Proceedings of the

International Conference on Sequence Analysis and Related Methods (LaCOSA II)

Lausanne, Switzerland, June 8-10, 2016

Gilbert Ritschard and Matthias Studer (editors)

(June 8, 2016)

Foreword

The International Conference on Sequence Analysis and Related Methods (LaCOSA II) was held in Lausanne, June 8-10, 2016, four years after the Lausanne Conference on Sequence Analysis (LaCOSA). The conference brought together scholars using innovative methods for analyzing longitudinal data in social, managerial, political, population, psychological, health, and environmental sciences with developers of methods for longitudinal analysis.

Sequence Analysis (SA) has become a popular exploratory tool in social sciences since the pioneering contributions of Andrew Abbott and the recent release of powerful pieces of software. Nevertheless, SA remains essentially exploratory and needs to be complemented with other modeling tools, especially when it comes to testing hypotheses or studying the dynamics that drives the trajectories. In that perspective, this LaCOSA II conference did not limit itself to SA by also covered alternative longitudinal methods, such as survival and event history analysis, Markov-based and other longitudinal stochastic models. The aim was to debate how these different approaches can complement each other.

Alongside three keynote talks by Francesco Billari, Jeroen Vermunt and Aart Liefbroer, 57 papers were presented at the conference. The papers were selected among 79 propositions on the basis of reviews made by members of the scientific committee. In addition LaCOSA II featured also a longitudinal data analysis contest.

The present proceedings collect the papers presented at the conference. Some authors chose to not include their full paper for copyright reasons. In those cases only a—short or long—abstract is included.

We would like to warmly thank here all members of the Scientific Committee for their scientific support and their help in the reviewing process. Many thanks also to the Organizing Committee, as well as to Christelle Burri for her administrative assistance. We also acknowledge the financial support of the University of Geneva and its Geneva School of Social Sciences, the Foundation and the Institute of Social Sciences of

the University of Lausanne, the Swiss National Center of Competence in Research LIVES and the Swiss National Science Foundation. LaCOSA II would not have been possible without all these supports.

Organising Committee

Gilbert Ritschard, NCCR LIVES, U. of Geneva (chair)
André Berchtold, U. of Lausanne
Felix Bühlmann, U. of Lausanne
Jacques-Antoine Gauthier, U. of Lausanne
Jean-Marie Le Goff, U. of Lausanne
Emmanuelle Marendaz Colle, U. of Lausanne
Grégoire Métral, U. of Geneva
Emanuela Struffolino, WZB Berlin
Matthias Studer, U. of Geneva
Eric Widmer, U. of Geneva

Scientific Committee

Gilbert Ritschard, Switzerland (chair)
Andrew Abbott, USA
Silke Aisenbrey, USA
André Berchtold, Switzerland
Torsten Biemann, Germany
Francesco Billari, UK
Ivano Bison, Italy
Philippe Blanchard, UK
Göran Broström, Sweden
Christian Brzinsky-Fay, Germany
Felix Bühlmann, Switzerland
Benjamin Cornwell, USA
Daniel Courgeau, France
David Edwards, Denmark
Cees Elzinga, Netherlands
Anette Fasang, Germany
Alexis Gabadinho, Portugal
Jacques-Antoine Gauthier, Switzerland
Brendan Halpin, Ireland
Dominique Joye, Switzerland
Jean-Marie Le Goff, Switzerland
Laurent Lesnard, France
Tim Liao, USA
John J. McArdle, USA
Melinda Mills, UK
Madalina Olteanu, France
Raffaella Piccarreta, Italy
Gary Pollock, UK
Nicolas Robette, France
Patrick Rousset, France
Fiona Steele, UK
Katherine Stovel, USA
Emanuela Struffolino, Germany
Matthias Studer, Switzerland
Eric Widmer, Switzerland
Frans Willekens, Germany

Contents

Keynotes

Discovery and explanation in demography and life course research

Francesco C. Billari
Oxford University

Simple and advanced latent Markov modeling: A flexible probabilistic approach to sequence analysis

Jeroen K. Vermunt
Universiteit Van Tilburg

Abstract: Latent Markov modeling – also referred to as hidden Markov, Markov switching, regime switching, or latent transition modeling – has become a quite popular tool for longitudinal data analysis in social, behavioral, and biomedical research. In this talk, I will introduce the latent Markov model as a tool for sequence analysis. The key feature of this probabilistic model is that it takes into account that true and observed sequences may not match perfectly. More advanced versions allow among others dealing with multivariate, parallel, and correlated sequences, with various forms of observed and unobserved heterogeneity, with nested/multilevel sequences, with incompletely observed sequences, and with an unequal spacing of the measurements in time. I will illustrate these simple and more advanced versions of the latent Markov model with an empirical example and discuss their implementation in the Latent GOLD 5.1 software.

Using sequence snalysis to understand the family-life course: Developments and future perspectives

Aart C. Liefbroer
Netherlands Interdisciplinary Demographic Institute (NIDI)

From 07.00 to 22.00: a dual-earner typical day in Italy.

Old questions and new evidences from social sequence analysis.

Ivano Bison & Alessandro Scalcon
Dep. of Sociology and Social Research,
University of Trento,
via Verdi, 26, I-38100 – TRENTO (Italy).
ivano.bison@unitn.it

Abstract

The paper analyses the daily activities of dual-earner couples in Italy. The goal is to discover how Italian dual-earner couples organize their daily activities (sleep, personal care, work, moving, housework, free time), during a typical work day from Monday to Friday. The analysis, carried out on data from the 2008 Italian Census on Time Use (the last one available), involves all the 873 couples that filled in their diaries on the same day.

Using the binary index (Bison, 2006, 2011a, 2011b, 2014; Bison, Rettore, Schizzerotto 2010; Franzosi, Bison 2010), we conduct a 'multichannel' analyses on the dual-earner couple's activities from 7.00 to 22.00.

Quite strong relations with socio-demo-geographic conditions emerge from these analyses. Hence there is a strong relation of time packaging and the time spent on the various activities according to where couples live with respect to both geographical area (North, Centre and South & Islands) and the size of the town (metropolitan, more than 50,000 residents, from 10,000 to 50,000, fewer than 10,000).

Strong relations also emerge with the level of education, the social class and the occupational sector of Him and Her. Relations with the presence of children are observed mainly at the beginning and the end of the day. At the same time, the different time packaging profile of the dual-earner couple that emerges from the k-means cluster analysis seems to have a direct effect on His and Her level of satisfaction.

All the preliminary analyses seem to confirm the idea that dual-earner couples package their life time mainly in accordance with their jobs. Moreover, the analyses show that this time packaging changes in relation to the kind of job (social class) and the occupational sector. Secondly, the time spent on each activity changes according to the level of education of Him and Her, but there is an additional effect due to the social and cultural level of the area where they live.

1. Introduction

Since the 1960s and 1970s, the daily use of time has radically changed in industrialized countries. For instance, the average work time per person has declined while the leisure time has generally increased (Gershuny, 2000); high-skilled workers have progressively worked longer hours compared to unskilled and low-status ones, inverting the traditional work hours/social class gradient (Warren 2003; Lesnard et al., 2009); the overall gender gap in non-paid work has being partially filled – even if to a lesser extent than expected (Gershuny et al., 1988) – as a consequence of the increase of women's participation in the labor market (Hook 2006; Raley et al., 2012). Factual changes in daily behaviors follow new gender values, like the diffusion of more 'career-oriented' attitudes among women (Hakim, 2003) and the parallel rise of more conciliatory and intimate fatherhood (Naldini et al., 2011).

Dual-earner couples experience strong time constraints and need constantly to negotiate their time use by dealing with the family's time scarcity (Saraceno, 2012). They may try to be more or less aligned during the day, according to their 'production' and 'consumption' complementarity strategy (Mansour et al., 2013). This happens especially on weekdays, where the combined

exposure of time pressure increases due to the work time of each spouse. Thus, the spouses are required to 'find time' to spend *with* the family as well as *for* the family and these collective needs are followed by individual and private ones as well. The two individual careers have to coexist with a third one – that of 'family life' – which today seems to be equally important for both the spouses (Levner, 2000 in Haddock et al., 2006). It is for this reason that the daily work-family balance becomes a crucial dimension for the quality of life among dual-earner couples.

A dual-earner couple's daily strategy is obviously constrained to the 'work' activity, which represents a totalizing and exclusive time. Regarding workdays, we may say that free time and household care – as well as travel/moving, sleep and personal care – must be primarily managed according to work times by filling the gaps in working schedules. This is why «not only the total amount of work time but also its scheduling are very significant» in understanding dual-earners' entire workdays (Lesnard et al., 2009:3). The non-work activities, in fact, are expected to be affected by work in terms of both quantity and timing.

According to their work-family strategies and time constraints, couples may prefer higher or lower levels of synchronization in their daily working schedules. Nock and Kingston (1984) found that when both the spouses work, the time for family may be more desynchronized than that of single-earner couples. This happens because their working schedules may not overlap, thus reducing the time that those spouses could spend together on other joint activities (Nock et al., 1984). Moreover, it has been argued that a certain degree of 'off-scheduling' would be preferred by some particular couples, especially those with children, and that – although fathers seem to be less used to altering their hours of labor force participation in favor of childcare (Raley et al., 2012) – both the spouses might want to reduce the overlap of their working schedules in order to maximize the potential time for childcare (van Klaveren et al., 2011).

In general, the literature shows that dual-earner couples that are more desynchronized in working schedules share household and family duties more equally, and that this could be a desirable solution for them (Presser, 1994; Chenu et al., 2002; Lesnard, 2008; Naldini et al., 2011). At the same time, scholars have pointed out that dual-earner couples always seem to prefer a certain level of synchronization in their working schedules – with an increase in the overlap between them – in order to maximize a shared conjugal leisure time (Hamermesh, 2002; Lesnard, 2008).

Here, the point is that, independently of their most desired work-family solution, dual-earner couples must deal with the rigidity of the time constraints imposed by working schedules. On the basis of their 'time sovereignty' over their working schedules, spouses could better align their preferences with factual time-use behaviors. However, the literature shows that this capability is strongly related to the overall job commitments of the spouses, and these are associated with their individual occupational class and the more general social ladder (Warren, 2003). Thus, basically, workday schedules and the constraints for the couples' daily activities is not random (Warren, 2003).

Several papers have pointed out the externalities of such a class-related 'wealth' of time among couples (Warren, 2003), analyzing the impact of different socio-economic conditions on daily working time. Indeed, the higher the spouses' social position, the greater their bargaining power with employers for the purpose of daily time and schedules management (Lesnard, 2008; Warren 2003). However, high-skilled and high-status jobs are likely to require long work hours (Gershuny, 2000; Warren, 2003; Lesnard et al., 2009). Thus, more freedom in the organization of the working schedule may be associated with greater work hour's commitments.

Another point concerns education. For instance, we know that higher-educated people have more autonomy in determining their work schedules (Voorpostel et al, 2010). At the same time, they are expected to have higher earnings on average than lower-educated individuals, and for wealthy couples we know that they consume more synchronous leisure time (Hallberg, 2002). On the other hand, lower-wage workers are more likely to work evening shifts (Hamermesh, 2002) and some studies have pointed out a negative association between evening working hours and some

family togetherness moments regularly scheduled at the end of the day, such as shared meals, television watching, or leisure activities (Nock & Kingston, 1988; Lesnard, 2008). Finally, being more educated helps couples to increase the availability of shared conjugal time.

As said, that of family solidarity and togetherness is a non-reducible valuable dimension for couples' everyday life (Hamermesh, 2002; Lesnard, 2008). Scholars have underlined the importance of the total amount of time spent jointly in the same place by the spouses. However, even during time spent together, significant gender differences have been identified, especially in the configuration of free/leisure time and household task boundaries.

For instance, it has been noticed that even if spouses spend free time together in the same place, the woman is more likely to do unpaid work simultaneously, as a 'secondary activity'. This difference in multi-tasking allows men to spend their leisure time in blocks, while that of women is more likely to be interrupted and reduced by household care tasks (Bittman et al., 2000; Mattingly et al., 2003; Kilkely et al., 2010; Naldini et al., 2011). Women's multi-tasking may undermine their daily quality of life (Offer et al., 2011) by negatively affecting the free time quantity and continuity.

Moreover, the risk of a free time deprivation for women increases by the kind of household care activities. For instance, the contribution of men to house care occurs mainly for less routine tasks – i.e. pet care, maintenance of the garden, repairs, care of adults – while the more routine, essential and demanding activities – i.e. cooking, cleaning and laundry – still seem to be a women's responsibility (Kan et al., 2011; Moreno-Colom, 2015).

Something similar has been observed for gender segregation in childcare time. In fact, fathers do less child care than mothers, even if this gap is lower than in the past (Raley et al., 2012; Craig et al., 2014). Moreover, fathers tend to leave mothers alone in the most stressful, ordinary, and onerous tasks: they are more likely to provide childcare simultaneously with the mother, rather than alone; and they are generally more likely to be engaged in less routine and more desirable tasks (Budig et al., 2004; Craig, 2006; Raley et al., 2012).

Finally, women are 'care managers' (Naldini et al., 2011) engaged in the most onerous tasks in terms of time and energy, while fathers seem to fill the timetable gaps with the more pleasant and 'desirable' ones. The main outcome is that women's unpaid work throughout the day is more constant and repetitive (Wajcman, 2008; Kilkely et al., 2010) while that of men is typically sporadic and delimited in both time spent and variety of tasks (Kilkely et al., 2010:245). All these findings depict a well-recognized and documented scenario: within the spouses' daily life there is a 'leisure gap' in favor of men even if their partner works: «in most industrial countries […] employed women work longer hours (paid and unpaid) than employed men» (Mattingly et al., 2003; Beblo et al., 2008:281) and the gradual gender convergence in the housework time allocation of recent decades (Raley et. al, 2012; Craig, 2006; Kilkey et al., 2010) seems to be not enough for the protection of women's free time.

Whether the spouses are spending time together or they are performing more or less similar activities at a certain point in time, the issue of 'being (de)synchronized' matters. In this sense, that of off-scheduling becomes a crucial concept. However, the main problem is how to measure it.

When off-scheduling has been measured by means of time use diaries,[1] the main approach has been to count the slots in which both the spouses have worked or not, obtaining work synchronicity ratios or percentages. In this way, the (de)synchronization is seen as the quantity of time in which both the spouses work. However, nothing is known about 'when' the work schedules are overlapped and when they are not. This is a crucial limitation for two main reasons. First, time is socially structured as well as social rhythms and social constraints. Hence, being at work simultaneously at 10 a.m. or 10 p.m. has radically different impacts on a couple's daily life (Lesnard, 2008). Second,

[1] We shall not discuss the other older and less precise techniques to measure working time, like those of surveys in which two different questions – when did you start / when did you finish – are posed. We focus on modern time use surveys.

take the case of a full-time shift perfectly synchronized with a part-time afternoon shift: by considering only the duration of the overlap, we will mistakenly classify it as a highly desynchronized working schedule. However, such kinds of '*structural desynchronizations*' – due simply to differences in duration – should not be compared with hypothetical others with the same off-scheduling amount but different organization during the day (Nock et al., 1984).

Moreover, most of the above scholars have shown an important limitation regarding the mainstream time approach. As suggested by Lesnard (2005), if «we know little about how family time is daily balanced with work time for both spouses», this is mainly due to the limits of the dominant time-budget perspective, «an individualistic approach and a simplification of time» (Lesnard 2005:2). In fact, scholars have underestimated the importance of daily scheduling, while paying more attention to total amounts of time (Lesnard, 2008). They have traditionally acquired time budget information related to different daily activities, but these should be seen in a holistic perspective that makes it possible to study the couple's days as a whole, avoiding the manipulation of time as if it were clay.

According to Hallberg (2002), «while the traditional time allocation model typically studies the total time spent in, e.g., market work, over a day or a week, it provides little or no insight into the temporal pattern of time-use and therefore, potentially, misses a vital part of the mechanisms underlying empirical observations» (Hallberg, 2002:2). On the other hand, if schedules are studied as sequences (Lesnard, 2004), new insights could emerge on the interdependence and the synchronization within different daily activities scheduled by both the spouses. A sequence analysis of time-use would point out the routine aspect of the daily life, as well as the couples' *projects*[2] performed to perceive their strategies across several daily constraints and unexpected events (Hägerstrand, 1982; Hellgren, 2014). Finally, the analysis of the time-use temporal patterns seems more relevant – instead of time budgets – in the study of the daily strategies and behaviors of a couple (Hallberg, 2002).

