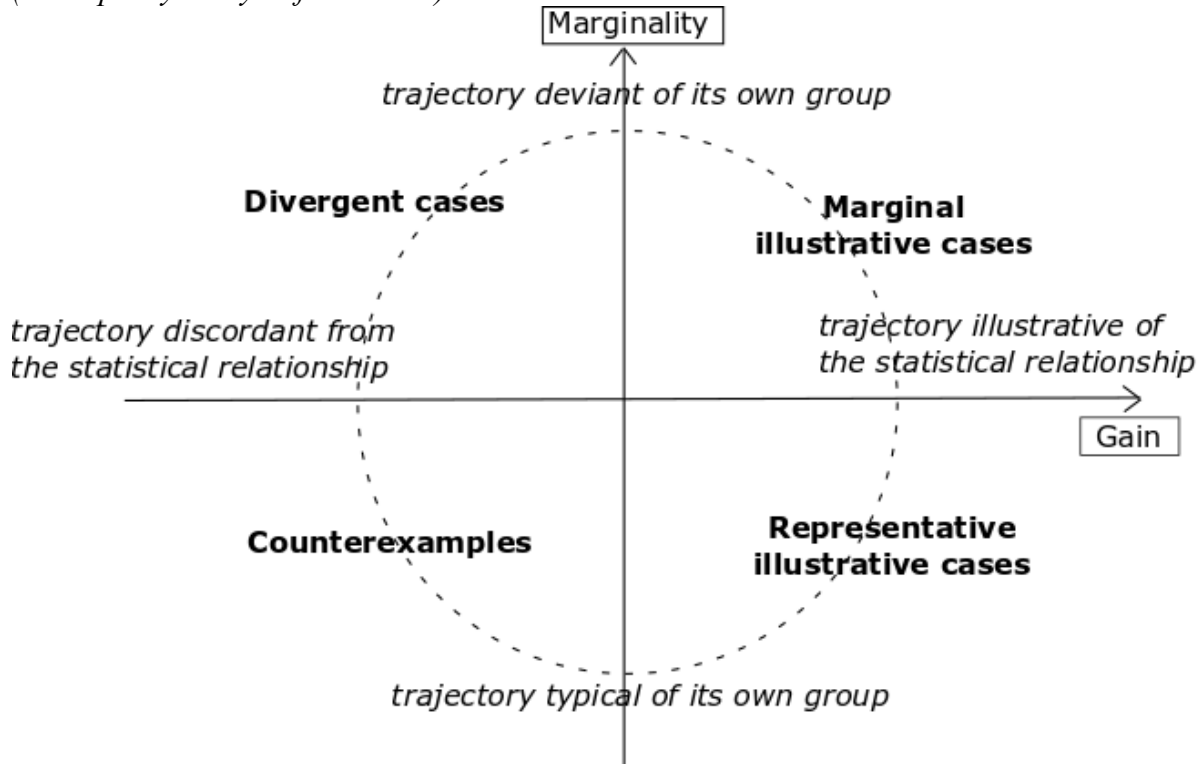
Since both indicators convey useful information, we propose to use them jointly to select or label cases. This is what we present in the next section.

4.2.5. Combining Gain and Marginality

Gain and marginality provide distinctive information. We propose to look at a scatterplot of the joint distribution of these two indicators to select cases for qualitative analysis. Schematically, this scatterplot can be read as illustrated in Figure 5. In this plot, each quadrant indicates a different combination of the two indicators. It is constructed as follows. The x-axis represents gain, where a clear division can be drawn between positive and negative values. The vertical bar is therefore drawn at zero. The y-axis represents marginality. For this indicator, the

exact value is not of special interest here: we are mostly interested in the value of a case relative to the others. For this reason, we draw the horizontal line at the average value.

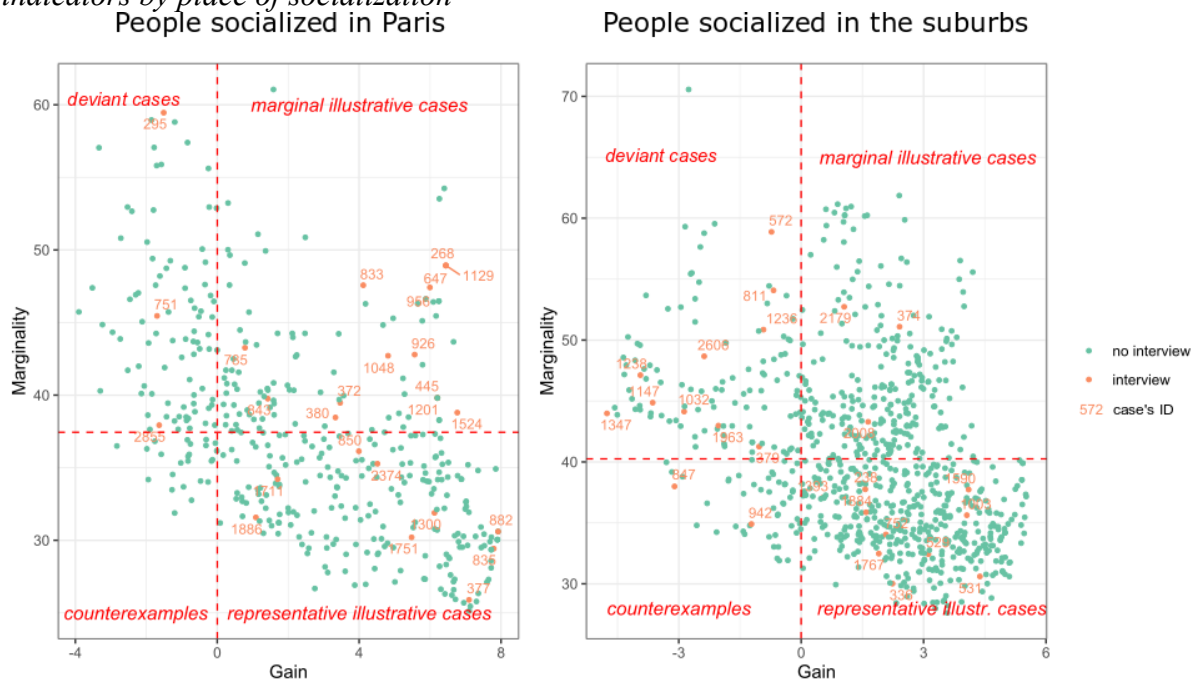
Figure 5: Interpretation of observations by the combination of marginality and gain (discrepancy analysis framework)



Cases in each of these quadrants can be selected for different aims. Let us now look at each of them in turn before discussing their usefulness in mixed-methods design.

