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Late-Career Employment Trajectories and Postretirement Mortality: Evidence From Italy

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ABSTRACT In the last decades, the long-standing paradigm of life course theory postulating direct transition from lifetime employment to full retirement has been eroding in advanced economies. For many mature workers, the period between the end of stable employment and the attainment of eligibility requirements for accessing retirement benefits can be, in fact, quite discontinuous. Still, little is known about the health consequences of employment instability in later working life. This study addresses this issue by examining how late-career employment trajectories shape postretirement all-cause mortality. I use longitudinal register data from Italy to reconstruct the later-life employment history of a large sample of Italian retirees previously employed in the private sector for whom I can observe mortality up to 2018. I rely on sequence analysis to identify ideal-type, late-career trajectories and use them as further inputs for discrete-time survival analysis. Results show that going through a trajectory marked by employment instability in later working life is related to worse postretirement survival chances, with this relationship being stronger if unemployment spells are prolonged and not covered by social allowances. Given the current pressures to extend the length of working life, these findings highlight the relevance of policies aimed at improving the employment prospects of displaced senior workers and at ensuring adequate support in case of prolonged unemployment.

KEYWORDS Employment trajectories • Retirement • Mortality • Sequence analysis

Introduction

The relationship between employment and retirement has changed dramatically over the last decades in advanced economies. The early life course view—which postulated predictable career paths, with lifetime employment ending with direct entry into full retirement at a specific age—has been challenged by evidence that retirement patterns have become increasingly diversified (Fasang 2010, 2012). Behind the general trend toward early retirement observed throughout the 1970s, 1980s, and 1990s, and its progressive reversal through pension reforms aimed at postponing retirement, important heterogeneities have emerged. For many individuals, leaving their major employment before meeting retirement eligibility requirements is an involuntary choice. For others, it is a strategy

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to cope with policy-induced changes in the length of working life. Hence, the period between the end of stable employment and entry into full retirement at pensionable age can be quite discontinuous, marked by frequent job searches, displacements, and unemployment spells, or reemployment at lower occupational status and salary (Marshall et al. 2001; Riekhoff and Järnefelt 2018). Rather than being a definite event in time, marking the passage from paid work to pension income, retirement looks increasingly like a process consisting of a "series of acts involving movements both out and back in the labor force" (Hayward and Grady 1990:352).

Although there is an extensive literature examining the relationship between retirement and health, we know little about the health consequences of discontinuous employment trajectories in later working life. This is a major gap given that a sizable and possibly growing proportion of older workers in advanced economies are now facing the prospect of some form of employment instability—encompassing job loss, prolonged unemployment, or repeated transitions into and out of unemployment—before entering into full retirement. This study provides empirical evidence addressing this gap. I do so by identifying ideal-type, late-career trajectories for a large sample of individuals who spent most of their professional life working as private employees in Italy, who retired between 2001 and 2018, and for whom I can observe mortality up to 2018. For this purpose, I use register data from the Italian Social Security Institute (INPS), which allows me to accurately reconstruct individual working histories. Focusing on the 10 years prior to retirement, I identify the prevalent forms of employment instability, which materialize as deviations from full-time private employment, and relate them to postretirement mortality. Methodologically, I employ sequence analysis to identify ideal-type, late-career trajectories that I use as explanatory variables in discrete-time survival analysis. Results suggest that going through periods of unemployment prior to retirement—especially if prolonged and not covered by unemployment allowances—is negatively associated with postretirement survival. I also find that the adverse consequences of employment instability in later working life on survival tend to be more acute among disadvantaged occupational subgroups, at least in the case of women. These results are robust to sensitivity analyses, which aim to alleviate concerns of reverse causality dynamics between employment trajectories and health.