Lesnard's works pave the way to the solution of these distortions by considering working *schedules as sequences* (Lesnard, 2004), overcoming the time budget framework's limits and measuring (de)synchronizations in an integrated quantity-timing perspective (Lesnard 2004, 2005, 2008; Lesnard et al. 2009). Unfortunately, and despite this fundamental contribution, the entire complexity of daily schedules have been basically reduced to working schedules. Thus, the crucial dimension of the spouses' daily (de)synchronization-in-time – i.e. their combination of activities at each point-in-time – has been studied only for the work activity. For instance, we do not know how leisure and household activities interact with the working schedules during the whole day by filling the out-of-work time of the spouses. For these activities, we have only information on different time budgets.

The point is that we are not able to locate these different out-of-work activities in the different parts of the day and we don't know how the different activities of the day are combined by the spouses at each point-in-time. Somehow, by considering multiple activities simultaneously, the problem of being able to recognize structural desynchronizations and those that are not is crucial (Nock et al., 1984). In a sense, we might say that the same gendered time budget gap in house care could be more or less impactful between two different couples, according to His and Her structure of the day in terms of both duration and sequence of activities.

Finally, in current research on couples' daily work-family balance strategies, there are several shortcomings in the implementation of a holistic approach of time integrity. Garcia et al. (2016) underline that: *a)* not many studies have adopted a real couple-level-approach[3] (Lesnard, 2008;

[2] The word *project* is a key concept in the 'time-geography' perspective, founded by Torsten Hägerstrand (1970). This concept «was meant to tie together into a whole all those 'cuts' in evolving situations that an actor must secure in order to reach a goal» (Hägerstrand, 1982: 324)

[3] Even among the more recent and important time-use surveys, the provision of information about both the partners is a rare feature – i.e. the American Time Use Survey (ATUS) does provide it. In this regard, the Italian survey 'Uso del

Craig et al., 2011 in Garcia et al., 2016); *b)* few others have focused on how working schedules are related to multiple daily activities (Wight et al., 2008; Lesnard, 2008; Garcia et al., 2016). We add that *c)* only Lesnard has studied working schedules from a sequence analysis perspective (Lesnard 2004). Moreover, to our knowledge, *d)* no one has considered the entire complex of daily activities of Him and Her as a unique sequence, neither at an individual nor at a couples' level.

Thus, in order to understand the complexity of work-family balance strategies, it is necessary to study the couple's daily time-use pattern as a whole and in a more holistic way. In what follows, we aim to contribute to overcoming these limitations with a new viewpoint based on a 'multichannel' sequence analysis. We believe that new useful evidence may emerge from old questions if we start to consider couples' work-family strategies as an overall temporal pattern of combinations of multiple activities. And the first is to wondering: how to measure it?

2. Order as distance

> "All things whatever stand to each other in some relation of time. Every phenomenon, when considered in connection with any other, must be cognized either as occurring before it, as being simultaneous with it, or as occurring after it. But all objects of thought, and, among others, relations of time, admit of being compared, and their likeness or unlikeness recognized. The time-relation of events that occur simultaneously, is manifest different from the time-relation that occur one after the other. Two sequences are alike in so far as they are sequences, and each of them is unlike a coexistence. Hence, if there are time-relations so completely alike as to be indistinguishable, they may properly be called equal." (Spencer 1855, p.119).

One of the main problems of current techniques used to compute the distances among sequences derives from the way in which similarity between two sequences is defined. Abbott& Forrest (1986), Elzinga (2003) and Dijskra (1997) agree that two sequences are equal when they comprise the same elements in the same order. They also agree, although they take different approaches to the problem, that two sequences are maximally different when they have no elements in common (as regards order and type of elements). In other words, imagine that four women are being observed for a period of length 2, and that whether or not they give birth to a child in each time interval is recorded, thus obtaining the following four different sequences: A {0,0}; B {0,1}; C {1,0} and D {1,1}. With the methods proposed, the distances between sequences BC and AD are greater than the distances between the sequences AB, AC, DB and DC. In fact, A and D do not have elements in common; nor do – in the same order – B and C.

But what is meant by 'maximally dissimilar'? Whilst it is evident that if two sequences share the same number of elements in the same order they are maximally similar, it is less clear what 'maximally dissimilar' signifies. In other words, is the number of shared elements the only possible way in which we can establish the distance between two sequences?

In the above example, woman A had no fertility events during the observation period; woman B had a fertility event immediately before the conclusion of the observation period; woman C had a fertility event at the beginning of the observation period; and woman D had two fertility events, one at the beginning and one at the end of the observation period. It is clear that in this case is difficult to say that the women B and C are maximally distant: both had just one child, the only difference being that they did so at different moments of the observation period, while it is reasonable to believe that the distance between A and D is maximum. The problem therefore resides in the importance given to the temporal order of the events, their numerousness, and the presence of shared elements when the distance is calculated.

Tempo' (ISTAT, 2011) gathers such information, which is essential for understanding both how spouses coordinate their family time and whether men and women differ in their time-use patterns.

The principal focus of the above-cited studies is the search by means of pair wise comparison for common elements, but this may not be only the way to establish distances (similarities or differences) between sequences. If the sequences are ordered according to the number of observed events and, all of observed events being equal, an order is established along the temporal axis in which the events have occurred, then woman B, who had her fertility event immediately before conclusion of the observation, follows (is logically closer to) woman A, who had no fertility event during the observation period;[4] woman C follows A and B in that she also had only one child, but did so before B, and obviously before A. Finally, comes, woman D, who had two fertility events and is therefore more distant from the woman who did not have any, but also from those who had only one. Hence, on considering numerousness and the order of occurrence of the events, one obtains a unilinear structure with the order A,B,C,D of the four sequences. The similarity between sequences and their proximity thus results from the order in which the events occur, not from the common elements. The order itself exhibits that there are more elements there are in common, the closer the two sequences, without requiring complicated and not always clear measures to compute the weights and contributions for comparison. The problem is therefore how to find a simple and rapid way to compute this order.

3.0 A first definition of lexicographic index

We can define a generic sequence as a list of episode-states observed in a particular time interval. Ideally, but also graphically, this list develops along a single dimension, that of time. For instance, suppose that one is observing labor market participation by subject A for six months. Assume that at any particular time subject A can exhibit only one of the followings three states: 1= employed; 2 = unemployed; 3= inactive. At the end of the six months of observation, sequence A is [123321]. Graphically, this sequence is a list of the episodes experienced by the subject in a one-dimensional space. At the beginning of the observation, A spends the first month in employment and in the second month is unemployed. At the end of the second month, s/he exits the labor market and only returns in the fifth month to seek a job. Finally, in the sixth month s/he is once again employed. Now, the question is: can we reduce a multinomial sequence to a one-dimensional list of different episodes linked in time? The answer is no. Indeed, a multinomial sequence cannot be represented by any list at all. A multinomial sequence does not exist as such; rather, it results from the co-action of the states of which it is composed. A multinomial sequence is a point in the space-time defined by the states space. The problem now is how to represent a multinomial sequence.

It said above that every state has its own generating mechanism, which operates independently of the others. In geometric terms this signifies that each individual state defines an axis of a $\boldsymbol{q}$-dimensional space, where $\boldsymbol{q}$ is the size of the state space, i.e. the set of values defined in the state space that the generic sequence can assume. Each axis in its turn represents the state space of the set of all the possible orders in which a state can occur in a sequence of length **t**. Put otherwise: a space will have as many dimensions, each orthogonal to the others, as there are states defined in $\boldsymbol{q}$. Taken individually, each dimension of this space will represent the set of all the possible realizations with which every state may occur in a binary sequence of length $\boldsymbol{t}$.

Now suppose that it is possible to attribute a value to all the elementary sequences observed so that they can be arranged along their axis. Suppose also that it is possible to draw as many orthogonal straight lines as there are axes starting from each point defined by each elementary sequence making up the multinomial sequence. The point in space defined by the intersection of all these straight lines will be the multinomial sequence. A multinomial sequence is therefore a point in the $\boldsymbol{q}$-dimensional space of the states, and its coordinates are the values of the individual elementary sequences of which it is composed.

[4] Although this is not to say that in the following, not immediately observed, period also A will have a fertility event.

In this way, three things are obtained. The first is that a multinomial sequence consisting of manifold states is reduced to a single point in space. The second is that the multinomial sequence is no longer a series of realizations along a one-dimensional line in which the different mechanisms that have produced it are con-fused in a whole. Rather, each individual state, each individual event, is free to define the form and the length of the individual lines, which in turn are free to interweave with each other to form the complicated plot of a story which has a logical narrative. Finally, and perhaps most interestingly, the distance between two multinomial sequences is the distance between two points in a Euclidean space. It will be only necessary to decide what method one wants to adopt for calculating the distance.

Moving from a multinomial sequence to its elementary sequences is straightforward. Just as a qualitative variable of $\boldsymbol{k}$ modality can be represented by $\boldsymbol{k}$-dummy variables, so a multinomial sequence of $\boldsymbol{q}$-states can be represented by $\boldsymbol{q}$ binary sequences. For example, the sequence A = [123321] can be represented into the following three sequences A_1 = [100001]; A_2 = [010010]; A_3 = [001100].

Still to be defined is a method to calculate the coordinates, and therefore a method to attribute univocal values to the elementary sequences. The next section provides a possible solution.

3.1 The lexicographic index

The index now introduced derives from the example in the previous section. The goal is instead to attribute a univocal value to each different binary sequence of length $\boldsymbol{t}$. The intention is also for the index in question to have the properties of triangularity, symmetry and positivity proper to a distance; and even more importantly for it to take account of time; that is, of the different ways in which a state can come about in time within a binary sequence. For these various purposes, we must impose an order of all the possible binary sequences of length t. However, the problem is deciding what order to impose.

Take, for instance, the following binary sequence relative to labor market participation by A = [0101] in a period of four months. This sequence gives us two items of information. The first is that A was employed for two months. The second is that A was employed at the time $\mathbf{t_2}$ and at the time $\mathbf{t_4}$. A binary sequence, therefore, responds to two distinct ways of observing time. The first concerns the quantity of time and answers the question 'how long'. The second concerns the moments in which the states are realized and answers the question 'when', 'at what time'. This twofold nature of the binary sequence forms the basis of the sorting order introduced here.

The index is based on the sorting order of these two different modes of observing time. The first order is given by the quantity of time and is therefore based on the number of times that state $\boldsymbol{q}$ is observed in the sequence. The second order is given – the quantity of observed time being equal – by the 'moment' or 'moments' in the sequence when state $\boldsymbol{q}$ occurs. This second sorting order is also based on a twofold order. The first is the reverse order in which the events occur in time. It thus puts first the events that occurred last and then the events that occurred first. This solution is adopted in light of the discussion in Section 3. It will be recalled that woman B with sequence [0,1] followed woman A with sequence [0,0]. The two sequences were considered to be closer to each other than the others because B's fertility event occurred immediately before the end of the observation period, with it being hypothesised that A would have had her own fertility event immediately after conclusion of the observation. The second order is a direct consequence of the first. The events that occur last will vary more slowly in the order than those that occurred first.

Because the nature of the sorting order is double, also the proposed index consists of two distinct parts. The first part, ranging from 0 and 1, takes account of the different amount of time/realization recorded in each sequence and it is:

$$d'(x_i) = \frac{u}{T} \quad \text{for } u > 0 \text{ and } 0 \text{ for } u = 0. \tag{1}$$

The second part, ranging from 0 and 1, which takes account of the different numbers of combinations displayed by the sequences with variation in the amount of time. Calculation of this part is slightly more elaborate.

Tab.3.1State space of the sequences length T = 4 ordered by the lexicographic index (d_i') and (d_i'') of lexicographic index $>_{b2}$.

i.	t1	t2	t3	t4	(d_i')	(d_i'')
1	0	0	0	0	0	0.0000
2	0	0	0	1	0.25	0.2000
3	0	0	1	0	0.25	0.4000
4	0	1	0	0	0.25	0.6000
5	1	0	0	0	0.25	0.8000
6	0	0	1	1	0.50	0.1429
7	0	1	0	1	0.50	0.2857
8	1	0	0	1	0.50	0.4286
9	0	1	1	0	0.50	0.5714
10	1	0	1	0	0.50	0.7143
11	1	1	0	0	0.50	0.8571
12	0	1	1	1	0.75	0.2000
13	1	0	1	1	0.75	0.4000
14	1	1	0	1	0.75	0.6000
15	1	1	1	0	0.75	0.8000
16	1	1	1	1	1.00	0.0000

Suppose that there is a binary sequence x_i containing the observations of T time periods. Observation x_i can assume only two modalities represented by the numbers 0-1. These modalities we shall call absence/presence. Consider the case in which exactly u realizations equal to 1 occur. There are obviously several sequences that have this characteristic. For example (Table 1.) sequences from 6 to 11 have $u = 2$.

The problem now is to allocate to each sequence x_i a number (x_i'') representing its position, normalized between 0 and 1, in the sorting order of the sequences. An example will aid understanding of the computational procedure. The set of the possible binary sequences x_i of length T=4 are exactly 2^4=16, and they are represented in Table 1.

Consider, for simplicity, only the $x_i = \binom{T}{u} = \binom{4}{2} = 6$ sequences for $u = 2$, which are denoted in Table 1 by the numbers from 6 to 11. Following the chronological order, the first and second realization (the 1s) of the sequence are called $\boldsymbol{s}_1$ and $\boldsymbol{s}_2$. We calculate for every realization u of the sequence x_i three values $\boldsymbol{s}_k\{\boldsymbol{A}_k, \boldsymbol{B}_k, \boldsymbol{C}_k\}$, where:

- $\boldsymbol{A}_k$ is the exact position of $\boldsymbol{s}_k$ in the sequence. For instance, in the sequence 6, for $\boldsymbol{s}_1$: $\boldsymbol{A}_1 = 3$, and for $\boldsymbol{s}_2$: $\boldsymbol{A}_2 = 4$; in the sequence 13, $\boldsymbol{s}_1$: $\boldsymbol{A}_1 = 1$, $\boldsymbol{s}_2$: $\boldsymbol{A}_2 = 3$, $\boldsymbol{s}_3$: $\boldsymbol{A}_3 = 4$;
- $\boldsymbol{B}_k$ is the maximum position that $\boldsymbol{s}_k$ can occupy within the sequence. For example, for the sequences 6, 7, 8, $\boldsymbol{s}_1$ can occupy at most position t3 because position t4 is occupied by $\boldsymbol{s}_2$, so that $\boldsymbol{B}_1 = 3$, while for sequences 9 and 10, $\boldsymbol{B}_1 = 2$, because $\boldsymbol{s}_2$ now occupies position t3. Finally, for sequence 11, $\boldsymbol{B}_1 = 1$. For $\boldsymbol{s}_2$ in all six sequences considered, $\boldsymbol{B}_2 = 4$;
- $\boldsymbol{C}_k$ is the minimum position $\boldsymbol{s}_k$ that can occupy. In this case, for all six sequences considered $\boldsymbol{C}_1 = 1$ and $\boldsymbol{C}_2 = 2$.

At this point, the calculation of the second part of any binary sequence of length **t,** for any number of realizations u, will be:

$$d''(x_i) = \frac{\binom{T}{u}}{\binom{T}{u}+1} * \frac{1+\binom{T}{u}-\left[\binom{B_u}{C_u}-\sum_{s_{k=1}}^{s_k}\binom{B_k}{C_k}-\binom{A_k}{C_k}\right]}{\binom{T}{u}} \quad (2)$$

The (d_i'') part of the lexicographical index is one plus the difference between the set of all the possible realizations of a given value of *u* minus the difference between the set of the possible realizations for the maximum position $(\boldsymbol{s_k})$ reach of *u* minus the summation of the difference between the set of all the possible realizations of $\boldsymbol{s_k}$ taking account of the upper and lower limits within which $\boldsymbol{s_k}$ can occur and the position in which $\boldsymbol{s_k}$ is observed divided by the binomial coefficient of all the sequences that can be realized for a given value of *u*, normalize from 0 to 1.

The decision to normalize (d_u'') is taken because the number of sequences varies with the value of *u*. Thus, independently of the value of *u*, the distance between the first and the last sequence defined with the same *u* will be at most 1.

The solution thus is a measure of distance to an index formed by a couple of distances/coordinates on a Cartesian space (Graph 1.0), where $d'(x_i)$ concerns the quantity of time and $d''(x_i)$ concerns the moments (the timing) in which the states are realized.