The bottom right quadrant consists of “representative illustrative cases.” These cases have low residuals, are thus well represented by the “average” trajectory of their group, and the quantitative analysis provided useful information to describe their trajectories. In other words, these are cases that are both typical of their group and illustrative of the quantitative relationship. A qualitative study of these cases is therefore useful to *confirm* the logic of the statistical association. As pointed out by Seawright and Gerring (2008), we may be particularly interested in qualitatively analyzing how the (usually) cross-case quantitative relationship takes place *within a given case*. Such qualitative analyses might deepen our understanding of how an explanatory factor influences the analyzed trajectories. In a mixed methods design, this quadrant is therefore useful from a confirmatory perspective.

Figure 6: Distribution of observations and interviewees according to gain and marginality indicators by place of socialization



Source: Biographies et Entourage survey (INED, 2001)

Figure 6 presents the scatterplot of the two indicators for our illustrative study, focusing on respondents socialized either in Paris or the suburbs to keep the presentation simple. Logically, as the association is statistically significant, the “representative illustrative” cases are the most common. This should generally be the case if the relationship is strong enough. As seen in our previous analysis (Fig. 5), these cases represent “common” homeownership trajectories for each group: in the most central areas for people socialized in Paris, remaining in less accessible areas for those socialized in the suburbs. The qualitative analysis should then focus on the studied relationship, while keeping these results in mind. Let us illustrate this for people socialized in Paris. As shown in the previous section, these cases should be used to confirm (or not) the link between growing up in Paris and staying in the most accessible locations. The aim of the qualitative analysis is then to identify factors or social processes that may explain this relationship in greater detail. Being typical cases, they should describe the main mechanisms that drive individuals in this group to buy a home in those specific locations.

The top-right quadrant consists of “marginal illustrative cases.” These have high residuals, and thus usually represent uncommon or atypical trajectories. They should therefore not be interpreted as representative of the population (Seawright and Gerring, 2008). However, at the same time, the included explanatory factor has proven to be useful in understanding their

trajectories. These cases can thus illustrate how the logic of the studied quantitative relationship operates, even for atypical cases, and shed light on the diversity of mechanisms. There are useful in order to *explore* the diversity of the association. In this sense, these cases have the potential to provide an intermediate perspective that lies between the confirmatory and the exploratory. They can be used for explanatory purposes, to examine the initial hypothesis in a diversity of contexts. The qualitative analysis should then be used as a complement to the analysis of representative illustrative cases. Looking for a moment at the individuals socialized in Paris, marginal illustrative cases, like representative illustrative cases, resided in the most accessible places, but, in contrast to them, lived mostly in social housing. Qualitative analysis of these cases would then either support the mechanism highlighted for representative illustrative cases—despite distinct tenure trajectories—or highlight other factors at work in the studied relationship, which are less common but which enable a fuller description of the diversity of behaviors.

The bottom-left quadrant consists of “counterexamples.” These trajectories are discordant with the quantitative association, but are nevertheless close to the central trajectory, and therefore typical of their group. Qualitative analysis of these cases may thus shed light on the limitations of the quantitative findings, suggesting possible alternative mechanisms behind divergent trajectories, and nuancing the quantitative association. The aim here, therefore, is once again intermediate between the confirmatory and the exploratory. These cases can be used to explore the limitations of (and potentially invalidate) the quantitative relationship. Special attention might be given to covariates which are missing from the quantitative part. Finally, the qualitative analysis should focus on what might explain these cases’ discordance with the statistical association: this can include other competing factors, but also the ambiguity or non-univocal nature of the factors highlighted by the illustrative cases. In this sense, these cases can refine the study of the statistical relationship or point to the limits of the model.

Finally, the top-left quadrant consists of “divergent cases.” These are atypical trajectories that are also counterexamples to the quantitative analysis. As such, they are mainly useful to explore mechanisms ignored by the statistical model in a highly exploratory fashion. Since these cases are atypical, they should not be considered as representative of the population (Seawright and Gerring, 2008). Qualitative analysis of these highly atypical cases, whether within their group or with regard to the statistical association, should focus on why they are not well captured by the statistical model. Taking the example of people socialized in Paris, divergent cases neither stayed in central locations nor became homeowners. The qualitative analysis, then,

will likely focus on any competing factors that could explain this great divergence from the behaviors of representative illustrative cases.

Table 1 summarizes the potential use of cases in each quadrant.

Table 1: Guidelines for qualitative analysis by the type of case

Quadrant	Approach	Focus of the qualitative analysis
<i>Representative illustrative</i>	Confirmatory	Understand the inner logic driving the statistical association. Confirm the (usually cross-case) statistical associations and deepen the interpretation based on within-case qualitative analysis.
<i>Marginal illustrative</i>	Confirmatory and exploratory	Understand the inner logic driving the statistical association and how it operates in a diversity of contexts and cases.
<i>Counterexamples</i>	Confirmatory and exploratory	Understand why the association is not found for some of the cases and explore possible competing factors
<i>Divergent</i>	Exploratory	Explore the limits of the statistical association, such as non-included factors.

Figure 6 presents the scatterplot of the gain and marginality indicators. In this plot, the qualitative interviews are labeled using their case number. This information can then be used for case selection, but also to tune the qualitative interpretation of the interview. The procedure is thus also useful when the qualitative material has already been collected. In the following section, we apply these guidelines to illustrate how cases drawn from each of these quadrants both deepen our interpretation of the association and help us to document its limitations.

5. Contribution of Qualitative Cases to Quantitative Analysis

In this section, we illustrate how the proposed guidelines can be used to analyze the qualitative interviews in our sample application. To keep our presentation simple, we focus here on individuals socialized in Paris or in the suburbs, leaving aside those socialized outside of the Paris region. While all the interviews were analyzed, we present one case for each quadrant of

Figure 6. The following analysis is grouped by quadrant in order to better illustrate the specific contributions of each one.