This work draws on and contributes to three main strands of literature. First, it provides novel evidence on the "scarring effects" of employment instability (Clark et al. 2001), focusing on a period of working life—the later one—that has been largely neglected so far. To the best of my knowledge, this is the first study to investigate how late-career employment trajectories relate to postretirement survival chances. Second, it integrates the growing literature on the relationship between retirement and subsequent health outcomes. It does so by stressing the importance of taking a dynamic approach to retirement, in the wake of studies that look at retirement as a sequentially linked process rather than as a single transition in time (Fasang 2010, 2012; McDonough et al. 2017; Riekhoff 2018; Riekhoff and Järnefelt 2018). It is worth stressing that this study does not explore the relationship between unemployment or retirement and mortality, *per se*, but rather the relationship between employment instability in the path to retirement and subsequent mortality. Last, this study also speaks to the well-established literature on differential mortality (Marmot 2005; Wilkinson and Marmot 2003). To the extent that deviations from full-time

employment in later adult life are more frequent across socioeconomically vulnerable strata of the population, the study can shed further light on the relationship between socioeconomic status and life span inequalities. In addition, it can provide new insights on drivers of differential mortality within socioeconomic groups themselves.

Employment Trajectories, Retirement, and Health

The relationship between employment and health has long been studied (Dooley et al. 1996; Jin et al. 1995; Roelfs et al. 2011). Still, it continues to raise significant scholarly interest. Indeed, the mechanisms connecting employment status and health outcomes are complex, possibly countervailing, and certainly difficult to disentangle. On the one hand, precarious employment, unemployment, and inactivity are generally expected to have a negative impact on individual health, with the potential channels including economic hardship, loss of status, or harmful behavior, such as suicide (Wilkinson and Marmot 2003). On the other hand, employment itself can negatively affect health via physical stress, injuries, diseases related to the workplace, or perceived job insecurity (Caroli and Godard 2014; Quinlan 2015). The consensus is that unemployment is associated with worse health outcomes, even after accounting for health selection issues (Blakely et al. 2003; Pirani and Salvini 2015; Vägero and Garcy 2016). Yet, evidence of causality remains mixed (Salm 2009; Schmitz 2011; Sullivan and von Wachter 2009). A major limitation of many existing studies connecting employment and health—which may also be the reason behind contradictory results—is their focus on short-term labor market events. In fact, the effects of given employment conditions may depend on the length of exposure to a given status, accumulate over time, and emerge only gradually. For this reason, scholars have increasingly stressed the need for taking a more dynamic approach to the issue, looking at long-run employment trajectories over the life course (Benach and Muntaner 2007). Longitudinal data and techniques to process them, such as sequence analysis, have been employed for this purpose. Research efforts have concentrated mostly on the long-term impact of employment trajectories on health and well-being of young and middle-aged people (Clark and Lepinteur 2019; Devillanova et al. 2019; Sarti and Zella 2016; Torssander and Almquist 2017). These studies are unanimous in concluding that low labor market attachment and trajectories marked by spells of short- and long-term unemployment have a negative impact on self-reported health and survival.

Little attention, however, has been devoted to the relationship between employment trajectories in later working life or the retirement process and subsequent health outcomes. Research on transition into retirement and health has focused overwhelmingly on the effect of the transition, *per se,* or on the timing. The overall evidence on the effect of retirement on health is, at best, mixed (van der Heide et al. 2013). As for timing, the consensus is that early retirement has adverse effects on health (Burdorf 2010; Hult et al. 2010; McDonough et al. 2017; Westerlund et al. 2010), even after accounting for health selection issues (Barban et al. 2020). Some studies have examined the consequences of employment trajectories in the retirement process for income inequality in old age (Fasang 2012; Riekhoff and Järnefelt 2018). With specific reference to the Italian context, Contini and Leombruni (2006) found that the late career of a nonnegligible share of the working population in the early 1990s was

marked by irregular patterns of labor market activity, with negative consequences for wages and pensions. Still, there is limited research about the relationship between employment-to-retirement trajectories and inequality in seniors' health and longevity. A few studies employ SHARE (Survey of Health, Ageing and Retirement in Europe) data, providing retrospective employment information to investigate how employment histories over the life course relate to self-reported health and quality of life at older ages (Ponomarenko 2016; Wahrendorf 2015; Zella and Harper 2020). These studies suggest that going through spells of inactivity and unemployment has negative consequences for well-being in old age, particularly for men. To the best of my knowledge, Marshall et al. (2001) is the only study so far that looks specifically at the relationship between late-career employment trajectories and subsequent health outcomes. Focusing on a sample of early retirees from a major Canadian telecommunication company between 1985 and 1995, they found that instability in the retirement transition—measured in terms of unemployment spells—yielded adverse effects on measures of self-rated health after retirement. Analogous evidence on how late-career employment trajectories relate to postretirement mortality is still missing.