The similarity/distance between two sequences $(x_i, x_j)$is the Euclidean distance between a couple of lexicographic indices '$>_{b2}$'.

$$r'(x_i, x_j) = \sqrt[2]{\sum_{q=1}^{Q}(d'(i)-d'(j))^2+(d''(i)-d''(j))^2} \quad (3)$$

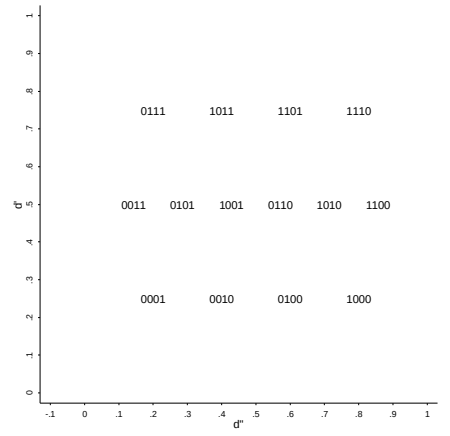


Fig.3.1. Plot of a binary sequence of length 4 according to the lexicographic index coordinates.

3.2 From binary to multinomial sequences

The next step is to pass from a binary sequence to a multinomial sequence: that is, the case in which there are more than two states (for example, 'employed', 'unemployed', 'never worked', etc.). In the above paragraph we have underlined that just as a qualitative variable of $\boldsymbol{k}$ modality can be represented by $\boldsymbol{k}$-dummy variables, so a multinomial sequence of $\boldsymbol{q}$-states can be represented by $\boldsymbol{q}$ binary sequences with values 0-1. So which element $x_{qi}(t) = 1$ if the ith unit assumes the qth modality in the tth instant, $x_{qi}(t) = 0$ otherwise. It is possible to apply both the lexicographical

indices to each of these sequences and compute the distance measure $r_q(x_i)$ or the coordinate/distance numbers $\{d'_q(x_i);\ d''_q(x_i)\}$. The multinomial sequence x_i is therefore described by a vector to real numbers. The distance function between two multinomial sequences x_i and x_j is the Euclidean[5] distance between their transformations r_i and r_j. Formally the coordinate/distance lexicographic index ($>_{b2}$) the distance is:

$$D'(x_i, x_j) = \sqrt[2]{\sum_{q=1}^{Q} \left(d'_q(i) - d'_q(j)\right)^2 + \left(d''_q(i) - d''_q(j)\right)^2} \qquad (4)$$

3.3 Some considerations on the index

We shall conclude this second part of the article by briefly discussing the index just presented. Firstly, the index is a measure defined *a priori*, independently of the sequences observed. Hence, it is not comparison between the sequences that defines their distance; instead, their distance is given by definition in an independent system of measurement. The index has a known beginning and end; each point of the measure is univocal and identifies one and only one combination of states in sequence. Two sequences which differ in the position of only one element will have different positions. Two sequences with the same number of realizations in the same order will share exactly the same point in the index. None of the information contained in the sequences is lost. From every point one can retrace the exact sequence that has produced it.

A second characteristic of the index concerns its output. With current methods, the output is a symmetrical matrix of distances. This matrix can be used only in statistical procedures based on matrixes of distance, like hierarchical clusters and multidimensional scaling. The output of the lexicographical index is a cases by variables format, where the cases are the sequences, and the variables are the lexicographical indexes of the states that make up a sequence. Each value of the index, in fact, can be conceived as a coordinate in the space of the multinomial sequence. This characteristic enables the researcher to adopt different methods to calculate the distance, but also to define forms of space other than Euclidean. Moreover, the index can also be used with other statistical analysis programs, like the k-mean cluster or the fuzzy k-means cluster. In this case, the matter is not only technical but also substantive. When applying a hierarchical cluster, one implicitly assumes that the phenomenon studied is organized into successive specializations. But this is only one of the possible ways in which a phenomenon may structure itself; the hierarchical model is only one of the possible ways in which a relationship model can be structured.

4. The data, their organization and the coding of the activities'

Analyses were conducted on 873 dual-earner couples[6] carry-out on data of the Italian Census on Time Use 2008/09 (the last disposable). The goal is to discover how the Italian dual-earner couples organize their daily activities (sleep, personal care, work, moving, housework, free time), during a typical work day from Monday to Friday.

From Him and Her time-use diaries were considered the dual-earner activities from 7.00 to 22.00. Each daily activity is observed every 10 minute, and the data files for the sequence analysis consisted of two pair sequences, one for Him and one for Her, with a total of 90 points in time.

[5] Given the metric nature of the two lexicographical indices, the Euclidean distance is only one of the possible ways of define the distance between two sequences. It is possible to adopt both different measures of Euclidean distance that to define other geometric spaces different from that Euclidean.

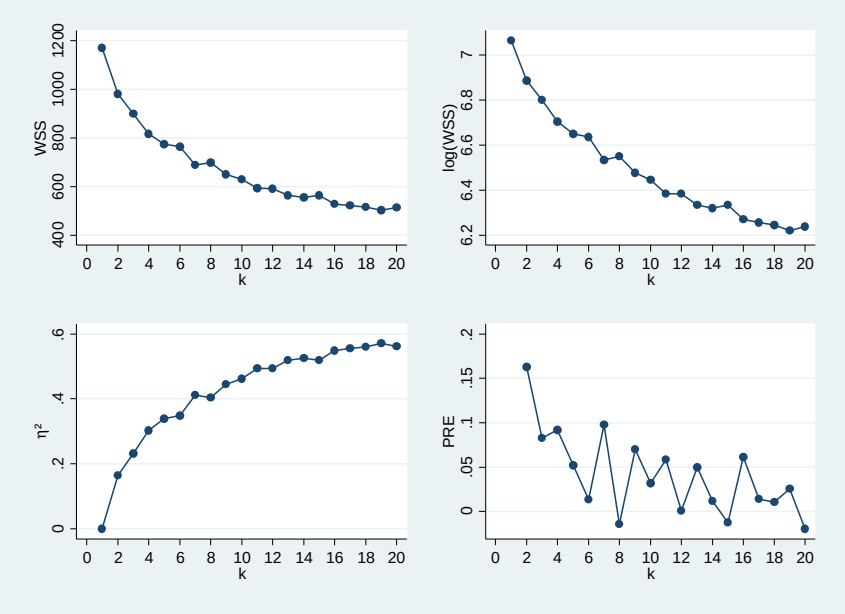
[6] Excluded from the sample were: (a) couples who living with other couples (parents or others); (b) couples that fill the questionnaire in different days, or fill the questionnaire in the week-end; (c) couples with incomplete information by one or both the spouses; and, (d) age of him or she greater than 65 year old.

Each couples of row of this file corresponded to a cohabitation, while each variable corresponded to 10 minutes of observation and each cell of the row/column intersection states the activities of the man and the woman at time **t**.

In order to simplify the analysis, the paper considered 6 different groups of activity: (a) sleep; (b) personal care, i.e. have a shower etc., eat (breakfast, lunch, dinner); (c) work; (d) moving (any kind); (e) house care, i.e. housework, children care, repair, etc.; (f) free time and other activities with or without others.

Once having defined the six daily macro-activities, the next step was establishing how to codify the day activities of the man and the woman in the couple. In this case, His activities and Her activities interact in time to give rise to the couple's daily activities. Taken individually, each of these two sequences takes the form of a series of mutually exclusive episodes. The problem is therefore how to codify two interacting sequences composed of a plurality of mutually exclusive events. All the solutions proposed to date (Abbott 1990b, Dijkscra 1995, Elzinga 2003, Gauthier et al. 2010) have been based on the generation of events combinations: that is, on the construction of a single sequence that combines the states of Him and Her.

Fig. 4.1. WSS, log(WSS), η2, and PRE for all twenty cluster solutions on the lexicographic index for the sequences from 07 to 22.



This operation has a number of consequences. Firstly, as Abbott pointed out, using combinations of events requires one to pay «… the price of losing all information about the temporal 'shape' of events – their duration and their intensity in terms of producing occurrence – in short their time horizon. (Abbott 1990b: 146)». Secondly, there is the risk that distinct time-use patterns will be tied together, although the order of causality may be bi-directional.

There are various reasons to believe that the day activities of Him and Her cannot be reduced to a simple combination of states. Internally, moreover, each sequence consists of states which themselves are regulated by their own mechanisms which operate differently in defining the timing and duration of each individual episode/state. By way of example: consider the mechanisms that underlie the regulation of the states of housework and free time. In the former case, it is the

educational level, for instance, that regulates the time spent in these two activities; in the latter, and there is an interaction between gender and educational level.

It is therefore possible to hypothesize that the sequences of Him and Her – and the states of which they are composed – have their own underlying generative mechanisms which establish the timing and duration of episodes. These generative mechanisms work independently of each other and interact in time: they stand in a coexistence relationship. The couple's daily activities are therefore the result of a complex process of co-action between two sequences, that of Him and that of Her, regulated by different generative mechanisms resulting from the co-action between different generative mechanisms underlying each state. Consequently, reducing everything to a combination of events is to lose large part of the variability inherent in each single time use sequence.

Couple's daily activities, or more correctly the couple sequences analyzed here, are therefore configured by co-action by two multinomial sequences composed of mutually exclusive episodes. On extending the applications proposed (Bison, 2011a, 2011b) of the lexicographical index ">b2", 12 binary sequences can be defined, six for His states and six for Her states, of equal length t = 90, that is, to the overall number of point of observation. The couple sequence is defined as a point in a 24-dimension space whose coordinates are the 12 binary sequences defining the respective sequences of Him and of Her. The distance between two couple sequences will be given by the Euclidean distance between the two points of the two sequences in the 24-dimension space.[7]

These 24 variable/coordinates defined for all the 873 couples were analyzed using a simple k-means cluster algorithm to find clusters of similar couple sequences. From the analyses it was decided to adopt a seven-cluster solution for the first analysis (Fig.4.1).

These clusters has been analyzed both as dependent variables in order to verify which features were most expressive of the individual patterns and subsequently as independent variables to estimate the effect on His/Her satisfaction of time and daily activities. For all these analyses we have used information relative to the educational qualification[8], job (sector, class position, full-time/part-time), area of residence[9], dimension of town[10], age, the presence of children.

5. From 7.00 to 22.00: a typical working day of a dual-earner couple in Italy

It is not news that the everyday life of a dual-earner couple is complex. It involves a long and difficult schedule of: waking up, having a shower, breakfast, taking the car-bus-train, going to work, beginning work, lunch, resuming work, coming back home, then housework and family/child care for Her, relaxation for Him, dinner, and at the end of the day, before they go to sleep, some leisure activity.

Data from the Italian Time Use survey demonstrate that this is the typical daily routine of a dual-earner couple. The time plot of activities of figure 5.1 does not show a clear difference in the behaviors of Him and Her or differences among couples. In the morning, at 7.00, 75.0% of couples are involved in personal care, are at work, or going to work. From 8:00 to 12:00 all the couples are at work. After that, they have a break for the lunchtime. From 1.30pm to 5.00pm they are again at work. Finally at home, they engage in housework and free-time activities, and then the day is ended.

Until noon the couple's everyday lives are perfectly synchronized. He and She show some differences in the afternoon, where fewer women than men are at work. The women seem to use

[7] It can be easily shown that information is not lost or altered with this coding scheme. Moreover, the procedure does not require the researcher to perform complicated combinational operations and make arbitrary coding choices.

[8] Educational qualifications were classified as: (a) compulsory (elementary school certificate (including no educational qualifications), lower-secondary school certificate (including 2-to-3 year vocational certificates), (b) upper-secondary school diploma (including post-secondary diplomas), and (c) degree (including postgraduate qualifications).

[9] The areas were (a) North; (b) Centre (c) South and Islands.

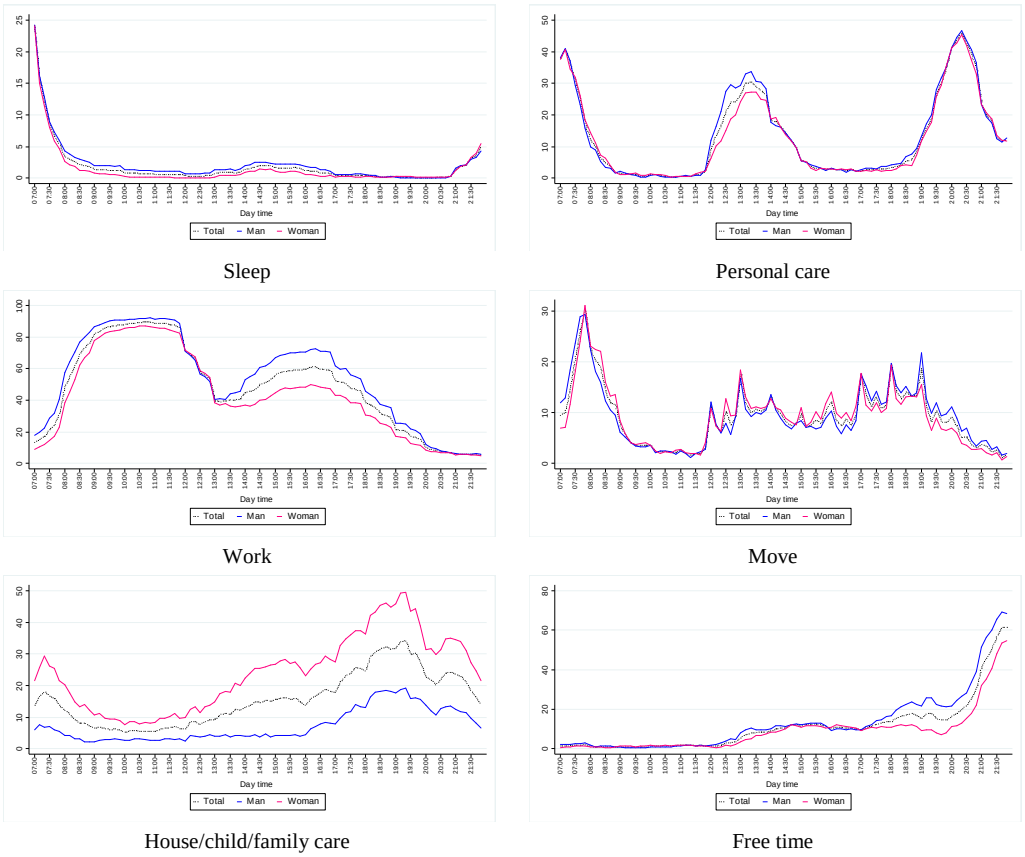
[10] The town dimension were classified as: (a) Metropolitan; (b) more than 50.000 people; (c) from 10.000 to 50.000 people; and, (d) less than 10.000 people

this time not spent on the job mainly for house care (housework, child care, etc.). This is not a new finding, and it is due to the unequal distribution of house care activities between genders in the couple.

Regarding to the total average, time spent on the single activities by men and woman during the day (Tab. 5.1), He and She devote more or less the same amount of time to personal care (i.e. showering, eating, etc.) and travel (any kind). Differences are observed in the time spent on work, house care, and free time. The men spend an average of 8 hours and 6 minutes on work, 1:06 on house care, and 2:02 on free time. The women spend 6:32 on work, 3:37 on house care (more than three times that spent by men), and only 1:22 on free time.

Then, on the one hand, the couple's daytime activities are synchronized with a common social rhythm; on the other, there are differences between men and women in the time spent on some specific activities. The questions that arise are the following. How do He and She organize their lives and how do they synchronize their daily activities? Do all dual-earner couples follow exactly the same pattern or are there different patterns, or no patterns? And if different patterns exist, are they due to internal and individual bargaining between him and her, are they the result of some external constraints, or are they a combination of both?

Fig.5.1. Tempograms: Daytime activities on total and by gender.



Sleep | Personal care

Work | Move

House/child/family care | Free time

Given the evidence that job activities and work time play a central role in daily time organization, one wonders whether the dual-earner daytime is similar both within the couple,

between Him and Her, and among couples, or whether there are different patterns of daytime activities within and among dual-earner couples. The hypotheses that derive from this are the following:

(a) Among couples, job activities and working time have an effect not only at the beginning of the day but also on the organization of large part of the daytime. We expect to find an effect on lunchtime, on free time, and on evening activities;

(b) Within dual-earner couples we expect to observe a different timing and packaging of daytime activities according to the different job characteristics of Him and Her. Moreover, we expect to observe that the different distribution of house care not only depends on the educational/cultural level of Him and Her (mainly to configure a different timing at the beginning and end of the day) but is also strictly connected with the different worktime and work schedules (working hours, hour of starting and finishing work) of Him and Her;

(c) Social rhythms and social constraints have an effect both among and within dual-earner couples. We expect to find that the timing of a couple's activities varies according to the social and the cultural context in which it lives.