5.1. Representative Illustrative Cases

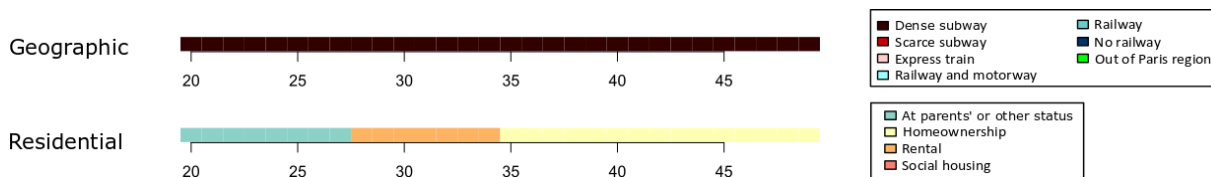
Paris

Representative illustrative cases of people socialized in Paris are trajectories in central locations accessing homeownership. The qualitative interviews (nos. 882, 835, 377, 1300, 1751: see Fig. 6) highlight the role of socialization notably through the attachment to a childhood neighborhood and urban lifestyles, but above all the support of family networks anchored in those neighborhoods. The case of Josiane (case 377, see inset), a psychologist, socialized in a Parisian neighborhood, illustrates this finding. Josiane's trajectory was driven by the logic of the family and characterized by its geographical stability. Practically no location choice was involved. She stayed in the neighborhood where she was born, where she grew up, and where her family is located and brought her financial and practical support. Many cases reveal similar patrimonial and locational family strategies.

Nevertheless, interviewees in this group expressed varying degrees of intentionality about remaining in central location: while some cases seemed to be passive, speaking of having “no choice” or “self-evidence,” other cases reflect more thoughtful choices and arbitrations, through compromises on the neighborhood or the size of the dwelling. Socialization into Parisian lifestyles sometimes leads to a strong rejection of the suburbs, even among individuals who have never lived there. Paul's (no. 882) representation of the suburbs illustrates this:

“Paris is not a choice. Paris is where I've lived, where I was born, so you have all your roots in Paris and you don't plan to [move to the suburbs]. When a child is born in the country, it's hard to live in the city. When you're born in the city, you have difficulty living in the country.”

For these cases, the resistance to the overall centrifugal trend is made possible by the existence of significant resources.

Case 377: Josiane, representative illustrative case of people socialized in Paris

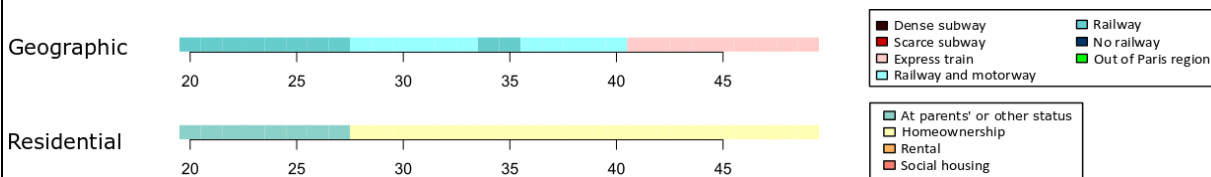
Josiane, a psychologist, was born in 1935 and has always lived in Paris except during the first years of the war, which she spent in Lyon (large city in the south-east of France) with her grandmother. She describes the 15th arrondissement of Paris as a veritable family fiefdom: her grandparents already lived there, and her parents and sister still live there. This “local” family lives in a small area within the capital, helps each other, and sees each other more than once a week. Having moved out of her parents’ home late, at the age of 27, she moved into the studio that her grandfather had rented. “It was a bit hard because the studio belonged to my grandfather who had died, so we had to mourn him too. It wasn’t easy.” She stayed there for five years. Josiane, who wanted to be able to have visitors and to expand, decided to buy with the support of her parents. Her father, a company director, had regretted not being able to buy an apartment in the 1930s, since co-ownership was very unusual at the time. “They were almost the ones who pushed me, because I was a bit panic-stricken at the time about what it meant financially.” In 1970, she bought a large two-room apartment off plan, right next door to her parents’ house. She never thought of leaving the neighborhood she loved, because her family was nearby, and because it was a neighborhood with shops, transportation, a quiet neighborhood that she describes as a family neighborhood. “It’s a neighborhood that I like, it’s the extension of rue du Commerce, which was very lively at the time, which has changed a bit now. It was also close to the metro [subway].” Two years later, she met her husband, who came to live in the apartment. In 1975, they decided to buy an apartment together and found a three-room apartment in the same neighborhood.

Note: Josiane’s interview was explored by looking for all the factors and resources that could explain her residential choices in central locations, while having a classic homeownership trajectory.

Suburbs

The interviews with representative illustrative cases of people socialized in the suburbs (nos. 531, 529, 1003, 1590, 336: Fig. 6) highlight the role of the localization of social and family networks. They also highlight a strong effect of the context of socialization on the construction of aspirations, urban representations and a rejection of Parisian lifestyles.

The case of Alessandra (no. 531, inset) illustrates a typical trajectory anchored in the suburbs with an early house purchase, driven by the desire to live in a detached house and a village-like neighborhood. At age 33, she returned to the suburban neighborhood where she grew up and still knew people.

Case 531: Alessandra, a representative illustrative case of people socialized in the suburbs

Alessandra, born in 1938, is of Italian origin. She grew up in a wooden shack north of Paris with her whole family. They then moved to a more comfortable hut in Villepinte (working-class north-eastern suburbs). When she was 12 years old, her father found another job in Versailles (wealthy western suburbs) and decided to buy a small house that they enlarged after a few years, as it was hard to pay the monthly payments at the beginning. She has very good memories of her neighborhood, “a small neighborhood that is a bit of a village compared to the center of Versailles,” and its people. She lived with her parents until she got married. In the midst of a housing crisis, the young couple had great difficulty buying a residence. They ended up finding an apartment in Malakoff, a municipality of the inner suburbs, through a friend of a work colleague who had been renting it out, but decided to sell. Alessandra therefore went straight from being at her parents’ house to being a homeowner. In Malakoff, they experienced life in an apartment. “My husband was even more unhappy than I was in an apartment, because there was nothing to do there and he was bored if he... well, he was bored if he wasn’t busy.” After six years, still not used to living in an apartment, they were looking to buy a little house in Malakoff, but found nothing that was suited to their needs. One day while visiting Alessandra’s parents in Versailles, they came across a house for sale. “Yes, it’s written ‘for sale’ on it, like that... we weren’t even looking for... we weren’t even looking for Versailles at all, eh? But since in Malakoff we were desperate to find something, we thought, ‘After all since it’s not Malakoff, why go to a place we don’t know at all? Versailles is an opportunity, let’s give it a try.’ It worked.”

Their professional positions having improved, they were able to buy this detached house, and spent two years renovating it entirely. It was therefore “by chance” that Alessandra came back to live in Versailles in her childhood neighborhood. “It’s the same neighborhood as my parents, well, it’s a suburban neighborhood that’s a bit like a village, where everyone knows each other a little bit, the people... well, they were there because now there are a lot of people who have disappeared, but the people were often there for a very long time, so we knew everyone, we knew the children, the grandchildren, well, well, with quite a few shopkeepers anyway, enough to survive anyway, so a neighborhood a little bit... well, a nice neighborhood in the end.”