Building on these insights, this study investigates how late-career employment trajectories shape postretirement survival chances. I seek to answer two main questions. First, are late-career employment trajectories marked by deviations from full-time employment associated with worse survival chances than those dominated by full-time employment? On the one hand, late-career trajectories diverging from the full-time, employment-to-retirement paradigm—especially if they take the form of labor market inactivity and unemployment—may lead to mortality risk–enhancing circumstances, such as economic strain and social isolation. For these reasons, one may expect late-career trajectories departing from full-time employment to come with worse postretirement survival chances. On the other hand, late-career trajectories deviating from full-time employment—especially if they materialize in terms of part-time employment and self-employment—may stem from senior workers' struggle or unwillingness to cope with full-time work commitments, for reasons ranging from fatigue to care obligations. To the extent they allow for lower life stress or better life–work balance, late-career trajectories departing from full-time employment may thus come with better postretirement survival chances.

Second, do late-career employment trajectories differentially shape postretirement survival chances for men and women? A number of studies bring evidence that deviations from full-time employment carry greater social stigma and mental distress for men than for women (Artazcoc et al. 2004; Unger et al. 2018; van der Meer 2014). A plausible explanation for such findings relates to gender differences in expectations toward labor market participation (Marshall et al. 2001). While women are more likely to renounce full-time work to meet care obligations, which may lower their expectations of control and stability in work, men's deviations from full-time employment are more likely to reflect inability to find full-time work (Ponomarenko 2016). Under such circumstances, late-career trajectories deviating from full-time employment can be expected to yield more adverse consequences for postretirement survival among men than women. Still, a few studies found that employment instability was equally stressful for both sexes (Thomas et al. 2005), if not more stressful for women (Frasquilo et al. 2016). Such mixed results motivate the alternative hypotheses that late-career patterns deviating from full-time employment are associated with worse

postretirement survival chances irrespective of gender and with worse postretirement survival chances among women than among men.

Data

The INPS LoSai Sample

I use longitudinal register data extracted from the archives of the Italian Social Security Institute—made available by the Italian Ministry of Labour—to examine late-career trajectories of a sample of workers previously employed in the Italian private sector who retired between 2001 and 2018. This so-called INPS LoSai sample is made up of individuals born on days 1 and 9 of each month of any birth year, for all cohorts appearing in the INPS archives. To the extent births are uniformly distributed in any year, extracted individuals represent about 7% of the INPS population.

I combine data from three sources. The first is the *Estratti Conto* data set, which reports the entire contributory history of private-sector workers covered by INPS-managed social security schemes until 2018. Major schemes managed by INPS cover private-sector employees and self-employed workers, including craftsmen, shopkeepers, and farmers. Public employees and high-profile freelance professionals (e.g., architects, lawyers) are covered, instead, by non-INPS schemes. The *Estratti Conto* data set provides a detailed record of all episodes in one's working life covered by INPS social security contributions: employment/self-employment job spells, parental/family leaves, sickness/injury episodes, unemployment spells covered by social benefits, and work suspension spells covered by wage subsidy schemes. For each spell, there is information about its beginning and ending dates and the monetary value of the relative contributions. For private employment spells, the *Estratti Conto* also provides information about occupational class (blue collar, white collar, middle manager, and manager) and type of contract (full-time vs. part-time).

The second source I draw on is the *Casellario Pensionati* archive, which keeps track of all recipients of pension benefits disbursed by INPS between 2001 and 2018. It provides information about the date at which the pension flow started, the date at which the pension flow ended (if this occurs by the end of 2018), and the type of pension benefit (see online appendix A for details on types of pension benefits disbursed by INPS).

Third, I use information extracted from the *Anagrafica* data set, which reports basic individual demographic characteristics, including gender, year of birth, year of death (if relevant), and region of residence as of 2018 or as of the year of death. A major drawback of the *Anagrafica* data set—and of register data in general—is the paucity of information about individual characteristics. I notably lack information about education, marital/family status, and other family background characteristics, and I cannot match across spouses or family members.