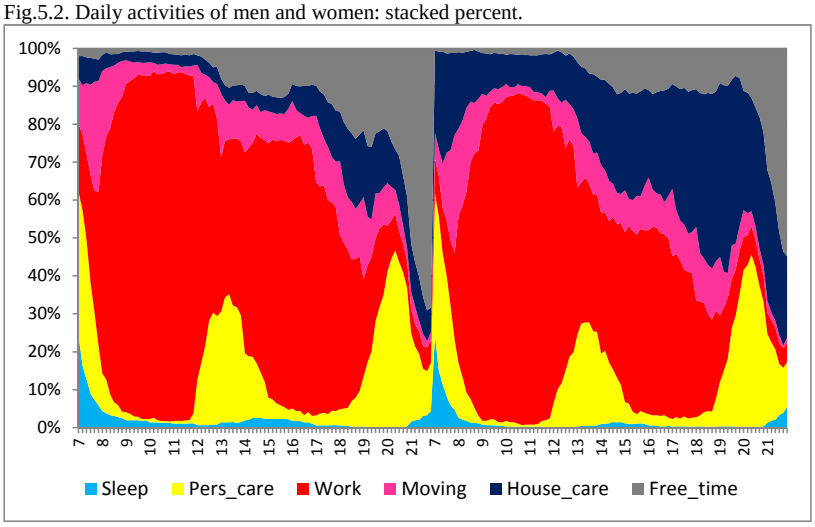
To falsify these hypotheses, we start by observing the entire daytime of dual-earner couples from 7.00 to 22.00.

The results of the k-means cluster analysis carried out on the lexicographic index >b2 show that a seven cluster solution (Fig.4.1) is acceptable (but not optimal).

Considering each cluster in detail, however, we can observe some systematic differences among clusters. Moreover, these differences seem to describe clear and reckonable patterns in the day organization of both individuals and couples. Finally, the strong relations with social-cultural-demographic features support the idea that these behaviors and patterns are the results of two factors: one is the internal organization of each couple conditioned by the social-cultural-economical characteristics of the two partners; and the other is the external social rhythms constraint.

There follow brief biographical sketches for each cluster.

Fig.5.2. Daily activities of men and women: stacked percent.



The dual-earner couples in **cluster 1** wake up very early in the morning (Fig.5.3, Tab. 5.2). At 7:00am both are awake (Tab.5.1). Both work for a long time: He for 8 hours and 32 minutes, and She for 7 hours and 28 minutes. Both spend more than one hour and a half on travel/moving. Their

lunch breaks begin at different times (Tab.5.3): for Him at 13:20, for Her at 13:30. Both have very little free time. However, between the two, She has less free time, only 49 minutes in the entire day, compared to His 1:42 hours.

The sequence index plot shows that these couples have an unequal behavior in the division of housework. He spends no more than one hour a day on house care; moreover, He does not do anything in the evening. She not only spends more than three hours a day on house care, but this activity is mainly carried out in the evening when He is relaxing.

These dual-earner couples live mainly in metropolitan areas or in medium-sized towns (10-50,000 residents) in the Centre of Italy (Tab. 5.5). They have one or more children aged between 0 and 14 years old. Both are in the middle class (IIIa), the only difference being that He works in private services and She in industry (Tab. 5.6 & 5.8).

Tab.5.1. Mean (in hours/minutes) of the times spent in each activity by the clusters. (F. Test)

	Sleep		Personal Care		Work		House Care		Moving		Free Time		
Clu.num	M	W	M	W	M	W	M	W	M	W	M	W	N.
1	0:01	0:00	2:02	1:50	8:32	7:28	1:08	3:15	1:35	1:38	1:42	0:49	133
2	0:04	0:03	1:50	1:49	7:26	6:30	1:51	3:51	1:23	1:18	2:27	1:28	158
3	0:03	0:38	2:09	2:01	8:38	6:07	0:50	3:35	1:18	1:17	2:02	1:23	99
4	1:04	0:44	2:02	1:58	7:27	6:09	1:10	3:27	1:17	1:19	2:00	1:24	108
5	0:51	0:02	2:10	1:53	7:46	6:58	1:05	3:25	1:14	1:24	1:55	1:18	129
6	0:08	0:08	2:08	1:51	8:45	6:07	0:30	3:59	1:24	1:78	2:05	1:37	179
7	0:14	0:11	2:06	2:01	7:58	6:16	1:13	3:30	1:42	1:26	1:47	1:36	67
Total	0:19	0:13	2:03	1:54	8:06	6:32	1:06	3:37	1:24	1:23	2:02	1:22	873
F.	*31.5***	*42.5***	*3.6***	*1.6*	*12.9***	*8.6***	*18.9***	*2.8**	*3.1***	*3.9***	*4.3***	*6.9***	

Sign: (*) p.<0.05; (**) p.<0.01

Both are very dissatisfied with the time available for the partner, children, and relaxation (Tab. 5.7). He is much stressed, highly dissatisfied with daily life and with the time that he has for himself. Finally, both have many difficulties in reconciling daily tasks with the opening hours of office, shops, and leisure center.

The dual-earner couples in **cluster 2**, like those in the previous cluster 1, wake up very early in the morning. At 7:00 am both are awake; 37.1% of men are at work or are about to reach the workplace. She starts work slightly later than He; only 24.7% of women are at work or going to work at 7:00 am.

Compared with the other couples, the couples in this cluster spend less time on personal care (1 hour and 50 minutes on average) and on work: He 7 hours and 26 minutes, and She 6 hours and 30 minutes. Work activities are undertaken mainly in the morning. Both devote a great deal of time to house care.

Tab.5.2. What does He and She do at 7:00am. Activities conducted from 7.00am to 7:10am by gender and cluster.

	Sleep		Personal Care		Work		House Care		Moving		Free Time		
Clu.num	M	W	M	W	M	W	M	W	M	W	M	W	N.
1	0.8	0.0	52.6	51.9	18.1	6.8	7.5	30.1	20.3	10.5	0.8	0.8	133
2	1.3	0.6	43.7	44.9	26.6	15.8	15.8	29.1	9.5	8.9	3.2	0.6	158
3	1.0	90.9	62.6	4.0	16.2	1.0	3.0	3.0	16.2	1.0	1.0	0.0	99
4	87.0	91.7	5.6	3.7	5.6	2.8	0.9	1.9	0.9	0.0	0.0	0.0	108
5	81.4	0.8	4.7	53.5	10.9	10.9	0.8	27.1	1.6	7.0	0.8	0.8	129
6	1.7	2.2	50.8	43.6	22.9	13.4	4.5	29.6	16.8	10.6	3.4	0.6	179
7	9.0	22.4	41.8	50.8	17.9	4.5	6.0	14.9	19.4	6.0	6.0	1.5	67
Total	24.3	24.1	38.0	37.7	17.8	9.1	6.0	21.7	11.9	7.0	2.1	0.6	873

Among the men, He is the one that devotes most time to house care (1 hour and 51 minutes), while among women, She is the one that devotes most time to house care (3 hours and 51 minutes). Lunchtime for Him is between 12:30 and 13:30, while for Her it is at either 13:10 or at 14:10.

Dinner is for both at 20:10. After dinner both spend their time on relaxing and leisure activities. Moreover, among men, He is the one that has most leisure activities (2:27).

Tab.5.3. What does He and She do at 22:00. Activities conducted from 21.50pm to 22.00pm by gender and cluster.

	Sleep		Personal Care		Work		House Care		Moving		Free Time		
Clu.num	M	W	M	W	M	W	M	W	M	W	M	W	N.
1	3.8	0.8	9.0	9.0	1.5	3.0	13.5	61.7	0.8	0.0	71.4	25.6	133
2	4.4	8.2	8.2	10.8	3.8	3.8	0.0	1.9	2.5	0.0	81.0	75.3	158
3	5.1	0.0	12.1	14.1	3.0	5.1	3.0	23.2	3.0	4.0	73.7	53.5	99
4	0.0	0.0	9.3	5.6	13.9	10.2	7.4	30.6	2.8	2.8	66.7	50.9	108
5	0.0	5.4	9.3	9.3	14.0	5.4	4.7	23.3	0.8	0.8	71.3	55.8	129
6	8.4	11.7	8.9	8.9	0.0	1.7	6.7	0.0	0.6	0.6	75.4	77.1	179
7	9.0	9.0	53.7	38.8	11.9	11.9	16.4	25.4	7.5	4.5	1.5	10.5	67
Total	4.4	5.5	12.7	11.8	6.0	5.0	6.6	21.5	2.1	1.4	68.3	54.8	873

These couples live mainly in large towns (over 50,000 residents) in center and northern Italy. They have children. He and She belong to the middle class (IIIa) or the working class (VI+VIIab), and they both work in the public sector.

Tab.5.4. When do He and She eat? Lunch and dinner hour by gender and cluster

	Lunch		Dinner		
cs7	men	women	men	women	Freq.
1	13:20	13:30	20:10	20:08	128
2	13:27	13:33	20:00	19:53	151
3	13:08	13:21	19:58	20:03	91
4	13:26	13:34	20:20	20:10	97
5	13:22	13:39	20:14	19:57	119
6	13:03	13:30	19:51	19:47	169
7	13:24	13:36	20:43	20:21	61
Total	13:18	13:32	20:07	20:00	816
F.	4.15**	1.22	12.81**	10.04**	

Sign: (*) p.<0.05; (**) p.<0.01

He is quite satisfied with the time for himself and with daily life. He is slightly more satisfied than Her with the time available for the partner, children, and relaxation. It is mainly She that has difficulties in reconciling daily tasks with office opening hours; while neither of them has particular difficulties in reconciling daily tasks with the opening hours of leisure centers and shops.

In **cluster 3**, He wakes up before She. At 7:00 in the morning 62.6% of men are having a shower and/or breakfast, and another 32.4% are at work or about to reach the workplace. She wakes up on average 38 minutes after Him. Both spend more time, compared to the overall mean, on personal care during the day. Lunchtime for Him is at 13:27; for Her it is at 13:33. Dinner for Him is at 20:00 while for Her it is at 19:53.

In this dual-earner couple a first main difference concerns work time. He spends 8 hours and 38 minutes on average at work. By contrast, She spends only 6 hours and 7 minutes. Moreover, compared with the other women, she is the one that spends less time at work. The second main difference concerns the time that He and She devote to house care. He is occupied for only 50 minutes a day in this activity; She 3 hours and 35 minutes at day. The third main difference concerns free time in terms of duration and moment (when) they relax. On average, He has 2 hours and 2 minutes of free time, while She has only 1 hour and 23 minutes. For Him, free time starts at 21:00 while for Her it starts later. In these couples, at 22:00 only 53.5% of women are in leisure activities against the 73.7% of men.

These couples reside in medium-sized towns in northern and central Italy. They have no children or have children aged over 14. Both are entrepreneurs, professionals or managers (I+II). He works in industry or the private services sector; She works in the public service sector.

Tab.5.5. Cluster distribution by geographic area, municipality size, children, couple's educational level, and couple's social class. (row percentage)

	Clusters						
	1	2	3	4	5	6	7
Geographical area (X^2=22.8; Pr = 0.03)							
North	13.6	19.1	11.7	12.1	14.9	22.9	5.6
Center	19.0	18.4	12.9	15.1	11.2	17.3	6.2
South and Islands	15.5	16.0	9.5	10.8	17.2	18.1	12.9
Municipalities (X^2=33.6 Pr = 0.01)							
Metropolitan	17.7	16.6	11.6	12.7	20.4	13.8	7.2
over 50.000 residents	14.1	24.7	11.2	15.9	11.2	14.7	8.2
10.000-50.000 residents	18.5	13.7	12.8	10.9	15.6	21.3	7.1
lower than 10.000 residents	12.2	18.3	10.3	11.3	12.9	27.0	8.0
Children (X^2=23.5 Pr = 0.02)							
No child	11.4	14.4	13.8	19.2	13.8	16.8	10.8
Children 0-14	17.2	19.0	9.6	11.0	16.3	19.2	7.8
Children 14+	14.5	19.0	12.6	10.4	13.0	24.9	5.6
Couple school degree (X^2=17.5 Pr = 0.13)							
University	14.8	14.3	9.8	17.6	14.8	19.7	9.0
Secondary	15.9	21.0	11.8	10.2	14.5	18.3	8.3
Compulsory	14.8	17.5	12.1	10.5	15.2	24.5	5.5
Couple Social Class (X^2=35.3Pr = 0.01)							
I+II	15.7	11.4	14.6	15.0	13.9	22.1	7.1
IIIa	16.9	23.2	9.4	10.2	16.3	16.9	7.2
IVabc	10.4	14.8	10.4	16.5	13.0	22.6	12.2
VI+VIIab	13.8	21.6	10.3	8.6	13.8	25.9	6.0
Total	15.2	18.1	11.3	12.4	14.8	20.5	7.7

Tab.5.6. Cluster distribution by education level, social class and sector of man and woman. (row percentages)

	Cluster						
	1	2	3	4	5	6	7
Man school degree (X^2=18.6 Pr = 0.10)							
University	14.3	16.8	9.9	19.3	16.8	16.2	6.8
Secondary	15.1	21.5	12.0	11.0	13.9	17.7	8.8
Compulsory	15.7	16.0	11.4	10.6	14.7	24.6	7.1
Woman school degree (X^2=12.8 Pr = 0.38)							
University	15.8	16.3	7.6	16.3	14.7	20.7	8.7
Secondary	16.1	19.2	13.0	12.2	13.6	17.5	8.5
Compulsory	14.0	17.9	11.6	10.5	16.1	23.6	6.3
Man social class (X^2=44.2 Pr = 0.00)							
I+II	15.0	11.3	13.8	14.6	15.0	22.5	7.9
IIIa	19.8	24.1	8.2	11.6	15.1	14.7	6.5
IVabc	13.2	11.2	11.2	17.1	15.8	20.4	11.2
VI+VIIab	12.5	23.3	12.1	8.0	13.7	24.1	6.4
Woman social class (X^2=33.5 Pr = 0.02)							
I+II	17.0	9.4	16.0	18.9	9.4	17.9	11.3
IIIa	18.0	19.7	11.1	11.3	14.9	18.9	6.2
IVabc	9.3	16.1	8.5	17.0	14.4	25.4	9.3
VI+VIIab	11.6	20.2	11.1	8.6	17.7	22.7	8.1
Man sector (X^2=53.7 Pr = 0.00)							
Industry	14.0	19.6	12.2	8.0	11.6	27.4	7.1
Private services	16.7	11.8	12.8	16.7	18.3	15.9	7.9
Public services	14.6	28.7	6.4	11.7	13.5	17.0	8.2
Woman sector (X^2=44.6 Pr = 0.00)							
Industry	17.7	18.8	9.7	3.8	18.3	25.8	5.9
Private services	16.1	14.4	13.1	18.1	13.6	16.1	8.6
Public services	12.4	22.8	10.0	10.0	14.1	23.1	7.6
Total	15.2	18.1	11.3	12.4	14.8	20.5	7.7

Tab.5.7. ANOVA: mean score, F.test and probability of the level of satisfaction, level of stress, difficulties in reconciling daily tasks, according to husband and wife by cluster types.