A few years later, not wanting any neighbors, they also bought the little house next door to temporarily house their in-laws and that they intended to recover later for their retirement.

The qualitative exploration of representative illustrative cases provides better and deeper understanding of the main mechanisms at work. The quantitative framework guided the analysis, revealing the mechanisms linking individuals’ place of socialization during childhood and their subsequent residential choices. Among other factors, it highlights the key role of the individual’s family and social network as a resource.

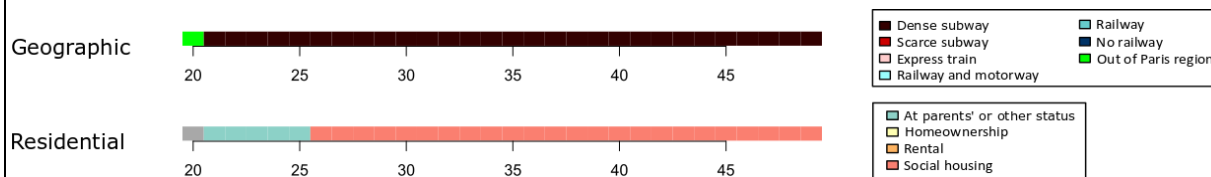
5.2. Marginal Illustrative Cases

Paris

The marginal illustrative cases of respondents socialized in Paris (no. 1129, 268, 647, 956, 926, 1048, 1201, 445, 1524, 833, Fig. 6) are trajectories anchored in central locations through social housing and housing transfers between family members. Serge (Case 956) who has always lived in the same neighborhood, is a perfect illustration. He never tried to become a homeowner, nor to leave Paris. This case illustrates frequent family strategies used to maintain themselves in central neighborhoods. They maintain a minimal occupancy to keep a social housing and exchange dwellings between family members according to the evolution of household sizes.

In all the marginal illustrative cases explored through interviews, respondents' desire to stay in the neighborhood where they grew up or in the most central locations won out over their desire to be a homeowner. The presence of (*de facto*) social housing supply in Parisian neighborhoods thus enabled a portion of working-class households to maintain themselves in the places of their childhood through strategies relying on local social and family networks. Interviewees evoked their attachment to their neighborhoods. However, in some cases they described feeling trapped in social housing.

Generally speaking, the marginal illustrative cases are individuals with few financial resources and low socio-professional status. They are marginal in the sense that they resisted the overall centrifugal trend that would otherwise have carried them, like most of the working classes, out to the suburbs.

Case 956: Serge, marginal illustrative case of people socialized in Paris

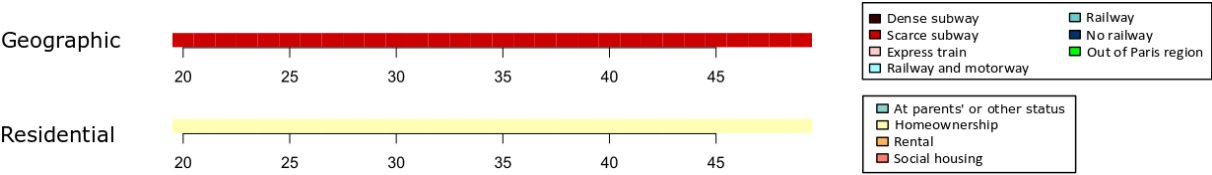
Born in 1942, Serge was the youngest in a family of six children. “I have never left my neighborhood for 60 years, I was born in the yard next door.” His parents, who lived in social housing in the 20th arrondissement (east of Paris, socially mixed), were forced to leave Paris when he was 6–7 years old. However, to make sure they kept their Parisian home, they gave it to Serge’s older sister, their daughter. “So it was the daughter who kept the apartment, when we came back, we got the apartment back.” In 1958, Serge’s father, the owner of a bar, died and the family returned to the apartment, which the eldest daughter then vacated. When Serge got married in 1963 to a neighbor in the same building, his mother, who was left alone after her last son’s departure, offered to keep the apartment. She said, “Well, listen my son, I’m all alone now, here’s what I’m going to do, I’ll leave you the apartment and then I’ll find a little something.” But very quickly, with the birth of two children, the flat became too small. Once again, the solution came from family: this time, in-laws who lived in the apartment across the street. “When my in-laws retired, they said to me: ‘Listen, Serge, you’re going to do something, now with your two kids, you’re going to take over this one. There’s still one more room, one more bedroom.’ We made a change of contract.” At the time, the exchange of housing units was a very common practice in both social and private housing stock. Serge never wanted to move, even to become a homeowner, which would have forced him to change neighborhoods or even leave Paris. “A long time ago if we wanted a house, we would have bought a house. But I didn’t want to leave Paris, I didn’t want to leave my neighborhood, I didn’t want to buy.”

Note: In Serge’s interview, we looked at how his residential socialization during childhood could explain his following trajectory in central locations. Being marginal due to his residential trajectory in social housing, we also looked for the specific role of this trajectory in his location choices and compared it with processes brought to light in the representative illustrative cases.

Suburbs

Unfortunately, only a few marginal illustrative cases of individuals socialized in the suburbs were interviewed (no. 374, 2008, 2179: Fig. 6). Generally speaking, their trajectories are categorized as marginal because they were homeowners in the innermost suburbs (reachable by subway), and they are among the few people who did not follow the overall trend of movement away from the center. However, the mechanism at work is the same as for those who bought in the distant suburbs. Local social and family networks—and more generally what Retière (2003) refers to as *capital d’autochthonie* (social capital derived from originating in a place)—have a key role in the interviews. As an illustration, Emilie (Case 374) lived as a homeowner in the innermost suburbs, in her husband’s neighborhood as she rejected her own family. Her husband bought a piece of land early and built his own house with the help of his parents, who lived about 200 meters away.

Case 374: Emilie, marginal illustrative case of people socialized in the suburbs



Emilie was born in Paris in 1938, just before the Second World War. Her parents, who lived in the 16th arrondissement of Paris, divorced when she was 18 months old. “Then nobody wanted me anymore, so I lived in Livry-Gargan [eastern suburbs] with my grandparents, for eight years.” Then, after four years of boarding school in Saint-Maur [southern suburbs], she lived at her mother’s house in Crosne (distant southern suburbs). She did not have many friends there. Emilie reacted against her mother and rejected her childhood.

When she was 20 years old, she married a manual worker from Montreuil [gentrifying nearest eastern suburbs] who had bought a piece of land next to his parents’ house. He was starting to build a small house with their help.