Sample Construction

The initial sample is composed of 501,220 individuals who retired between 2001 and 2018. I identify time of retirement as the first year the individual received old-age or

seniority pension benefits from INPS. I restrict my analysis to individuals reporting at least one contributory spell in the 10 years prior to retirement and who spent most of their career working as private employees, as deducible from their contributory history ($n=238,098$). In other words, I focus on individuals who contributed for most of their career (i.e., >50%, measured in terms of years) to the INPS scheme covering private-sector employees (*Fondo Pensione Lavoratori Dipendenti*). I exclude individuals whose first appearance in INPS archives occurs at a suspiciously young age (i.e., <12) or after age 30, the purpose being to focus on individuals whose career is mostly tracked by the *Estratti Conto* data set ($n=8,490$). To alleviate reverse causality concerns about late-career trajectories and subsequent mortality patterns, I further exclude individuals who spent most of any of the 10 years prior to retirement in injury/sickness leave ($n=1,857$). I also exclude individuals who retired before the age of 50 or after the age of 70 ($n=3,253$), the aim being to have a sample of people who entered retirement at a "normal" age, presumably in good health. The final sample consists of 224,498 uniquely identified individuals, 146,978 men and 77,520 women,[1] who can be followed from retirement up to 2018 or to the year of death, if before 2018, for a total of 2,206,937 person-year observations and 20,379 recorded deaths (16,458 for men and 3,921 for women). Descriptive statistics about the final sample are reported in Table 1; steps taken in the sample construction are recapitulated in Table E1 of the online appendix.

Employment Statuses in INPS Data

For each retiree in the sample, it is possible to reconstruct reliable career trajectories since the entry in the labor market until retirement based on their contributory history at INPS. Spells that fall outside the scope of *Estratti Conto* pertain to five main cases: (1) transition into temporary unemployment not covered by any allowance, (2) transition into the informal labor market, (3) transition into permanent unemployment/inactivity, (4) transition into the public sector or into high-profile freelance jobs, and (5) migration abroad. Because the focus of our analysis is on late-career trajectories (i.e., the 10 years before retirement), case 4 can be ruled out, given that the likelihood of getting a public-sector job (which in most cases implies passing a public examination) or starting highly qualified professional activity in late adulthood is likely negligible (Contini and Leombruni 2006). While the data do not allow me to directly address the case of migration abroad, statistics on the characteristics of Italian emigrants suggest that migration in later working life is also infrequent (ISTAT 2019). Case 1 can be properly identified if the individual disappears from the data and reappears during a given year or if they disappear and reappear during the following year; however, the data unfortunately do not allow me to disentangle the remaining two cases. Long-term disappearance from the scope of *Estratti Conto* in the last years prior to retirement may be due to transition into inactivity or into the informal labor market. Thus, I consider these two cases together as (formal) unemployment. With

[1] The imbalance in observations across sexes is consistent with women's traditionally low participation in the Italian labor market.