	Cluster									
	1	2	3	4	5	6	7	Mean	F.test	Pr.
Satisfied with the time for:										
He: Yourself	1.63	1.85	1.84	1.86	1.63	1.89	2.16	***1.81***	3.16***	0.005
She; Yourself	1.54	1.56	1.76	1.72	1.52	1.70	1.68	***1.63***	1.35	0.234
He: Partner	1.62	1.97	1.87	1.81	1.74	1.91	2.03	***1.84***	2.48**	0.022
She: Partner	1.74	1.82	1.81	1.92	1.74	1.86	2.11	***1.84***	1.39	0.217
He: Children	1.54	2.05	1.81	1.80	1.68	1.69	2.03	***1.77***	4.23***	0.000
She Children	1.73	2.07	2.05	2.08	1.93	2.06	2.30	***2.00***	2.94***	0.008
He: Parent	2.05	1.85	1.99	1.82	1.91	1.68	1.79	***1.86***	2.02*	0.061
She: Parent	1.88	1.70	2.00	1.86	1.87	1.76	1.78	***1.83***	0.98	0.435
He: Job	2.49	2.62	2.51	2.46	2.58	2.44	2.57	***2.52***	2.14**	0.046
She: Job	2.61	2.53	2.61	2.56	2.53	2.70	2.61	***2.60***	1.77*	0.100
He: Friends, social relations	1.51	1.93	1.78	1.53	1.66	1.94	1.80	***1.75***	4.65***	0.000
She: Friends, social relations	1.62	1.70	1.76	1.81	1.76	1.74	1.70	***1.73***	0.51	0.799
He: Leisure, hobby	1.42	1.55	1.57	1.37	1.48	1.43	1.60	***1.47***	1.08	0.371
She: Leisure, hobby	1.47	1.42	1.48	1.59	1.48	1.43	1.53	***1.47***	0.61	0.726
He: Relax	1.65	2.00	1.91	2.00	1.75	1.60	2.10	***1.81***	4.86***	0.000
She: Relax	1.51	1.61	2.07	1.75	1.67	1.79	1.57	***1.71***	4.16***	0.000
Are you stressed?										
He	2.27	2.09	2.17	2.19	2.12	2.24	2.01	***2.17***	1.48	0.182
She	2.35	2.32	2.29	2.24	2.32	2.62	2.34	***2.38***	3.97***	0.001
Difficulty to reconciling daily tasks with:										
He: Work time of partner	2.29	2.16	2.26	2.31	2.22	2.43	2.27	***2.29***	1.25	0.280
She: Work time of partner	2.34	2.16	2.17	2.20	2.27	2.04	2.24	***2.19***	1.55	0.160
He: Children school hours	2.39	2.16	2.39	2.38	1.97	2.32	2.22	***2.26***	1.80*	0.097
She: Children school hours	2.40	2.09	2.20	1.97	2.18	2.21	2.00	***2.17***	1.90*	0.079
He: Office opening hours	2.69	2.24	2.34	2.39	2.23	2.55	2.24	***2.41***	4.08***	0.001
She: Office opening hours	2.45	2.24	2.17	2.26	2.44	2.16	2.21	***2.28***	1.78*	0.100
He: Leisure center opening hours	2.53	1.95	2.23	2.08	2.07	2.26	2.30	***2.20***	4.36***	0.000
She: Leisure center opening hours	2.31	1.90	1.98	2.07	2.18	1.81	2.09	***2.03***	4.34***	0.000
He: Shops opening hours	2.34	1.86	2.17	2.13	2.09	2.41	2.13	***2.18***	5.15***	0.000
She: Shops opening hours	2.33	1.95	1.98	2.05	2.12	1.80	1.98	***2.02***	4.47***	0.000
Satisfied of daily life:										
He	2.74	2.87	2.80	3.01	2.77	2.71	3.08	***2.82***	6.22***	0.000
She	2.82	2.89	2.90	2.94	2.82	2.75	2.89	***2.85***	1.88*	0.082
Satisfaction for labor division with the partner regarding:										
He: House care	3.20	3.17	3.18	3.27	3.17	3.33	3.17	***3.22***	1.38	0.219
She: House care	2.58	2.70	2.68	2.68	2.59	2.40	2.68	***2.59***	2.21**	0.041
He: Children care	3.15	3.22	3.18	3.23	3.35	3.17	3.41	***3.23***	2.14**	0.047
She: Children care	3.02	3.12	2.95	3.07	2.94	3.03	2.92	***3.02***	0.89	0.499

Legend: (*) p<0.1; (**); p<0.05; p<0.01

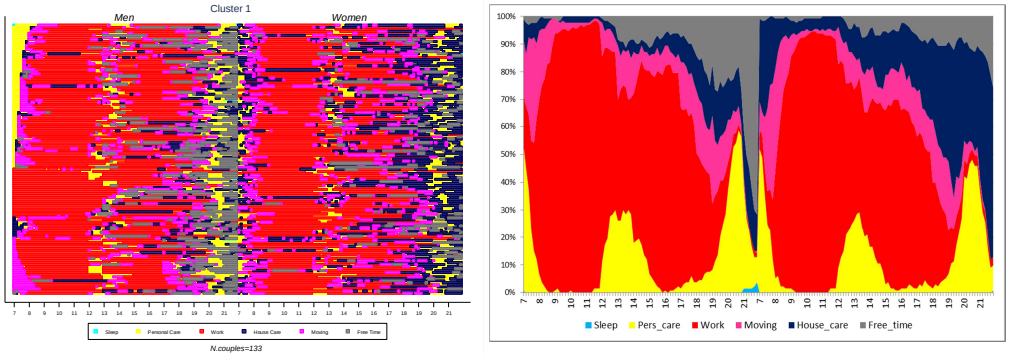
Both are only slightly more satisfied than couples in cluster 1 with the time that they have for the partner and children. She is very satisfied with the amount of time for relaxation: She records the highest value among women. Moreover, She does not signal particular difficulties in reconciling daily tasks with the opening hours of shops and leisure centers. By contrast, He seems to suffer more than She does. He is rather stressed and not very satisfied with daily life. He states that he has more problems in reconciling daily tasks with the opening hours of offices, shops and leisure centers.

The dual-earner couples in **cluster 4** are characterized by a quite synchronized and relaxed day. Both wake up one hour after the majority of members of other couples. 87.0% of men and 91.7% of women in this cluster are asleep at 7:00. Like the couples in cluster 2, those in cluster 4 spend a relatively short amount of time at work: He 7 hours and 27 minutes, She 6 hours and 9

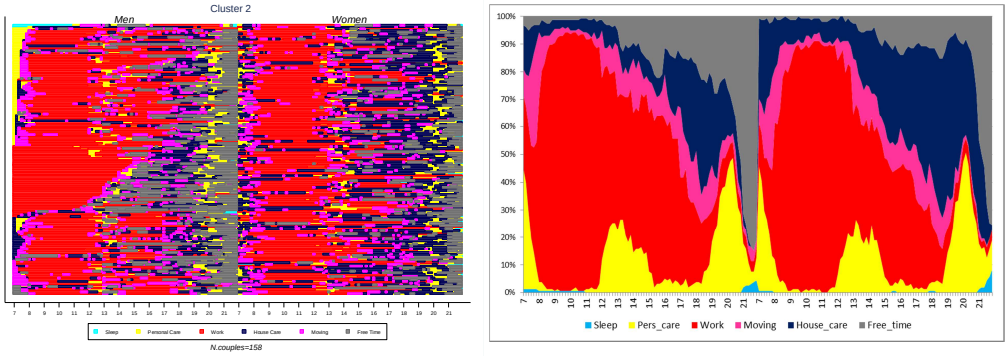
minutes. Both have lunch at the same time (He at 13:26; She at 13:24). In the evening, She has dinner slightly earlier (20:10) than He (20:20).

Fig.5.3. Sequence index plot and stacked area plot of the seven clusters.

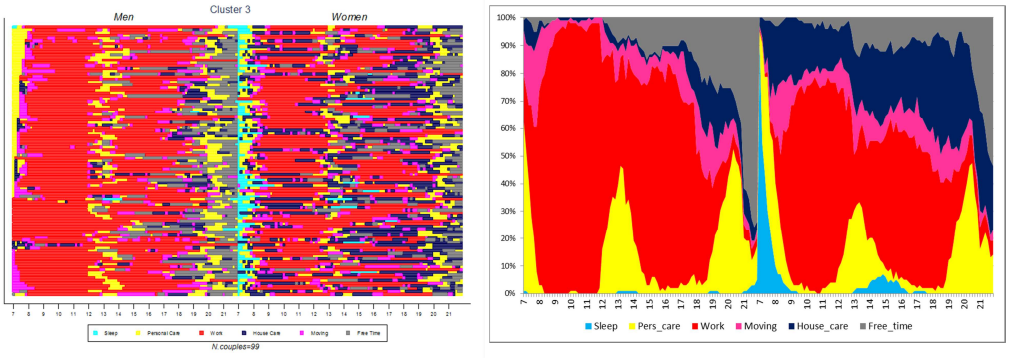
Cluster 1



Cluster 2



Cluster 3

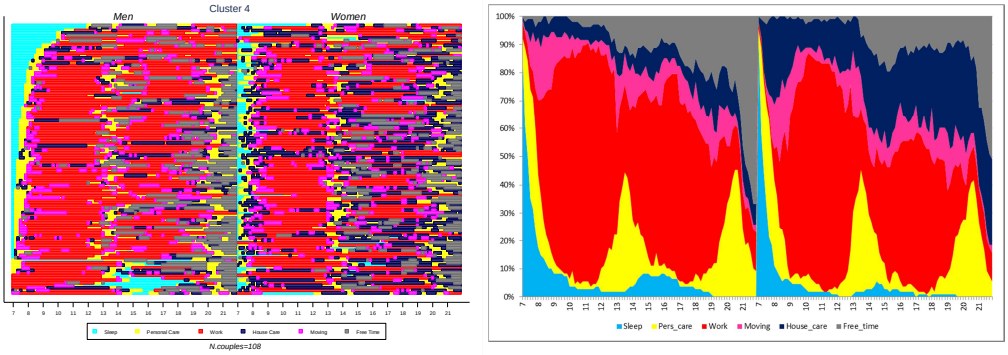


Regarding the time for house care, neither is this equally distributed. He devotes slightly more time than the overall mean of men to this activity (1 hour and 10 minutes). She devotes slightly less

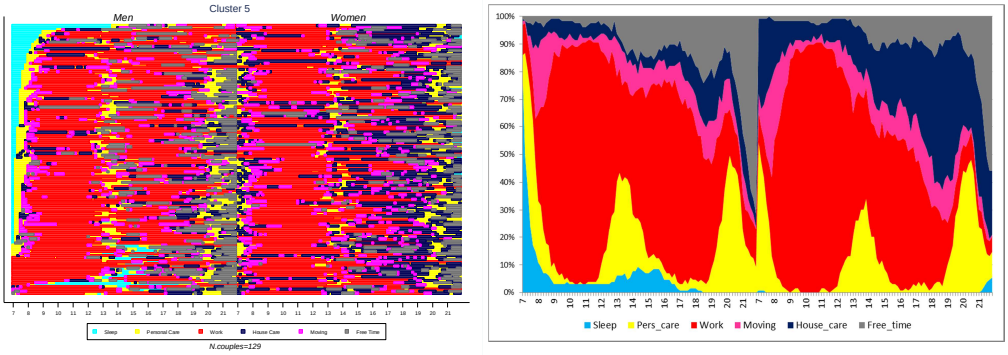
time than the overall mean of women to this activity (3 hours and 27 minutes). In the evening, after 21:00, 66.7% of men and 50.9% of women are in leisure activities.

Fig.5.3. Sequence index plot and stacked area plot of the seven clusters.

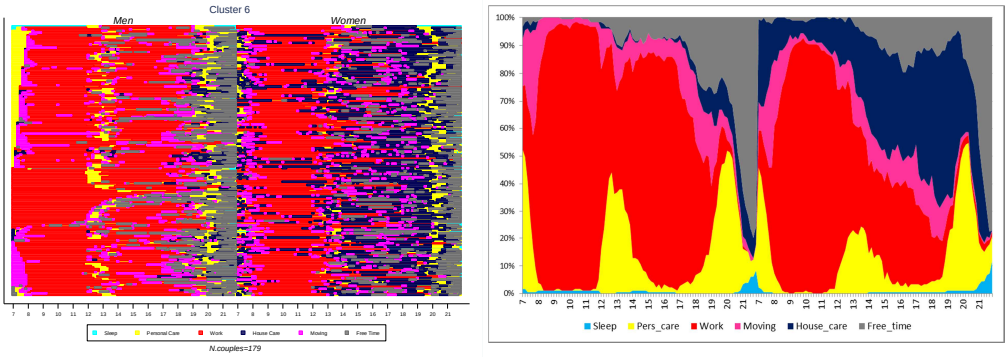
Cluster 4



Cluster 5



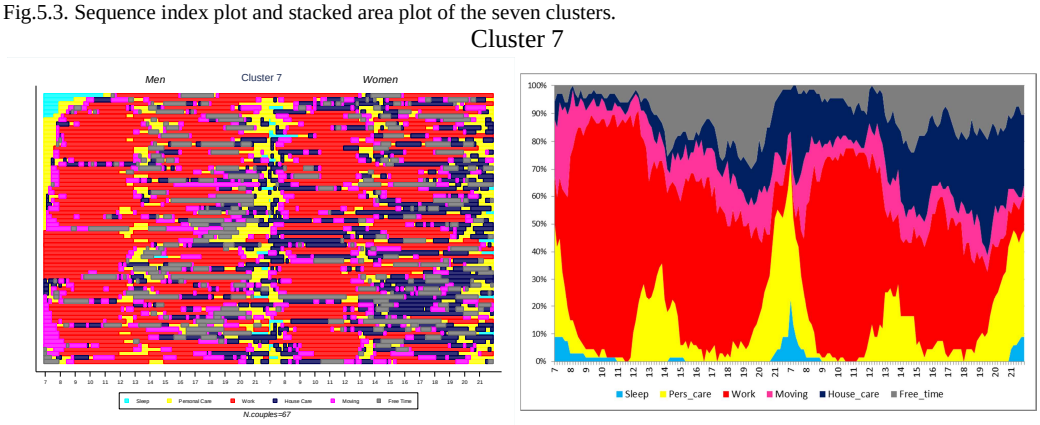
Cluster 6



These couples live mainly in large towns of central Italy. They do not have children. Both partners have a university degree, are entrepreneurs, professionals, managers (I+II) or are members of the petty bourgeoisie (VIab) and work in the private service sector.

He is very satisfied with daily life and with the amount of time that he has for relaxation. Both have some difficulties in reconciling daily tasks with the opening hours of offices, shops, and leisure centers.

Fig.5.3. Sequence index plot and stacked area plot of the seven clusters.



In **cluster 5**, She wakes up earlier than Him: on average, 50 minutes before He does. She starts work earlier (8:00) than Him (9:00). Among women, the women in this cluster are those who work longer (6 hours and 58 minutes). Conversely, the men in this cluster work less than the overall mean of men (7 hours and 46 minutes).

He spends more time than She does on personal care: 2 hours and 10 minutes compared with 1 hour and 50 minutes. He has lunch at 13:22 and She at 13:39. Moreover, in the evening He has dinner at 20:14 and She at 19:57.

These couples record one of the most unequal time distributions of house care between men and women: He devotes 1 hour and 5 minutes to house care, while She devotes 3 hours and 25 minutes. Moreover, these couples are those that exhibit the lowest amounts of time for leisure. In total, He has only 1 hour and 55 minutes of free time, while She has only 1 hour and 18 minutes. They seem to have free time only in the evening. After dinner, 71.3% of men and 55.8% of women relax.

These couples reside in the metropolitan areas of Italy's North and South and Islands. They have one or more children aged between 0 and 14. He is a member of the petty bourgeoisie (IVab) while She is a member of the working class (VI+VIIab) or middle class (IIIa). He works in the private service sector and She in industry.

Both are very dissatisfied with the time available for the partner, children, and relaxation. Both have difficulties in reconciling daily tasks with the opening hours of offices, shops, and leisure centers. Finally, He is very unsatisfied with the amount of time that he has for himself and in general with daily life.

Both members of the dual-earner couples in **cluster 6** wakes up earlier in the morning. Half of the men are at work or are about to reach the workplace, while one third of women are involved in house care.

Like the men in cluster 3 also the men in cluster 6 spend a long time at work: 8 hours and 45 minutes. Also the women in this cluster are similar to those in cluster 3: in fact, these women spend an average of 6 hours and 7 minutes at work. Lunchtime for Him is 13:03, while for She it is around 13:30, but there is no clear time: probably she eats when she can. For both, dinner is at 19.50.

As regards house care, the unequal distribution of time between genders is maximum in this cluster. He spends only 30 minutes a day on house care, while She spends 3 hours and 59 minutes.

These couples reside in small towns (fewer than 10,000 residents) in North Italy. They have children aged over 14. Both have a low level of education (compulsory), and both are members of the working class (VI+VIIab) or petty bourgeoisie (IVab). Men work in industry, while women work in both industry and the public service sector.

They are very dissatisfied with the time available for the partner, children, and relaxation. Both have many difficulties in reconciling daily tasks with the opening hours of offices, shops, and leisure centers. Moreover, He is very unhappy about the amount of time that he has for himself and with daily life in general.

The last cluster, **the seventh**, comprises dual-earner couples who are awake at 7:00 and having breakfast. 41.8% of the men are having breakfast, and another 37.3% are at work or are about to reach the workplace. For the women in this cluster, 50.8% are having breakfast, 14.9% are cleaning the house, and another 22.4% are still asleep.