Once it was built, they moved in and stayed in this house for the rest of their lives, although they had the opportunity to move to another region, “because we had the opportunity to go twice to the provinces of my husband’s work, and he changed jobs. We didn’t want to leave our house or his parents who were next door, so we would have had to move the parents and the house again.”

Emilie, who rejected her birth mother, developed a close relationship with her mother-in-law. In 2002, Emilie and her husband were still living in their house he had built in Montreuil in 1958. Their two daughters left and formed their own families.

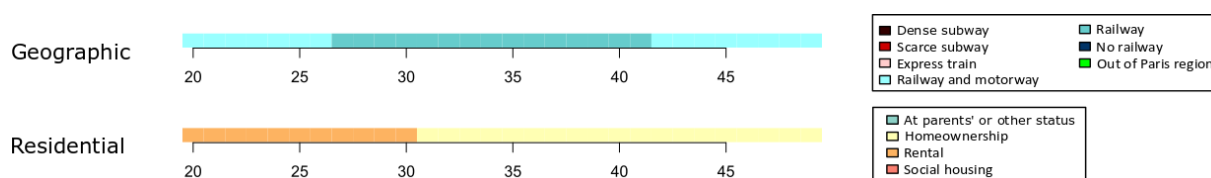
Marginal illustrative cases thus add value to the analysis by accounting for more of the diversity of mechanisms at work behind particular statistical associations. Often hidden by major trends, these cases reveal a wider range of behaviors—as in the case of Serge, “choices” of renting and family strategies to stay in the childhood neighborhood. For people socialized in Paris, the fact that all those in the cluster of marginal cases were working class or lower-middle class individuals living in social housing could also be taken to suggest adding a factor (social class) to the model.

5.3. Counterexamples

Cases on the other side of the gain axis, counterexamples, do not follow the logic of the statistical association.

Paris

As people socialized in Paris during childhood tended to stay in Paris, counterexamples are people raised in Paris who then settled in the suburbs. Here, however, we only have one interview, although it could also be considered as a “divergent case” (as its marginality is slightly higher than its group average). The case of Laurence (Case 2855) is nevertheless enlightening. It shows that residential socialization can forge counter-models. She grew up in an overcrowded Parisian apartment during the post-war housing crisis, and built a negative representation of Paris. She then left Paris very early to live in the suburbs, looking for space and lower density.

Case 2855: Laurence, counterexample of people socialized in Paris

Laurence was born in 1949 in Paris, the second of five children. Until the age of 12, she lived with her parents and siblings in a single room with only one window. It was a caretaker’s lodge (her mother’s work) in a building near the Montparnasse train station. In spite of the good memories she had of Paris, she was marked by the very difficult housing conditions she had: “there are good memories and then there are... because with a little bit you could play, with... it’s true that Paris wasn’t like Paris at the time. And it’s true that we have good memories, we have less good memories of this cramped, dark apartment, there’s one window, one front door. It’s true that it’s not ideal, right?”

Her father was also born in Paris, and her paternal grandmother was a caretaker in a building just across the street. At the birth of his fifth child, her father obtained a four-room apartment in Fresnes (southern suburbs) from his employer’s social housing stock. “There it’s true that there was really space, eh, compared to what we had known, we, the older ones, compared to my brothers who came after... there was really space, eh.” Still, this move was an uprooting for this family of Parisians.

After technical training at the age of 16, she quickly found a job in Paris near the Champs Elysées. At 20, she got married and lived on the ground floor without a bathroom in a house in Antony (close to Fresnes). She had three children, in 1969, 1973 and 1975. Her husband, who was a blue-collar worker, was transferred to the north of Paris and obtained social housing in Sarcelles (northern suburbs) through his employer. But she did not like to live in this apartment. She had difficulty with the overcrowding, the neighborhood, the smells, the noises. “I didn’t like it at all, I was on the verge of depression sometimes.”

Four years later, she managed to convince her husband to move, especially since, like many tenants in social housing, they were receiving advertisements for off plan houses in their mailboxes. They decided to build a six-room house in Persan (a municipality in the far northern suburbs) where there was still free and accessible land. Laurence has been living in Persan for 22 years and is very happy there. She appreciates the space all the more given how she suffered from the lack of it as a child:

“For me, it is space. But it’s the fact... I think that must be it, the fact that when I was young, very young, I lived in cramped conditions, we couldn’t play too much in the apartment, we had to go play

outside. But... I think it can only be that, because I can't stand being in a cramped apartment. I can't stand it anymore. I need some space! (laughing). Space, the garden..."

Note: As Laurence is a counterexample in the sense that she moved to a highly peripheral location despite her socialization in Paris, we looked for the aspects of her life history that could explain this discordant behavior.

Suburbs

For people socialized in the suburbs, the counterexamples (no. 847, 942: Fig. 6) also show possible repulsive effects resulting from residential socialization. These individuals' rejection of their suburban milieu explains their trajectory into more central locations.

For example, Jean-Pierre (Case 847) could have stayed in Neuilly close to his parents and benefited from the family property. He chose to reject his milieu, this chic and wealthy suburb. He became close to his in-laws and adopted another way of life, which he describes as more open, more Parisian, closer to the working classes. He thereby contributed to the gentrification of a previously working-class Parisian neighborhood by transforming a little factory into a home.

Case 847: Jean-Pierre, counterexample of people socialized in the suburbs (no. 847)

Jean-Pierre was born in 1941 in Neuilly-sur-Seine (a wealthy municipality in the innermost western suburbs). He grew up in a mansion, with a very large garden and immediate environment consisting almost entirely of similar residences, with many mansions and very few multi-unit buildings. “And my school friends lived in houses like mine, so we went from one garden to another, and we went by bike from one house to another. It was really nice.” He stayed there until the age of 14, until his parents moved to another part of Neuilly. His parents were very Catholic, very active in the parish of Neuilly, and often invited over family, friends, neighbors and relations: “It’s a world that is closed in on itself.” They hardly ever went to Paris. “I discovered Paris late. I was at boarding school for a long time. So I’d say I lived a lot between the school and Neuilly, but we didn’t go out much in Paris with my parents. I had to wait until I was a bit independent to go out in Paris.”

Jean-Pierre’s boarding school was in Charenton (innermost eastern suburbs, on the opposite side of Paris from Neuilly) for seven years: “For me, boarding school was a solution to escape from the family a little.”

After studying geology (he would go on to become a researcher, and later the director of a research institute), he left his parents’ house and got married.