Table 1 Descriptive statistics of the INPS LoSai sample

	All				Men				Women			
	Mean	SD	Min.	Max.	Mean	SD	Min.	Max.	Mean	SD	Min.	Max.
Year of Birth	1946.7	4.7	1931.0	1966.0	1946.4	5.0	1931.0	1966.0	1947.2	4.2	1931.0	1965.0
Retirement Age	59.5	3.7	51.0	70.0	59.7	4.1	51.0	70.0	59.2	2.7	51.0	70.0
Age at First Job	17.9	3.5	12.0	30.0	18.0	3.4	12.0	30.0	17.8	3.6	12.0	30.0
Work After Retirement (%)	19.3	39.5	0.0	100.0	22.7	41.9	0.0	100.0	13.0	33.7	0.0	100.0
Macroregion of Residence (%)												
North-East	20.1	40.1	0.0	100.0	18.5	38.8	0.0	100.0	23.2	42.2	0.0	100.0
North-West	31.9	46.6	0.0	100.0	30.8	46.2	0.0	100.0	33.8	47.3	0.0	100.0
Centre	18.5	38.8	0.0	100.0	18.2	38.6	0.0	100.0	19.0	39.3	0.0	100.0
South	19.9	39.9	0.0	100.0	21.2	40.9	0.0	100.0	17.5	38.0	0.0	100.0
Islands	9.6	29.5	0.0	100.0	11.3	31.7	0.0	100.0	6.5	24.6	0.0	100.0
Prevalent Occupation (%)												
Blue collar	68.0	46.7	0.0	100.0	70.8	45.5	0.0	100.0	62.8	48.3	0.0	100.0
White collar	30.0	45.8	0.0	100.0	26.7	44.2	0.0	100.0	36.2	48.0	0.0	100.0
Manager	2.0	14.1	0.0	100.0	2.6	15.8	0.0	100.0	1.0	10.1	0.0	100.0
Reception of Pension Benefits (%)												
Disability	4.2	20.1	0.0	100.0	4.5	20.6	0.0	100.0	3.8	19.2	0.0	100.0
Survivor	3.4	18.2	0.0	100.0	1.2	10.8	0.0	100.0	7.6	26.5	0.0	100.0
Indemnity	2.9	16.9	0.0	100.0	4.2	20.0	0.0	100.0	0.6	7.9	0.0	100.0
Social	1.3	11.4	0.0	100.0	1.5	12.3	0.0	100.0	0.9	9.5	0.0	100.0
Sickness/Injury Leave (%)	30.2	45.9	0.0	100.0	28.2	45.0	0.0	100.0	33.9	47.4	0.0	100.0
Sickness/Injury Leave Episodes	1.1	3.0	0.0	66.0	0.9	2.1	0.0	57.0	1.6	4.1	0.0	66.0
Sickness/Injury Leave (weeks)	1.6	7.1	0.0	169.0	1.0	4.6	0.0	167.0	2.8	10.1	0.0	169.0

Notes: Work after retirement measures whether the individual records any employment spell after retirement. North-East, North-West, Centre, South, and Islands are dummy variables for the macroregion of residence as of 2018 or as of the year of death, if this occurs earlier. Blue collar, white collar, and manager are dummy variables for the prevalent occupational status observed in the *Estratti Conto* data set over the entire working life. Disability, survivor, indemnity, and social pensions are dummy variables measuring whether individuals receive these types of pension benefits (see online appendix A) prior to retirement. Sickness/injury leave is a dummy variable taking a value of 1 if the individual records any sickness/injury leave in the 10 years prior to retirement, number of sickness/injury leave episodes measures the number of such episodes in the 10 years prior to retirement, and number of weeks in sickness/injury leave measures the total number of full weeks in such leaves in the 10 years prior to retirement.

these caveats in mind, I identify seven mutually exclusive employment statuses in which individuals may predominantly fall during a given year: (1) full-time dependent work, (2) part-time dependent work, (3) self-employment work,[2] (4) temporary suspension from work covered by wage subsidy public schemes (the so-called *Cassa Integrazione Guadagni*, or CIG), (5) unemployment (i.e., having worked <26 weeks during a year) and covered at least in part by unemployment benefits, (6) unemployment (i.e., having worked <26 weeks during a year) with no unemployment benefits, and (7) a residual category of statuses, as resulting from the *Estratti Conto*, which do not fall into any of the former six (e.g., family leaves).

Methods

Sequence and Cluster Analysis

To identify late-career trajectories, I apply sequence analysis. According to this theoretical and methodological framework, individual trajectories can be represented as sequences of categorical events, or states (Abbott 1995). The first step in sequence analysis is to produce a matrix of dissimilarity between individual sequences, which can then be used as input for data-reduction techniques, such as cluster analysis. Groups of individual sequences identified through data-reduction techniques can further be used as determinants or consequences of life course trajectories (Barban and Billari 2012).

I construct individual sequences of employment statuses for each individual in the final sample, focusing on the 10 years prior to retirement. Specifically, I code each individual year-based observation according to the prevalent employment status, among the seven outlined earlier. The trajectory of an individual who transitions from full-time employment (FT) to unemployment without social allowances (UWB) in the last three years prior to retirement would look, for instance, like this: FT, FT, FT, FT, FT, FT, FT, UWB, UWB, UWB. If an individual experiences multiple employment statuses during a year, they are assigned to the status that lasted the longest in terms of weeks.