He works an average of 7 hours and 58 minutes; She works an average of 6 hours and 16 minutes. For both, their jobs are concentrated mainly in the morning. Only forty percent of women and fifty percent of man work in the afternoon.

The distinctive characteristics of these dual-earner couples are the following: (a) free time for both in the afternoon; (b) a constant proportion of men and women engaged in house care throughout the day; (c) a fragmented packaging of activities; (d) She shows one of the largest amounts of free time among women (1:36), while he has one of the smallest amounts among men (1:47).

Another characteristic of these couples is the timing of lunch and dinner, which both eat very late. He has lunch at 13:24 and She at 13:36; while He has dinner at 20:43 and She at 20:21.

These couples reside in large towns of Italy's South and Islands. They do not have children. They have a medium/high level of education (tertiary or secondary). He is a member of the petty bourgeoisie (IVab), and She is a member of the bourgeoisie (entrepreneurs, professionals, and managers). She is employed in the private service sector.

These couples show the highest level of satisfaction with the time available for the partner, children, and relaxation. They record the lowest level of difficulties in reconciling daily tasks with the opening hours of offices, shops, and leisure centers. He is very happy with the amount of time for himself, and he is not stressed.

At the end of this part of the paper, it is evident that the sequences analysis of time use diaries provides a quite clear and meaningful representation of the main patterns of daytime organization of Italian dual-earner couples. In the next paragraph, we deeply enter on generative mechanism that acts on give shape and relevance at each pattern and in defining different forms of (de)synchronization.

6. (De)synchronization. The dual-earner strategies to combine work and couple's life

We have now outlined the seven patterns of dual-earner couples' daily time organization. The foregoing discussion has singled out the different forms of daily activities' organization and their specific combinations among the spouses. It has been noticed that the distribution of activities across the day, the timing with which they are carried out, and the amount of time devoted to each activity systematically varies both between different patterns and within spouses of the same pattern. Finally, it seems clear that dual-earner couples perform same common daily strategy.

Hence, the spouses' daily life seems to develop with socially shared, recognized, and identifiable patterns of combined time use. This insight raises two further questions. The first is how these patterns result from a complex process of adaptation to both work-social-family

constraints and individual needs. The second question concerns how the daily times are combined by the spouses, and how their performed combinations are random instead of being regulated by common generative mechanisms.

Tab.6.1. Multinomial logistic regression on the seven clusters by age of woman, geographic area, presence of children, sector, level of education and social class of the man and woman. (Weight parameter)

	Cluster 2		Cluster 3		Cluster 4		Cluster 5		Cluster 6		Cluster 7	
	β	$\sigma(\beta)$	β	$\sigma(\beta)$	β	$\sigma(\beta)$	β	$\sigma(\beta)$	β	$\sigma(\beta)$	β	$\sigma(\beta)$
Age												
Woman	0.08***	0.031	0.03	0.030	0.04	0.029	0.03	0.030	0.04	0.028	0.05*	0.030
Area												
North+												
Center	-0.20	0.365	-0.60	0.408	-0.08	0.405	-1.08***	0.412	-0.23	0.424	-0.30	0.532
South & Island	-0.37	0.373	-0.33	0.392	0.07	0.388	-0.18	0.360	-0.29	0.352	0.89**	0.424
Children												
No child+												
Children 0-14	-0.43	0.455	-1.40***	0.462	-1.28***	0.436	-0.41	0.448	-1.04**	0.454	-0.80	0.510
Children 14+	-0.95*	0.589	-1.54***	0.594	-1.60***	0.581	-1.00*	0.607	-1.13**	0.542	-1.92***	0.701
He sector												
Industry+												
Priv. services	-0.55	0.373	0.09	0.394	0.15	0.405	0.24	0.377	-0.11	0.384	-0.34	0.446
Public services	0.43	0.435	-0.76	0.524	0.26	0.554	-0.11	0.468	0.07	0.481	0.01	0.602
She sector												
Industry+												
Priv. services	0.30	0.405	0.41	0.452	1.51***	0.529	0.01	0.423	0.16	0.418	0.48	0.532
Public services	0.77*	0.430	1.02**	0.486	1.15**	0.600	0.52	0.446	1.07**	0.469	0.99*	0.580
He school degree												
University+												
Secondary	-0.30	0.437	-0.33	0.590	-0.68	0.493	-0.49	0.454	0.42	0.481	0.40	0.728
Compulsory	-1.16**	0.551	-0.27	0.637	-0.35	0.581	-0.50	0.534	0.24	0.564	0.22	0.834
She school degree												
University+												
Secondary	0.07	0.396	1.02*	0.579	0.00	0.480	0.02	0.429	-0.21	0.431	-0.26	0.632
Compulsory	0.09	0.528	1.25**	0.646	-0.08	0.564	0.10	0.549	-0.86*	0.532	-0.27	0.851
He social class												
I+II+												
IIIa	0.36	0.426	-0.84*	0.508	-0.65	0.458	-0.13	0.414	-0.92**	0.418	-0.54	0.547
IVabc	0.54	0.571	-0.13	0.572	0.29	0.530	0.33	0.570	0.02	0.504	0.70	0.579
VI+VIIab	1.23***	0.481	-0.36	0.503	-0.55	0.530	-0.06	0.500	0.38	0.451	0.10	0.565
She social class												
I+II+												
IIIa	0.73	0.584	-0.89*	0.496	-0.56	0.516	0.01	0.566	-0.05	0.490	-0.82	0.538
IVabc	1.52**	0.758	-0.62	0.716	0.00	0.673	0.47	0.771	1.41**	0.648	0.22	0.734
VI+VIIab	1.73**	0.695	-0.38	0.608	0.19	0.644	0.90	0.676	1.57**	0.630	0.64	0.733
Constant	-4.05**	1.444	-0.56	1.433	-1.14	1.447	-0.59	1.421	-1.13	1.276	-2.52*	1.557

Legend: (+) reference category; (*) p<0.1; (**) p<0.05; (***) p<0.01
Reference cluster (1)
Pseudo R2 = 0.09

In this regard, our hypothesis is that these time-use patterns result from the complex co-action of individual, family and social factors whose combination defines the relevance and the shape of patterns. The time balance within His and Her activities, as well as its configuration across the day, is not random; rather, it changes according to multiple latent factors. The first of these factors is work and its schedules, and therefore mainly the type of job and the economic sector (Hamermesh, 2002; Warren, 2003; Lesnard, 2008). The second is the spouses' and family's socio-demographic features – like the age of the spouses, the presence of children, and the geographic area of residence. The third is the cultural level of the cohabitation in terms of both the educational level of the

spouses and the level of predisposition toward egalitarian gender attitudes (Hakim, 2003; Oláh et. al, 2014). We maintain that all these dimensions contribute to defining the patterns of couples' daily activities.

Tab.6.2. Predicted probability of the multinomial logistic regression on the seven clusters. Probability change over the value of age of woman, geographic area, presence of children, sector, level of education and social class of the man and woman at mean of the others parameters. (Weight parameter)

	Cluster 1	Cluster 2	Cluster 3	Cluster 4	Cluster 5	Cluster 6	Cluster 7
Age Woman							
30	24.5	9.4	11.4	11.5	16.4	21.1	5.7
40	17.2	14.9	11.4	12.2	15.0	22.4	6.9
50	11.5	22.2	10.7	12.2	12.9	22.5	8.0
60	7.2	31.4	9.5	11.5	10.5	21.2	8.6
Area							
North+	14.9	15.6	12.6	10.9	17.9	22.5	5.5
Center	20.5	17.6	9.5	13.8	8.3	24.6	5.6
South & Island	16.3	11.7	9.9	12.8	16.3	18.4	14.6
Children							
No child+	8.3	12.1	16.9	17.4	11.7	25.1	8.5
Children 0-14	18.3	17.3	9.1	10.6	17.0	19.4	8.4
Children 14+	24.6	13.9	10.7	10.3	12.8	24.0	3.7
He sector							
Industry+	16.2	17.4	12.3	10.5	13.2	22.5	7.8
Priv. services	17.2	10.6	14.2	13.0	17.8	21.4	5.9
Public services	15.3	25.2	5.4	12.8	11.2	22.8	7.4
She sector							
Industry+	24.0	15.0	9.7	5.9	18.1	21.3	5.9
Priv. services	17.4	14.6	10.6	19.2	13.2	18.2	6.8
Public services	11.4	15.4	12.9	8.9	14.4	29.6	7.5
He school degree							
University+	13.6	23.1	11.8	15.0	18.1	14.0	4.4
Secondary	15.9	19.9	9.9	8.8	12.9	24.8	7.8
Compulsory	18.2	9.7	12.0	14.1	14.6	23.9	7.4
She school degree							
University+	16.0	13.8	4.5	12.0	13.5	32.0	8.2
Secondary	15.8	14.6	12.2	11.8	13.7	25.7	6.3
Compulsory	17.3	16.3	16.8	12.0	16.2	14.6	6.8
He social class							
I+II+	15.9	8.2	15.4	15.8	14.2	23.8	6.7
IIIa	23.3	17.2	9.7	12.0	18.3	13.8	5.7
IVabc	13.0	11.6	11.1	17.2	16.2	19.9	11.1
VI+VIIab	13.3	23.5	9.0	7.7	11.2	29.1	6.2
She social class							
I+II+	18.1	6.2	23.1	16.8	12.0	14.2	9.6
IIIa	22.7	16.0	11.9	12.0	15.2	16.9	5.3
IVabc	11.0	17.1	7.6	10.2	11.7	35.2	7.3
VI+VIIab	8.8	16.9	7.7	9.9	14.4	33.4	8.9
At Mean	16.7	15.4	11.4	12.2	14.9	22.5	7.0

We have already pointed out the limitations of a time-budget approach to the study of couples' daily time-use strategies. At the same time, we noted that the sequence analysis approach has been underestimated in the literature (Lesnard, 2004): to our knowledge, no efforts have been made to study the daily scheduling of multiple activities from a holistic and integrated perspective. In other words, we do not know how different daily activities are integrated into a single schedule and how spouses combine their activities each other. If we want to study daily work-family strategies, we need to preserve the integrity of the whole process and the interaction of different activities among the spouses. Indeed, from a time-integrity perspective, the study of the differences among couples'

time-use organization requires the ability to observe the activities' combination of Him and Her for each point-in-time and simultaneously.

In order to investigate the complex process of adaptation to both work-social-family constraints and individual needs of dual-earner couples' daily time organization we performed two separate analyses on the seven time-use patterns. The first analysis used a multinomial logistic regression model to verify if these patterns resulted from working-social-familial and individual constraints (Tab.6.1 & 6.2). The second consisted of a graphic representation of the change in the combination of His and Her modal state/activity during the entire day, at each point-in-time (10-minute intervals).

For this graphic analysis, we considered all the 36 possible combinations of activities (six for each spouse). For each cluster and for each point-in-time, the most frequent activities combination was identified. On this criterion, only 16 of all the possible combinations was found to be frequently performed by the couples, suggesting a certain routine by couples in everyday life (Hägerstrand, 1982; Hellgren, 2014). The graphs (Fig.6.1 – Fig.6.7) depicted the sequence of activities' combination for each cluster of dual-earner couples across the entire day (07.00-22.00).

A jointly reading of the modal multichannel sequence graphs and the multinomial logistic regression parameters quite clearly shows what are the (de)synchronization strategies adopted by couples and what may be the hidden generative mechanisms (Hallberg, 2002).

In particular, three different forms of time-use organization are highlighted by the graphs. The first is characterized by a general *synchronization* of the different spouses' activities during the days. We recall that some scholars suggest (Hamermesh, 2002; Lesnard, 2008) that this solution is expected to be the one preferred by dual-earner couples. However, the synchronization of the spouses' activities may be considered as one of the most complex forms of time organization, since it requires the alignment of social-work-individual times and constraints at a couple-level. Thus, even if it is the most desirable solution, not all the spouses are able to synchronize themselves during the day.

Couples in clusters 2 and 4 are associated with the highest synchronization levels. These dual-earner households share some specific features (Tab.6.1 & 6.2): the high level of education for Him – tertiary education and the medium-lower level of education for Her. Moreover, men in clusters 2 and 5 are employed in the services sector. Furthermore, couples from these two clusters mostly live in Central Italy.

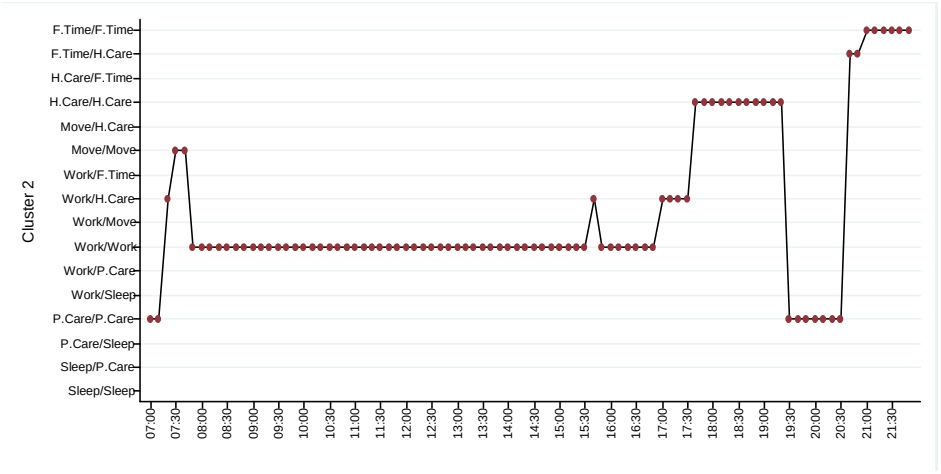


Fig.6.1. Modal (de)synchronized couples activities: cluster 2

What seems to distinguish the two clusters is that the probability of being a member of cluster 2 increases with the woman's age and with the presence of young children (0-14), while for the couples in cluster 4 the woman's age does not matter and they are more likely not to have a child. There are also differences of occupational sector and class between the couples in clusters 2 and 4. While both the spouses of cluster 4 are more likely to be employed in the private service sector, those of cluster 2 mostly work in the public sector or, secondly, in industry. As regards differences in occupational class, we can say that men in cluster 2 are white collar (IIIa) or workers (VI + VIIab), those in cluster 4 are self-employed (I+II and IVabc). At the same time, women in cluster 2 are mainly clerical workers (IIIa), while in cluster 4 they are more likely to be self-employed (I + II).

This particular combination of characteristics – and constraints – creates synchronized couples' sequences, as mentioned before (Fig.6.1). However, there are some substantive differences. In the case of cluster 2, he and she seem to have breakfast together before going to work, and they start working synchronically. They both stop working quite early in the afternoon, probably favored by their kind of job and the economic sector in which they are employed (mainly in the public services). At 17:00 as later she is back at home, while he follows her shortly thereafter, at 17:40. From that moment, both the spouses spend the rest of the day at home and engage in child care, before having dinner together and, finally, enjoying their free time to relax at the end of the day. In the second part of the day, the only moment in which spouses are not synchronized is immediately after dinner, when she postpones her free time for 20 minutes in order to do some rapid house care.

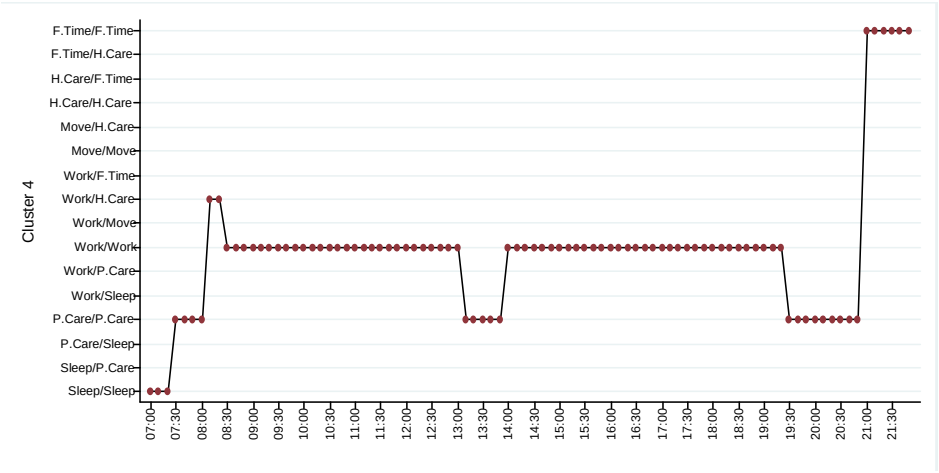


Fig.6.2. Modal (de)synchronized couples activities: cluster 4

In cluster 4 the absence of children and the type of work induces the couples to start their day in a different way compared with the others (Fig.6.2). Both the spouses wake up together, and they do so later than the other couples. They also have breakfast at the same time. Then, He leaves the house while She quickly tidies up before going to work. Job commitments equally fill most of their daily time. Moreover, they are synchronized in both their lunch and dinner times. Finally, and because of the pressure and extent of job commitments, spouses in cluster 4 jumps directly to free time and leisure, frequently avoid any kind of house care task. In general, house care activities seem to be almost absent within this daily time-use pattern. However, to be noticed is that this it doesn't mean that spouses haven't done housework, but rather that they are more likely to do it non-

regularly, during brief and scattered moments of spare times; although they may not necessarily do the housework every day, maybe postponing these tasks to the weekend.