“I wanted to live in Paris, and since I was interested in research, it was quite obvious that it was in Paris that I would find this place. I would say that my real place to live, the place that interested me was much more centered, close to the university, I would say that for me what interested me was more the 5th, 6th arrondissements, it was the university districts. So I knew that I wanted to do research and I knew that it had to be in Paris.”

His in-laws found the young couple a place to live near their home in the 4th arrondissement, in the very center of Paris. Jean-Pierre discovered a family different from his own, where he felt stifled, as well as another environment.

“And so there I discovered... I would say that Neuilly had lost all its charm, and the 4th arrondissement for me had an incredible charm. I discovered an old district of Paris with beautiful buildings, while Neuilly had become disgusting. It was the bad side of the 16th [bourgeois arrondissement of Paris] not even the pleasant Haussmannian character that there is in the 16th, and so really, Neuilly had become not very interesting. And what’s more I wanted to run away from home, I wanted to break up with the family a bit.”

After the birth of the second child, Jean-Pierre and his wife could not afford to rent in the central arrondissements and went back to the 12th arrondissement (south-east of Paris). After 12 years, wishing to buy, they looked in the east of Paris—an area that fit better with their “anti-bourgeois” lifestyle—for a flat big enough to accommodate the work of his stylist wife. They found a 300 sq. m. disused factory in the 20th arrondissement (east of Paris, socially mixed), which they transformed into a home.

Exploring other cases (notably no. 942, but other cases could also be interpreted as counterexamples, as some cases fall somewhere in between the status of divergent cases and counterexamples) show additional signs of counter-models of socialization, particularly associated to poor transportation conditions, which led some to prefer more accessible locations. Case 942:

“Well, you see, in the end, although I had a nice childhood, my childhood in the suburbs actually led me to a certain rejection of the suburbs. I don’t know why, I became very, very Parisian. So actually the prospect of going to the suburbs, going back to the suburbs wouldn’t appeal to me at all, I find that... I don’t know... you feel too isolated, not enough opportunities to go out.”

Residential socialization can also be counterbalanced by competing forms of socialization, particularly through schooling and friendship networks (Case 1238). In both cases (942 and 1238), the respondents studied in Paris: upper class families usually take care with their children’s schooling, and although these families lived in the suburbs, they sent their offspring to more prestigious Parisian high schools.

Exploring counterexamples can help to nuance the statistical association by bringing out cases that do not fit the model, and help to identify competing factors that may override the

studied factors. The role of residential socialization during childhood is thus not univocal: it can have a negative effect, for example through the experience of bad housing or transport conditions that push some individuals to reject the context in which they grew up. Secondly, the analyses shed light on competing factors: neighborhood of residence alone is not enough to describe individuals' socialization. School or work location may lead to other aspirations and representations. Counterexamples thus may give clues to improving statistical and theoretical models.

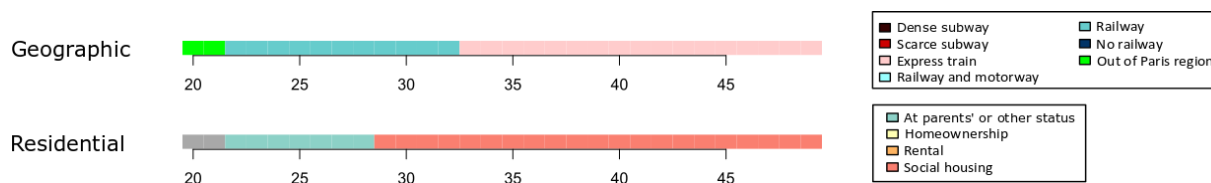
5.4. Divergent cases

Divergent cases are trajectories that do not follow the pattern identified by the statistical model and that are far from the center of gravity of the relevant node.

Paris

The trajectories of divergent cases among participants socialized in Paris (no. 295, 751: Fig. 6) mostly left central locations and did not purchase housing. These cases highlight one limitation of the model: it does not take into account the partner's residential socialization, which may dominate the couple's residential choices. This pattern is also observed for divergent cases of people socialized in the suburbs. For instance, Paule (Case 295), who grew up in Paris in a foster home, had no choice but to follow her husband, who was socialized in the suburbs. Her husband's employer offered them an apartment in social housing in the municipality of her husband's workplace, which she could not refuse. She experienced her departure from Paris as an exile, while she describes her husband as having not changed his habits, with his parents, friends and work all nearby. Interestingly, if her husband had been the respondent, the couple would have been classified as "socialized in the suburbs" and had an illustrative trajectory. Thus, if this information was available in the data, we could have added it to the statistical analysis. It might also suggest checking whether there is an interaction between socialization and gender.

From another perspective, as members of the stable working classes, they, like many workers of the period, found refuge in social housing outside Paris when they formed a family. Here again, introducing social class as a factor would thus have improved the model.

Case 295: Paule, a divergent case of people socialized in Paris.

Born in 1950, abandoned by her parents at birth, Paule spent her entire childhood and adolescence in a series of foster homes in Paris, mostly in the 15th arrondissement. She obtained a diploma in floristry and found work in 15th arrondissement. One of her colleagues introduced her to a friend who went on to become her husband. He was a mechanic and still lived with his parents in Villennes (distant western suburbs). After the wedding, they found an apartment (social housing) nearby in Poissy through her husband's company. Moving from Paris to the suburban social housing, Paule found it difficult to live in this new environment.

“Well, they're foreigners, so you know it's not so easy to get used to it when you come from a big city... Well, I came from Paris, I liked life in Paris. It's still changing.”

Her husband, on the other hand, didn't change anything in his life.

“He's comfortable, this was his area, he used to come around here all the time. Villennes, you know it's not far, it's 15 minutes by car. He used to come here all the time when he lived with his parents. He had friends here... he had lots of them.”

As she repeatedly expressed in the interview, they had no other choice when the children came and started to grow up than to accept the social housing offered by the company.

Paule admits that she would have liked to go back to live in the “15th arrondissement where I was in a foster home. That's where I was born too.”

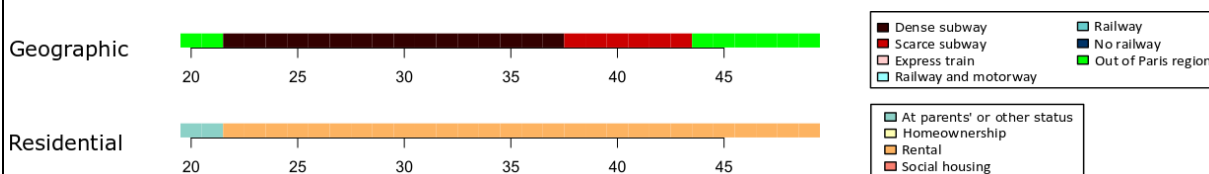
Note: In Paule's interview, we looked for factors that could explain her total divergence from the typical behaviors (staying in central locations and buying a dwelling).