I use the R package *TraMineR* developed by Gabadinho et al. (2011) to analyze the individual sequences so constructed. Given that employment trajectories of men and women tend to differ, I perform separate analyses by gender. I first compute pairwise dissimilarity matrices for men and for women using the dynamic Hamming algorithm to measure distance between individual sequences. The dynamic Hamming method has been proposed as an alternative to traditional optimal matching techniques. In optimal matching, the dissimilarity between two sequences is measured by considering how much effort is needed to transform one sequence into the other (Barban and Billari 2012). Transformation entails three basic operations (insertion, deletion, and substitution) to which specific costs should be assigned. Critics of

[2] A particular type of worker category covered by INPS data is that of parasubordinate workers—that is, workers who fall formally under nonsubordinate contractual arrangements while working, *de facto*, as dependent employees with reduced access to social welfare benefits. I classify spells of parasubordinate work as self-employment.

optimal matching generally point to the difficulty of providing solid theoretical background to the determination of these costs (Gauthier et al. 2009). They also stress failure of optimal matching to account for nonlinear dependency over time. That is, by relying on transformation costs that are the same at any point of the sequence, and independent of the direction, optimal matching ignores the ordering of sequences. This implies, for instance, that optimal matching treats transitioning from employment to unemployment as equivalent to transitioning from unemployment to employment, and transitioning from employment to unemployment as equally costly regardless of whether it occurs at age 50 or 65.

The dynamic Hamming method proposed by Lesnard (2010) addresses both shortcomings. First, it does not use insertions or deletions (for this reason, it can exclusively handle sequences of equal length). Second, it employs substitution costs that depend on position t in the sequence. The latter are derived from transition rates between possible states observed in the sample at successive positions. The dynamic Hamming time-dependent substitution cost between states a and b at position t is defined as

$$s_t(a,b) = 4 - p_t(b|a) - p_t(a|b) - p_{t+1}(b|a) - p_{t+1}(a|b), \quad (1)$$

where $p_t(b|a)$ is the probability of transitioning from a to b between $t - 1$ and t, and $s \in [0,4]$. The higher the transition rate between states a and b between $t - 1$ and t, and between t and $t + 1$, the lower the substitution cost between a and b at t. Given its timing sensitivity, the dynamic Hamming method is particularly useful for applications in which the exact timing/position of states within sequences is theoretically important, as in the case of retirement trajectories (Aisenbrey and Fasang 2010).

I use the dissimilarity matrices to identify ideal-type, late-career trajectories through hierarchical cluster analysis using the Ward's method, which minimizes the within-cluster variance, as linkage criterion. I determine the number of clusters on the basis of three criteria: (1) the observation of theoretically meaningful clusters, (2) saturation (i.e., whether the addition of a new cluster is just another version of those already existing), and (3) sufficient number of observations in each cluster.[3] I further evaluate the adequacy of clusters so determined by relying on the average silhouette width (ASW) criterion, weighted by the number of sequences in each cluster, which measures the coherence of assignment of each sequence to a given cluster. Average silhouette width ranges between 1 and −1, with a value of 1 indicating very good clustering and those greater than 0 indicating acceptable quality of clustering (Torssander and Almquist 2017). From these criteria, as further detailed in the following, I eventually end up with a six-cluster solution for men and a seven-cluster solution for women. In both cases, the ASW (weighted) is close to 0.6 (Figure B1 in the online appendix). Using the partitioning around medoids (PAM) criterion (Kaufman and Rousseeuw 2005) as an alternative clustering technique yields analogous clustering solutions (Figure B2 in the online appendix).

[3] As a rule of thumb, I considered 1,000 individuals to be a sufficient number.

Survival Analysis

I examine the relationship between late-career employment trajectories and postretirement mortality by using the identified clusters as explanatory variables in survival analysis, in which the focal event is death. Individuals are followed from the year of retirement until 2018 or until the year of death if before 2018. My outcome of interest is a dichotomous variable taking a value of 1 if the individual is dead by the end of the year and 0 if they are still alive. Because the data allow me to only identify whether any individual is dead or alive by the end of each year, I turn to discrete-time survival analysis. Specifically, I opt for the complementary log-log model that best fits the case of survival times, which are continuous in nature but come grouped or banded into intervals (Jenkins 2005). The model specification for the interval hazard rate, for each sex, looks like this:

$$\log\left(-\log\left[1-h_j\left(X\right)\right]\right)=\beta' X+\gamma_j \tag{2}$$