Also cluster 7 falls – although not completely – into the synchronized time-use pattern (Fig.6.3). On the one hand, the strategy of dual-earners in this cluster has some elements in common with those of cluster 2 and 4 (Tab.6.1 & 6.2). In particular, as for cluster 2, couples are more likely to be part of cluster 7 with the increasing age of Her, and Her employment in the public sector. Moreover, like those in cluster 4 these couples share the feature that both spouses are mostly self-employed (He IVab; She I + II). Like both the previous clusters, they also do not have children or, at least, have children younger than 14. On the other hand, a distinctive feature of this group – compared to the other two with a synchronized time-use pattern – is the strong presence of couples from the South of Italy.

Fig.6.3. Modal (de)synchronized couples activities: cluster 7

Cluster 7 has some characteristics in common with the 2nd and the 4th also in terms of daily time organization. Both the spouses have breakfast together, then He goes to work while She quickly rearranges the house: the same dynamic is exhibited by cluster 4, only that it is shifted earlier in the morning because of their different wake-up times. Also in the evening, clusters 7 and 4 are similar in that both these couples synchronically return home later. However, the 7th time-use pattern ends with a longer tail of synchronized personal care: spouses may still be having dinner together at the end of the observation (22:00). In any case, what really makes cluster 7 unique is the time organization around lunch. While for cluster 2, there is no specific time for lunch, and for cluster 4 the time interval for lunch is well defined between two work 'segments', for cluster 7 the break from work is longer for Her; and around a certain synchronized lunch-time, there is a certain desynchronization due to His work commitments and Her house care tasks. Finally, before going back to work, She is even able to spend a short time relaxing. Here, the sequence of activity combinations over time is much more chaotic, fragmented and socially desynchronized compared with the other patterns. However, this desynchronized part of the day seems functional to the production of a certain form of a general, mostly synchronized, daily couple strategy.

Among all the seven clusters, finally, dual-earner couples in the 2nd, 4th and 7th are the only ones to report little difficulties in balancing daily activities. They also have relatively low levels of stress, being more satisfied with their daily life and the division of house and child care demands with the partner.

Alongside the *synchronized patterns* there emerge other desynchronized daily time-use patterns. These strategies of desynchronization seem to be specialized into two forms, on the basis of the kind of tasks sequentially performed and combined by the two spouses during the day. As expected by previous scholars, women are more engaged in household care activities (Gershuny et al., 1988; Raley et al., 2012; Craig et al. 2014;), and there are important differences in how they organize and distribute their care tasks during the day, according to their time and that of the partner.[11] Here, an important role is played by the kind of job and the work hours of the woman.[12]

The first strategy is a *functionally desynchronized* pattern of the spouses' different activities during the days. This is apparently more desirable than others. Here, gender differences in activities-in-time seem to be an adaptation to the *structural desynchronization* (Nock et al., 1984) of couples' working schedules. The difference in work duration between men and women appears to produce a counterbalancing force by which – at the end of the work day – the woman compensates the different spread of work commitments of man's with house care in a quite calibrated way that preserves the free time of both the spouses.

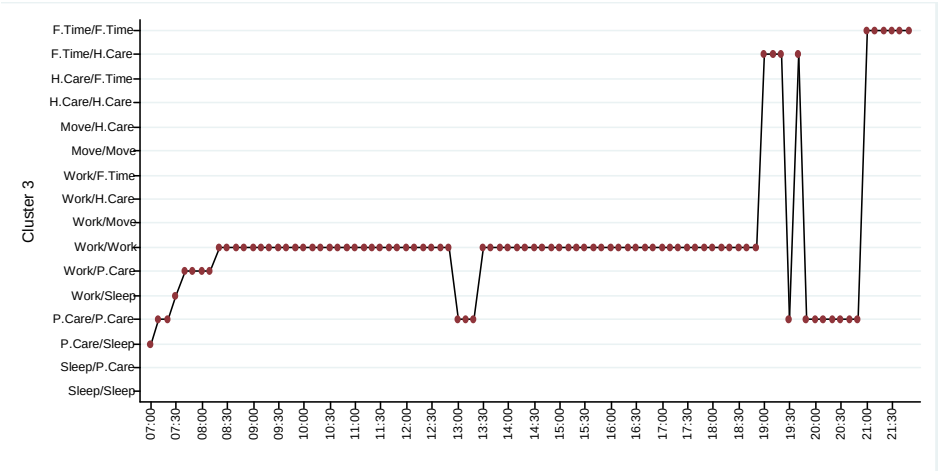


Fig.6.4. Modal (de)synchronized couples activities: cluster 3

Couples in clusters 3 and 5 are associated with the highest *functionally desynchronized* pattern levels. These dual-earner households share some specific features. They have similar educational levels: the men are either graduates or have a compulsory education, while the women have a medium-low level of education, and therefore upper-secondary at most. Both the spouses belong to the middle class or bourgeoisie. They both live mostly in the North of Italy, even if some of the couples in cluster 5 are also from southern metropolitan areas. Moreover, there are two substantial differences between the compositions of these two clusters. The first is the presence of young children within the household of cluster 5. The second is the different time at which She starts work in the morning and, consequently, the time when She comes back home in the evening.

[11] The problem is that not enough attention has been paid to their partners and what He does while She performs care activities. In fact, being at work instead of watching television while She is dealing with housework or child care is substantially different in terms of gender inequalities.

[12] The literature shows that, frequently, women are employed in shorter or facilitated work hours so that they can devote themselves more – in spite of their wishes – to household care (Bernardi, 1999a). Previous scholars have shown that women's permanence in the labor market in Italy, even after the birth of children, is often higher in the public sector. This may be seen as the best solution for them to combine work hours with their social role as mothers and care givers (Bernardi, 1999a)

In cluster 3, He starts work much earlier than Her. On the other hand, She prepares herself calmly before going out to work. That is possible also because of the absence of children care. At the end of the workday, the spouses come back home later and synchronically. Once at home, they desynchronize themselves again; while He takes a break to relax, She does some housework. It seems as if there is some sort of compensation of daily time activities. He started work much earlier than Her in the morning, and once returned home He perhaps believes that he has the right to get back the free time that She gained in the morning. Finally, they both eat and relax together.

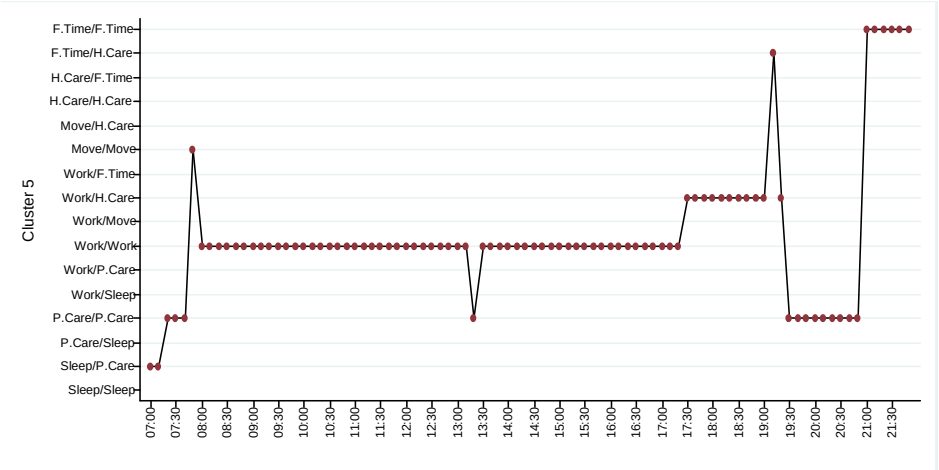


Fig.6.5. Modal (de)synchronized couples activities: cluster 5

In the cluster 5 couples' time-use pattern, She wakes up a little before Him, probably because of the presence of child care demands. They then have breakfast together before going to work, and they start working synchronically. In the afternoon, She leaves the workplace much earlier than Him, perhaps in orders to devote herself to house and child care. Soon after His return from work, they eat together, before spending synchronous free time. Compared to cluster 3, the clear non-cooperation of Him in the household tasks – among the spouses of cluster 5 – may be due to the different spread of work commitments during the whole day.

For these two last clusters, the household activities' overload for Her and the less time spent 'doing the same things' have an effect on the satisfaction expressed by the spouses. Compared to the well-synchronized couples, for those in cluster 3 and 5 we notice a reduction in the levels of satisfaction, as well as an increased difficulty of balancing the work-family activities. However, the reported levels of stress for women in cluster 3 and 5 are lower than the overall mean and slightly higher than those expressed by the wives of synchronized clusters.

The second *desynchronizations* strategy is a *dysfunctional* pattern of the different spouses' activities during the day. Here, the couple's distribution of activities during the day does not seem to follow any compensatory mechanism. The overall day desynchronization is less structural and due to working schedule commitments. It seems to be more weakly linked to the spouses' different time constraints: conversely, it appears to be an outcome of more traditional and less equal gender attitudes. Here, the result is a marked overload in paid + unpaid work for the women (Mattingly et al., 2003), with stronger evidence of the leisure gap (Beblo et al., 2008).

Couples in clusters 1 and 6 are associated with the highest *dysfunctional desynchronizations* pattern of the different spouses' activities during the day. Also these patterns share some specific features. The men in clusters 1 and 6 have low levels of education, mainly compulsory level, and spouses are parents of at least one child and that they live mostly in Central Italy.

These two clusters partially differ for the occupational class of the spouses. Those in cluster 1 are both from the middle class (IIIa), She is employed in the industry sector, while He works in the private service sector. Spouses in cluster 6 are mostly workers (VI + VIIab) or self-employed (He: I + II; She: IVabc). Women in the two clusters also differ in their educational level: those in cluster 1 have a lower-secondary education, while those in cluster 6 have mostly an upper-secondary or tertiary education.

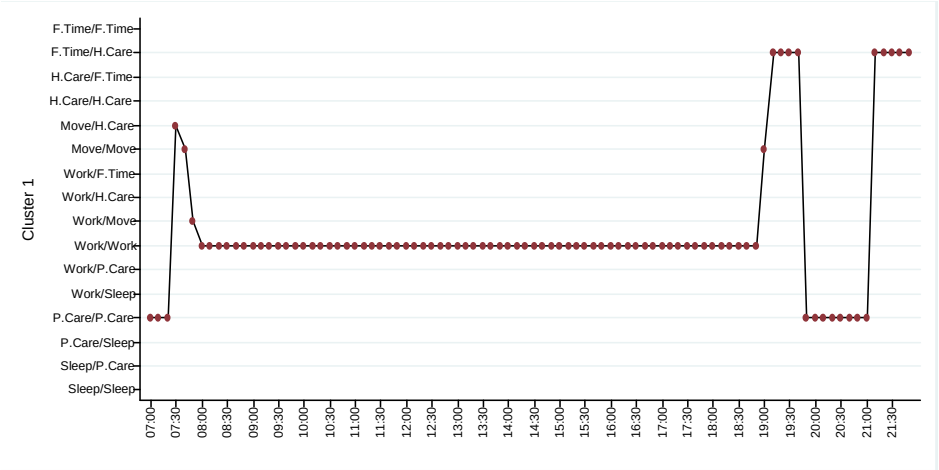


Fig.6.6. Modal (de)synchronized couples activities: cluster 1

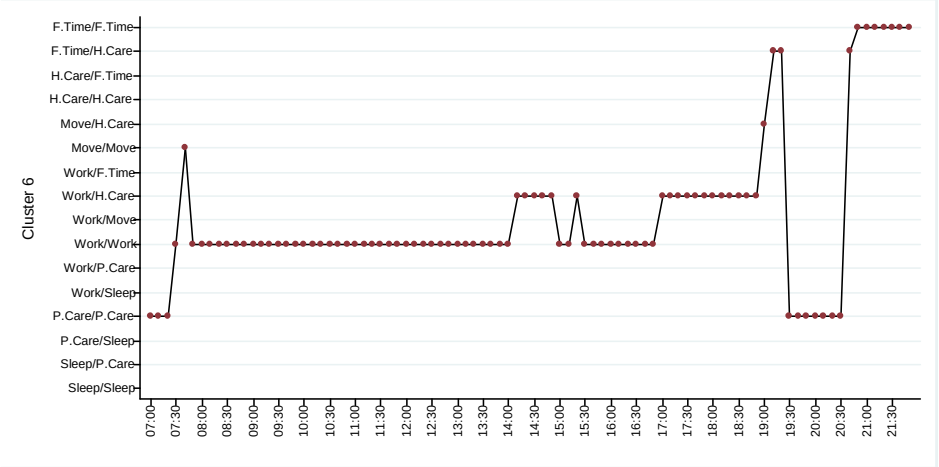


Fig.6.7. Modal (de)synchronized couples activities: cluster 6

In some way, the time-use pattern of cluster 6 is apparently similar to that of cluster 5. In fact, She comes back home before Him, dealing with house care activities. However, compared with cluster 5 we notice a greater extension of Her household commitments, from the early afternoon until the evening, when He has already returned home from work. Thus, if on the one hand the desynchronization is functional for the long time spent by Him at work, on the other, this couple's

time-use pattern does not show any cooperative or compensatory forms of time-use organization among the spouses.

Last but not least, cluster 1 is certainly the maximum expression of what we call 'dysfunctional desynchronization'. The relative time-use pattern describes a couple in which everything is on the shoulders of the woman. The delay of the exit from home is followed by a double move, probably due to the fact that – before going to work – She takes the children to school. Then, she continues to work until the late afternoon. Finally, when both the spouses return home, He takes a break and rests, while She continues to do housework and child care. The only synchronized moment in the final part of this couple's pattern is when they have dinner. Among all the time-use patterns, this is certainly the one with the highest level of gender inequality in regard to the daily work-family balance challenge.

There are clearly some differences between these two last clusters. However, they are both characterized by the total absence of His cooperation in the house and child care demands. Thus, strong implications regarding the levels of satisfaction and the ability to combine different daily activities are expected. Not surprisingly, both cluster 1 and 6 present the highest levels of difficulty in reconciling daily activities. They also have the lowest level of satisfaction with regard to the division of care tasks and the lowest levels of satisfaction with daily life as a whole. Finally, women in cluster 1 present the lowest levels of satisfaction and the greatest daily difficulties in all the areas investigated.

7. Conclusions

In this paper we study the workdays of dual-earner couples. As already argued, such a two-fold choice has important substantive implications for the exploration of combined time-use patterns: considerable parts of these days are *obligated* by both the amount of work time and its scheduling – an unavoidable constraint for the other activities in terms of quantity and timing as well (Lesnard et al., 2009). We may say that couples' daily strategies in regard to work-family balance are more likely to be settled around the working schedule's obligations by organizing the other activities within out-of-work times.

What happens around the working schedules is not expected to be random, and the activities of the spouses should not be randomly combined during the non-work parts of the day. We have argued that daily strategies and 'projects' follow certain routine pathways (Hägerstrand, 1982; Hellgren, 2014) and that temporal patterns in time use may spotlight the hidden generative mechanisms behind couples' strategies (Hallberg, 2002). Thus, in the study of workdays and dual-earner couples' dynamics, a crucial point is to find regularities.

Scholars have pointed out an important discriminating factor for dual-earners' work-family balance: that of being (de)synchronized. However, by adopting a time-budget perspective, we are unable to capture the timing dimension of (de)synchronizations. Within this framework, we may know the total duration of (de)synchronized times, but we cannot assess 'when' spouses have done the same activity. We may know the amount of time couples spent together in the same place doing different or similar activities, but, again, we do not know 'when' they did it. Thus, although this approach may allow very detailed descriptions of several sub-activities and time quality, this focus on quantities is not informative about the overall strategies of daily time organization performed by couples.