Many interviews with people socialized in the suburbs are identifiable as divergent cases, but most were close to the quadrant of marginal illustrative cases (Cases 572, 811, 1236, Fig. 6) or to the quadrant of counterexamples (Cases 1238, 2606, 1347, 1147, 1032, Fig. 6). We focus here on the latter group. Their trajectories took place in accessible locations and mostly in privately rented housing. As in the previous cases, part of the explanation may be found in the partner's residential socialization. We also found people who experienced significant changes in their trajectory, particularly following a divorce that pushed some people living in the suburbs to return to Parisian rental housing.

For example, if Stéphane (Case 1238) had not divorced, he would have remained a homeowner in Paris and could have been classified as a counterexample of socialization in the suburbs (rejection of the suburbs). This rejection can be explained by the fact that his family

was Parisian and that he attended Parisian high schools. He was partly socialized in Paris, although he only lived there until he was 5 years old. In this case, the identification of place of socialization during childhood with the location of the longest duration of residence may be questioned. Here again, Stéphane’s partner’s residential socialization was important in his trajectory: in his second union, his wife’s socialization in Neuilly outweighed Stéphane’s desire to live in Paris.

Case 1238: Stéphane, divergent case of people socialized in the suburbs



Stéphane, researcher, was born in 1946 in the 5th arrondissement of Paris (university central districts) in a family of intellectuals. His father was a professor of chemistry in a prestigious Parisian university. The family moved in 1951 to Savigny-sur-Orge (distant southern suburbs), where his parents already had a small house. They bought a large bourgeois house with a huge garden. Stéphane regrets how the town has changed over time.

“Well, this garden doesn’t exist anymore, as it’s full of buildings. And the house itself has become the municipal conservatory of music. But that’s not all... the general configuration has suffered enormously from the demographic growth. It’s becoming a bedroom community and there’s not enough housing, there’s not enough land, so the municipalities are trying very hard to build more.”

When he was 20 years old, he left to teach in a high school in Niger for two years. On his return to France, he resumed his studies and suffered from the distance to Paris, where he went every day.

“It was still, in terms of studies, a constraint that was hard for us, to have to go to Paris every morning by train. When I say ‘we,’ it’s as much for me as for my brothers. It’s a real servitude anyway. Every morning, to come back in the evening, to take the train, public transport, the train. It’s not very conducive to studies. I think so. Yes. We used to dream about our friends who lived in apartments in Paris at the time. When we were students, eh.”

He stayed very little time with his parents in Savigny before moving into a two-room apartment in the 15th arrondissement near his workplace. His wife, who joined him, was delighted because this apartment was close to her mother. After the birth of his first child, he found a bigger apartment in the same building through the caretaker. However, the rent was very expensive. With an inheritance from his mother, he decided to buy a property in the 20th arrondissement (east of Paris, socially mixed) where the prices were affordable. It also had the advantage of bringing him closer to his new workplace in the north of Paris. His ground floor apartment even had a small garden, an unusual privilege within Paris.

In 1984, he divorced and left the house he loved so much to his wife and children, and went through a period of residential difficulties: “I’m quite nomadic. Small transitional accommodation,” often found by friends. Then a friend offered him a large apartment where his two sons could come and stay. He stayed there for a short time before he remarried. He then moved to Neuilly to live in the building where his second wife’s parents lived. After years of loneliness, he appreciated finding a family again, his wife having children, brothers and sisters nearby.

Five years later, he had to leave for professional reasons. Seconded to a research institute in Switzerland, he moved there with his whole family. The children were happy and went to the international school. Seven years later, at age 52, he was forced to return to France, as his research institute did not renew his secondment. The whole family regretfully returned to Neuilly. Thanks to the higher salary he had in Geneva, he was finally able to buy an apartment in Neuilly.

Divergent cases mainly highlight limitations of the statistical model. Exploration of interviews offers suggestive possibilities for improvement. The first is the possibility of refining the variables included in the model: for example, the concept of socialization could take into account residential socialization of the interviewee's partner, or other forms of spatial socialization, especially through education. Second, it suggests the introduction of other factors that may help to better model the trajectories of divergent cases, such as elements of the conjugal trajectory.

5.5. Discussion

The mixed method proposed here enabled advances in the understanding of the role of the location of individuals' childhood socialization in their subsequent trajectory. It emphasizes the structuring role of the place where people grew up. In general, people tend to form bonds and become attached to these places. Here, "places" can refer to quite different scales and forms of attachment: to a neighborhood, a city, a region, or a type of urban environment. Moreover, the time spent in a specific place often determines the locations of family and social networks. As shown by the interviews, these networks represent a crucial factor in residential choices—people tend to stay close to them—and even a key resource in access to housing, as also demonstrated by research on *capital d'autochtonie* (Retière, 2003).

Marginal illustrative cases further showed that this structuring role vary between social classes, as exemplified by the inheritance of social housing within Paris.

The counterexamples also showed that this is not an unambiguous process. Painful experiences may drive people to reject their childhood *milieu*, because of housing or transport conditions or even because of the social composition of their place of residence (e.g., rejection of the bourgeois milieu). These cases should be further studied, as these counter-models are not well documented in the literature.

The counterexamples and divergent cases also brought out the limitations of focusing only on the residential dimension of the location of the socialization process. Competing forms of socialization, such as education and work, also play a role, contributing to the diversification of experiences of place and milieu. They may also play a role in the construction of aspirations and representations. The study of residential mobility would thus be enriched by taking into account the geography of other life domains, and not only their place of residence.

Deviant cases also recall that residential choices are often made within a couple. An important part of the unexplained deviation from the cross-case relationship is due to the omission of the residential socialization of the partner, or sometimes even the ex-partner. The choice seems to be easier when the partners share a similar social and residential background. It would thus be interesting to better understand how these tradeoffs are made, and who “prevails” when the partners have differential residential socialization and aspirations.

The interviews thus show that people usually try to stay in, or return to, places where they formed important bonds. Nevertheless, exploring cases along the marginality axis drew attention to the diversity of the means individuals used to stay in their places of socialization: financial support, housing transfers or provision of housing from the family, or even information and tips from friends and colleagues. This diversity is partly related to diversity in the constraints and resources of different households, in terms of financial and social capital, for example.

Overall, these results emphasize the limitations of quantitative analysis focused only on place of birth, ignoring time and processes of socialization. They also counterbalance economic models (Evans, 1973) by showing how strongly choices are driven by subjective histories and may result from strategies whose logic is not exclusively economic. Finally, the results provide support for the life course perspective, which makes it possible to take into account the effect of time as well as the various domains of social life (work, family, etc.) on behaviors. In this context, the combination of quantitative and qualitative methods is crucial to identifying how individual characteristics, experiences and contexts are related to specific behaviors, but also to understanding the variability of the meanings of experiences or transitions for distinct populations (Heinz, 2003), and even the non-linearity of the effect of time on the life course of individuals (Sánchez-Mira & Bernardi, 2020).

6. Generalization and Extensions

In order to keep our presentation as simple as possible, we focused our analysis on the relationship between individual trajectories and a single explanatory factor. However, the proposed tools can also be used with a typology of sequences, or to study several covariates simultaneously.

6.1. Using Multiple Covariates

The methodology proposed here can easily be extended to study several covariates simultaneously. The discrepancy analysis framework offers two methods for doing this: both can be used as part of the proposed case selection technique.

First, it is possible to include several covariates at once using multifactor discrepancy analysis (Studer et al., 2011). As shown by McArdle and Anderson (2001), Equation (1) can also be computed with several covariates. The two proposed indicators can thus be computed using the same formulae. However, in this case their interpretation is slightly different: the marginality and gain indicators now take into account all of the covariates taken together, and the specific effect of each covariate cannot be isolated. For instance, by simultaneously including the place of socialization and parents' social class, one would select cases that are typical or marginal of the two factors taken together. The same applies to the gain indicator, which would measure the information gain when both place of socialization and social class of origin are taken into account at the same time.

Second, it is also possible to include multiple covariates using sequence regression trees (Studer et al., 2011). These trees work as follows. First, all the sequences are grouped into a single "root" node. The procedure then splits this node in two according to the values of a covariate. The covariate, and the corresponding binary split, is chosen in such a way that the resulting child nodes differ as much as possible from one another, or similarly, that the binary split explains the greatest part of the discrepancy of the sequences. The operation is then recursively repeated on each child node until no significant split is found or another stopping criterion is met (typically a minimal node size or a maximum tree depth).

A sequence regression tree highlights the combination of factors that most differentiates the trajectories or, in other words, that best explains the discrepancy of trajectories. Interestingly,

it may uncover interaction effects between covariates, i.e., effects of covariates that depend on the value of another variable. For instance, social class may explain the discrepancy of the trajectories of people socialized in Paris, but not those of people socialized in the suburbs. Furthermore, various visual representations can be used to describe how covariates and trajectories are intertwined.

From a statistical perspective, the whole tree can be summarized by a categorical variable storing the terminal node membership. This variable is then used, for instance, to compute the overall fit statistics of a tree. The same “node membership” variable can be used to compute marginality and gain. Here again, one would select cases that are typical, representative or divergent from the statistical relationships identified by the tree.

The two abovementioned strategies enable several covariates to be included at once. However, the number of covariates should still be limited, as a sufficient number of cases should be selected for each combination of covariates. In this respect, sequence regression trees are particularly interesting as they are more parsimonious. They aim to automatically uncover the relevant combination of covariates to study a given trajectory and to ignore non-relevant combination.

6.2. Using a Typology of Sequences

As proposed by other authors (see for instance Latcheva & Herzog-Punzenberger [2011] or Verd & Andreu [2011]), one might select cases for a qualitative analysis based on a typology of sequences. In this case, the two proposed indicators can improve the diversity of the selected cases. Selecting cases with lowest marginality is roughly equivalent to the usual practice of selection using the medoids. However, selecting cases with differing marginality values might help improve the diversity of the selected cases.

The gain indicator might be useful for better understanding the inner logic of the trajectories identified by the typology. Furthermore, looking at counterexamples and divergent cases is crucial to understanding the limits of the typology, and therefore validating it.

When using a typology in discrepancy analysis, the association should be very strong, because the typology is built to have groups as different as possible from one another. As a result, high and positive values of the “gain” indicator can be expected for most cases. We

therefore recommend using a value greater than zero to distinguish between “illustrative” and divergent cases. For instance, the average or median value could be chosen instead.

The proposed indicator can therefore increase the diversity of the qualitative sample by not only looking at the most central individuals, but also at those whose trajectory does not follow the pattern captured by the quantitative typology.

7. Conclusion

The mixed method tool developed in this paper offers a novel way to mix quantitative and qualitative approaches. Anchored in an explanatory sequential design, it allows qualitative data to be used to deepen understanding of quantitative results. It serves the main purpose of mixed methods: integrating the two types of methods in order to obtain insights that could not be achieved using either type of method on its own (Tashakkori & Creswell, 2007).

The method developed in this paper helps analyze qualitative data by situating them with respect to the quantitative analysis. These qualitative analyses can be used not only to improve understanding of statistical associations, but also to identify the limitations of the statistical model. As explained by Lieberman (2005), this process can be circular, moving back and forth between the two types of materials to progressively enhance the statistical model.

The guidelines proposed in section 4.2.4, using cases whether they are typical or not, illustrative cases or counterexamples, offer various ways to enrich the study of statistical associations by exploring the diversity of mechanisms at work. One important contribution of this analytical framework is the exploration of atypical cases, which are seldom considered in life course research, and are often hidden by statistical trends. Studying them recovers some of the diversity and complexity of behaviors, and theoretically allows the study of the role of trajectories that deviate from the most frequent patterns in a social phenomenon. Focusing on atypical cases is an opportunity to challenge not only statistical models, but also theoretical ones.

In contrast to the tools already developed for cross-sectional analyses (Seawright & Gerring, 2008), the two proposed indicators have the advantage of directly characterizing trajectories considered as complex objects (multidimensional sequences). Two difficulties related to this complexity are inherent in our analytical framework. On the one hand, the values of marginality

and gain are not easily interpretable in relation to the types of trajectories, especially in our application with multidimensional sequences. On the other hand, the boundaries between divergent cases, counterexamples, representative illustrative cases and marginal cases are fuzzy and sometimes linked to methodological choices (e.g., state definitions in sequences). However, this in no way undermines the contributions of a guided analysis of the qualitative material.

8. Notes

1. Housing subject to the “1948 law” is housing built before 1 September 1948 and located in or adjacent to municipalities with more than 10,000 inhabitants. This system maintains low rents and gives tenants and their relatives the right to remain in the premises at the end of the lease. It can be considered as *de facto* social housing.
2. They both also differ from the pattern of those socialized outside of the Paris region.

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