According to Lesnard (2004), a consistent alternative is to preserve the time dimension by considering daily *schedules as sequences* (Lesnard, 2004). The problem is that from a sequence analysis perspective, the entire complexity of daily schedules has been basically reduced to working schedules. Consequently, spouses' (de)synchronization-in-time has been treated as a matter of being both working or not working for each point-in-time. Here, the possible combinations of states are reduced to a tripartite scheme: 1) spouses are both working, 2) only one is working, 3) neither is

working. On this view, we can only assess the synchronization for one activity, that of work, by treating the possible (de)synchronizations on other activities-in-time as vague residuals. Moreover, we are not able to distinguish the different combinations of activities when the spouses are being desynchronized. This, in our view, is a strong weakness: it is – at least – reasonable to suppose that different combinations of activities are more or less desirable at different times, according to the overall context of previous and next performed activities. It is possible that some desynchronized daily schedules may be more or less complementary and *functional*, according to both the spouses' roles and commitments during the whole day.

Finally, we should move to a more complex framework. We must be able to capture both the timing of multiple synchronizations within different activities and the experienced variety of activity combinations for desynchronized time intervals.

The main contribution of this paper is its use of a 'multichannel' sequence analysis approach for the simultaneous exploration of multiple-activity schedules at a couple level. We analyze typical daily schedules of dual-earner Italian couples during a weekday, from 07.00 to 22.00, by jointly considering the combinations-in-time of activities within six different domains: 'work', 'sleep', 'personal care', 'moving', 'house care' and 'free time'. Thus, a whole view of the couple's daily organization is proposed. In fact, previous findings may help us with deeper interpretation of certain daily phenomena among couples. At the same time, we believe that a multichannel sequence analysis can yield new insights by itself.

In our analysis seven different clusters of couple's time-use patterns have been identified. What clearly emerges from the analysis is a time use organization among dual-earner couples that describe a more complex reality than that we have been used to point out. Where three main types of time use pattern have been found: *synchronization*; *functional desynchronization; dysfunctional desynchronization*. These patterns describes a variegate set of work-family balance strategies performed by dual-earner couples, with reasonable different expected levels of desirability. Moreover, these patterns are associated with socio-demographic, educational, cultural, and work characteristics of both the spouses – thus, with different latent mechanisms of time constraints. Finally, these particular couple's solutions in daily scheduling affect spouses' level of satisfaction as an outcome of the daily life quality.

References

Abbott, A.
1983 *Sequences of Social Events,* in «*Historical Methods*», 16, 129-47.
1988 *Transcending General Linear Reality,* in «*Sociological Theory*», 6, 169-86.
1990a *Conceptions of Time and Events in Social Science Methods,* in «*Social Science History*», 23, 140-50.
1990b *A Primer on Sequence Methods,* in «*Organization Science*», 1, 373-92.
1992 *What Do Cases Do?* Pp. 53-82 in *What Is a Case?* a cura di C. Ragin H. Becker, Cambridge, Cambridge University Press.
1995a *Comment on Dijkstra and Taris: The Scope of Alignment Methods,* in «*Sociological Methods & Research*», 24, 232-43.
1995b *Sequence Analysis,* in «*Annual Review of Sociology*», 21, 93-113.
1997a *Of Time and Place,* in «*Social Forces*», 75, 1149-82.
1997b *On the Concept of Turning Point,* in «*Comparative Social Research*», 16, 89-109.
1998 *The Causal Devolution,* in «*Sociological Methods & Research*», 27,148-81.
1999 *Temporality and Process in Social Life,* in *Social Time and Social Change,* a cura di F. Engelstad and R. Kalleberg, Oslo, Scandinavian University Press, 28-61.
Abbott, A e Barman, E.

1997 *Sequence Comparison via Alignment and Gibbs Sampling* in «*Sociological Methodology*», 27, 47-87.
Abbott, A. & DeViney, S.
1992 *The Welfare State as Transnational Event* in «*Social Science History*», 16, 245-74.
Abbott, A. & Forrest, J.
1986 *Optimal Matching Methods for Historical Data* in «*Journal of Interdisciplinary History*», 16, 473-96.
Abbott, A. e Hrycak, A.
1990 *Measuring Resemblance in Social Sequences* in «*American Journal of Sociology*», 96, 144-85.
Abbott, A. e Tsay, A.
2000 *Sequence analysis and optimal matching methods in sociology* in «Sociological Methods and Research», **29**,1, 3-33.
Beblo, M.; Robledo, Julio R.
2008 *The wage gap and the leisure gap for double-earner couples*, Journal of Population Economics, 21(2)
Becker, G. S.
1964 *Human Capital: A Theoretical and Empirical Analysis*, New York, NBER.
1981 *A Treatise on the Family*, Cambridge (Mass.), Harvard University Press.
1991 *A Treatise on the Family: Enlarged Edition*, Cambridge (Mass.), Harvard University Press.
Bernardi, F.
1999a *Does the Husband Matter ? Married Women and Employment in Italy*, in «European Sociological Review», 3, 285-300.
1999b *Donne fra famiglia e carriera. Strategie di coppia e vincoli sociali*, Milano, Franco Angeli.
2000 *The Employment Behaviour of Married Women in Italy*, in *Careers of Couples in Contemporary Society*, a cura di H.-P. Blossfeld e S. Drobnic, Oxford, Oxford University Press.
Bernasco, W.
1994 *Coupled Careers : Effects of Spouse's Resources on Success at Work*, Amsterdam, Thesis Publishers.
Bernasco, W.; De Graff, P.M. e Ultee, W.C.
1998 *Coupled Careers : Effects of Spouse's Resources on Occupational Attainment in the Netherlands*, in «European Sociological Review», 1, 15-31.
Bianchi, Suzanne M.; Lesnard, L.; Nazio, T.; Raley, S.
2014 *Gender and time allocation of cohabiting and married women and men in France, Italy, and the United States*, Demographic Research, 31(8)
Bielby, W.T. Bielby, D.D.
1986 *Family Ties: Balancing Commitments to Works and Family in dual Earner Household.* American Sociological Review, 54 (5), 776-789
Bison I,
2014 *Sequence as Network: an attempt to apply network analysis to sequence analysis*. in Philippe Blanchard, Felix Bühlmann and Jacques-antoine Gauthier (a cura di), *Advances in Sequence Analysis: Methods, Theories and Applications*: Springher International Publishing,
2011a *'Lexicographic index: A new measurement of resemblance among sequences'*, in M. Williams and P. Vogt (eds), The SAGE Handbook of Innovation in Social Research Methods, London, SAGE, pp. 422-441
2011b, *Education, Social Origins and Career (Im)Mobility in Contemporary Italy: A holistic and categorical approach*, in European Societies, v. Volume 13, n. Issue 3 (2011), p. 481-503
2009 *OM matters: the interaction effects between indel and substitution costs* in Methodological Innovation On Line, 4 (2), p. 53-67

2006 *When She Helps Him to the Top*, Intergenerational transmissions: cultural, economic or social resources? RC28 Spring meeting Nijmegen, 11-14 May, 2006.
Bison I, E. Rettore, A. Schizzerotto,
2010 *"La riforma Treu e la mobilità contrattuale in Italia. Un confronto tra coorti"* in D. Checchi (a cura di), Immobilità diffusa - Perché la mobilità intergenerazionale è così bassa in Italia, Bologna: Il Mulino, p. 267-296
Bison, I.; Pisati, M. e Schizzerotto, A.
1996 *Disuguaglianze di genere e storie lavorative*, in *Genere. La costruzione sociale del maschile e del femminile*, a cura di S. Piccone Stella e C. Saraceno, Bologna, Il Mulino, 1996.
Bison, I; Esping-Andersen, G. K.
2000 *The Life Sequences in Italy*. "Polis meeting", Juan March Institute, Madrid, 10–11 March.
Bittman, M.; Wajcman, J.
2000 *The rush hour: The character of leisure time and gender equity*, Social Forces, 79(1)
Blossfeld H.P. (eds.)
1995 *The new role of women : family formation in modern societies* Boulder, Colo. [etc.] : Westview press
Blossfeld, H.P. Drobnic, S. (eds.)
2003 *Careers of Couples in Contemporary Society: From Male Breadwinner to Dual-Earner Families*, Oxford, Oxford University Press.
Blossfeld, H.P. Hakim C.
1997 *Between equalization and marginalization. Part-time working women in Europe and the United States of America*, Oxford University Press, Oxford
Budig, Michelle J.; Folbre, N.
2004 *Activity, proximity or responsibility? Measuring parental childcare time*, in Family time: The social organisation of care, edited by N. Folbre and M. Bittman, London: Routledge
Chenu, A.; Robinson, John P.
2002 *Synchronicity in the Work Schedules of Working Couples*, Monthly Labor Review, 125(4)
Craig, L.
2006 *Does father care mean fathers share? A comparison of how mothers and fathers in intact families spend their time with children*, Gender & Society, 20(2)
Craig, L; Powell, A.; Smyth, C.
2014 *Towards intensive parenting? Changes in the composition and determinants of mothers' and fathers' time with children 1992-2006*, British Journal of Sociology, 65(3)
Dijkstra,W. Toon T.
1995 *Measuring the Agreement Between Sequences.* Sociological Methods & Research 24 (2): 214-31
Drobnic, S.
1997 *Part-Time Work in Central and East European Countries*. In Blossfeld, H.P. Hakim C. *Between equalization and marginalization. Part-time working women in Europe and the United States of America*, Oxford University Press, Oxford, 71-89
Elzinga C. H.
2003 *Sequence Similarity, A Nonaligning Technique*, Sociological Methods & Research, 32, (1):. 3-29
England, P. and G. Farkas
1986 *Households, Employment, and Gender: A Social, Economic, and Demographic View.* New York: Aldine.
Esping-Andersen, G.
2002 (a cura di) *A New Gender Contract*, in *Why We Need a New Welfare State?*, a cura di G. Esping-Andersen, Oxford, Oxford University Press.
Ferre, M. M.

1987 *Family and Job for Working-Class Women: Gender and Class Systems Seen from Below*. In Gerstel N. and Gross H.E (eds.), *Families and Wok*. Philadelphia Penn, Temple University Press, 289-301.

Franzosi R., Bison I,

2010 *Temporal Order: Sequence Analysis* in R. Franzosi (a cura di), Quantitative Narrative Analyis, Thousand Oaks, California: SAGE Publication, Inc., 2010, p. 118-123

Garcia, P.; Kalmijn, M.

2016 *Parents' family time and work schedules: the split-shift schedule in Spain*, Journal of Marriage and Family, 78(2)

Gershuny, J.

2000 *Changing times: Work and leisure in postindustrial society*, Oxford: Oxford University Press

Gershuny, J.; Robinson, John P.

1988 *Historical changes in the household division of labor*, Demography, 25(4)

Gauthier, J-A, Widmer, E.D., Bucher, P., Notredame, C.

2010 *Multichannel Sequence Analysis Applied to Social Science Data*. Sociological Methodology. 40:1-38.

Haddock, Shelley A.; Zimmerman, Toni S.; Ziemba, Scott J.; Lyness, Kevin P.

2006 *Practices of dual earner couples successfully balancing work and family*, Journal of Family and Economic Issues, 27(2)

Hägerstrand, T.

1970 *What about people in regional science?* Papers in Regional Science, 24(1)

1982 *Diorama, path and project*, Tijdschrift voor Economische en Sociale Geografie, 73(6)

Hakim, C.

2003 *A new approach to explaining fertility patterns: Preference Theory*. Population and Development Review, 29(3)

Hallberg, D.

2002 *Synchronous leisure, Jointness and Household*. Labour Economics, 10(2)

Hamermesh, Daniel S.

2002 *Timing, Togetherness, and Time Windfalls*, Journal of Population Economics, 15(4)

Hellgren, M.

2014 *Extracting more knowledge from time diaries?* Social Indicators Research, 119(3)

Hook, Jennifer L.

2006 *Care in context: Men's unpaid work in 20 countries, 1965-2003*. American Sociological Review, 71(4)

ISTAT

2011 *Indagine multiscopo sulle famiglie - Uso del tempo Anno 2008-2009. Manuale utente*, Roma: ISTAT

Kan, Man Y.; Sullivan, O.; Gershuny,J.

2011 *Gender convergence in domestic work: Discerning the effects of interactional and institutional barriers from large-scale data*, Sociology, 45(2)

Kilkey, M.; Perrons, D.

2010 *Gendered divisions in domestic work time. The rise of the (migrant) handyman phenomenon*, Time & Society, 19(2)

Lesnard, L.

(2004), *Schedules as sequences: a new method to analyze the use of time based on collective rhythm with an application to the work arrangements of French dual-eaner couples*, Electronic International Journal of Time Use Research, 1(1)

2005 *The effects of the family work day on family time*, Working paper: Série des Documents de Travail du CREST, Institute National de la Statistique et des Etudes Economiques, No 2005-25

2008 *Off-scheduling within dueal-earner couples: An unequal and negative externality for family time*, American Journal of Sociology, 114(2)
Lesnard, L; Kan, Man Y.
2009 *Two stage optimal matching analysis of workdays and workweeks*, SociologyWorking Papers, 2009-04, University of Oxford
Makles, A.
(2012), *How to get the optimal k-means cluster solution*, The Stata Journal 12, Number 2, pp. 347–351
Mansour, H.; McKinnish, T.
2013 *Couples' time together: complementarities in production versus complementarities in consumption*, IZA Discussion Paper, No. 7848
Mattingly, M.; Bianchi, Suzanne M.
2003 *Gender Differences in the Quantity and Quality of Free Time: The US Experience*, Social Forces, 81(3)
Moen, P.
1992 *Women's two roles*. New York: Auburn House.
Moreno-Colom, S.
2015 *The gendered division of housework time: Analysis of time use by type and daily frequency of household tasks*, Time & Society, 0(0)
Naldini, M; Saraceno, C.
2011 *Conciliare famiglia e lavoro. Vecchi e nuovi patti tra sessi e generazioni.* Bologna: Il Mulino
Nock, Steven L.; Kingston, Paul W.
1984 *The Family Work Day*, Journal of Marriage and the Family, 46(2)
Offer, S.; Schneider, B.
2011 *Revisiting the gender gap in time-use patterns: Multitasking and well-being among mothers and fathers in dual-earner Families*, American Sociological Review, 76(6)
Oláh, L.Sz., Richter, R.; Kotowska, I.
2014 *State-of-the-art report: The new roles of men and women and implications for families and societies*, FamiliesAndSocieties Working Paper 11(2014)
Presser, Harriet B.
1994 *Employment Schedules among Dual-Earner Spouses and the Division of Household Labor by Gender*, American Sociological Review, 59(3)
Raley, S.; Bianchi, Suzanne M.; Wang, W.
2012 *When do fathers care? Mothers' economic contribution and fathers' involvement in child care*, American Journal of Sociology, 117(5)
Reyneri, E.
2001 *Sociologia del ML*, Bologna, Il Mulino.
Saraceno, C.
2003 *La conciliazione di responsabilità familiari e attività lavorative in Italia: paradossi ed equilibri imperfetti*, in «Polis», 2, 199-228.
2012 *Coppie e famiglie. Non è questione di natura*. Milano: Feltrinelli
Spencer H.
(1855), *The Principles of Psychology*, London, Longman, Brown, Green and Longmans
Stanley, S.C., Hunt, J.G., Hunt L.L.
1986 *The relative deprivation of Husbands in Dual-Earner Households*. Journal of Family Issues, 7, 3-20.
van Klaveren, C.; van den Brink, H.M.; van Praag, B.M.S.
2011 *Intra-household work timing: the effect on joint activities and the demand for child care*, Tinbergen Institute Discussion Paper, No. 11-065/3
Voorpostel, M.; van der Lippe, T.; Gershuny, J.

2010 *Spending Time Together. Changes Over Four Decades in Leisure Time Spent with a Spouse*, Journal of Leisure Research, 42(2)
Warren, T
2003 *Class- and gender- based working time? Time poverty and time division of domestic labour*, Sociology, 37(4)
Wight, V.R.; Raley, S.B.; Bianchi, S.M.
2008 *Time for children, one's spouse and oneself among parents who work nonstandard hours*, Social Forces, 87(1)
Wu, L.L.,
2000 *Some comments on "Sequence Analysis and Optimal Matching Methods in Sociology: Review and Prospect*, in Sociological Methods and Research, **29**,1, 41-64.
Zimmermann H.J.
1990 *Fuzzy set theory and its application*, Kluwer, Dordrecht.