or

$$\mathrm{h}_{\mathrm{j}}\left(X\right)=1-\exp\left[-\exp\left[\left(\beta' X+\gamma_j\right)\right]\right], \tag{3}$$

where $h\left(j,X\right)$ defines the hazard rate of dying over the interval *j, X* are the covariates with the related coefficients β, and γ_j are parameters that summarize the duration dependence in the interval hazard. In this case, I opt for a fully nonparametric baseline hazard. This implies creating duration-specific-interval dummy variables, one for each spell year at risk.[4] The main explanatory variables are the dummy variables for the various ideal-type, late-career trajectories identified through cluster analysis. Baseline controls include year of birth; region of residence; prevalent occupational position throughout the observable career (blue collar, white collar, and manager); age of appearance in the *Estratti Conto* records, which can be interpreted as a proxy of age of entry into the labor market; age at retirement; and a dummy variable for whether the individual records any employment spell after retirement. The major threat to the validity of my analysis comes from unobservable health conditions, which can affect both retirement trajectories and postretirement mortality. I seek to address this reverse causality concern by controlling for the reception of pension benefits associated with physical or mental impairment, occurring prior to the attainment of old-age/seniority pension. I also include a dummy variable for the reception prior to retirement of survivors' pension benefits. Although not directly related to recipient's physical or mental impairment, survivors' benefits track the occurrence of a major event (i.e., the loss of one's spouse), which may affect both health conditions (Roelfs et al. 2012) and labor supply decisions (Giupponi 2019). Finally, I also control for

[4] Because the earliest year of retirement in the data set is 2001 and there are individuals from the 2001 retirement cohort who are still alive by the end 2018, I create 18 duration-specific-interval dummy variables.

the total number of sickness/injury leave episodes and for the cumulative number of full weeks in sickness/injury leave in the 10 years prior to retirement.

Results

Sequence Analysis

Figure 1 reports the percentage of individuals in each employment state in the decade prior to retirement. Full-time employment is the most frequent employment status for both older male and female workers, although its relative importance decreases as retirement approaches, notably for the latter. The most noticeable gender difference is the larger incidence of part-time work and long-term unemployment/inactivity prior to retirement among women. This is in line with the weaker attachment of Italian women to the labor market as a result of, *inter alia*, gender asymmetries in caring responsibilities in a context traditionally marked by "familistic" welfare (Esping-Andersen 1990). The limited relevance of self-employment is not surprising given that the sample consists of people who paid contributions as private-sector employees for most of their career.

Figure 2 displays clusters of individual sequences ordered by the distance from the most frequent sequence in each cluster, for men and women.[5] The composition of clusters across sexes is qualitatively similar (except for one women-specific cluster, as further clarified below). The cluster "Full-time employment'" is dominated by stable late-career employment trajectories, corresponding to the paradigm of smooth transition from full-time employment directly into retirement. At the national level, the majority of men fall into this cluster (60%), as do about 39% of women. The cluster "Self-employment'" features sequences characterized by spells of autonomous work; this applies to individuals (about 7% and 6% of sampled male and female retirees, respectively) who used to hold a dependent job and who spent the 10 years prior to retirement working mostly in a self-employed capacity. The cluster "Full-time employment/unemployment without benefits" is characterized by sequences featuring early stable employment that then gives way to spells of unemployment not covered by social benefits prior to retirement; about 7% of male and 6% of female retirees fall into this case. The cluster "Full-time employment/unemployment with benefits" features sequences in which full-time work gives way to unemployment spells, mostly covered by unemployment benefits; this cluster includes about 11% of men and 8% of women in the sample. The cluster "Unemployment without benefits" is characterized by trajectories dominated by spells of (formal) unemployment not covered by social benefits along the entire decade preceding retirement; this trajectory applies to individuals who may be unable to find a (formal) job after dismissal or who may voluntarily drop out of the labor market (14% of male and 27% of female retirees). The cluster "Part-time employment" is characterized by the prevalence of part-time work spells; the share of men belonging to this category is minimal (1%), while the share of women is sizable (13%). The last cluster, "Full-time/part-time

[5] For visualization reasons, 500 representative sequences (randomly drawn) are shown for each cluster.

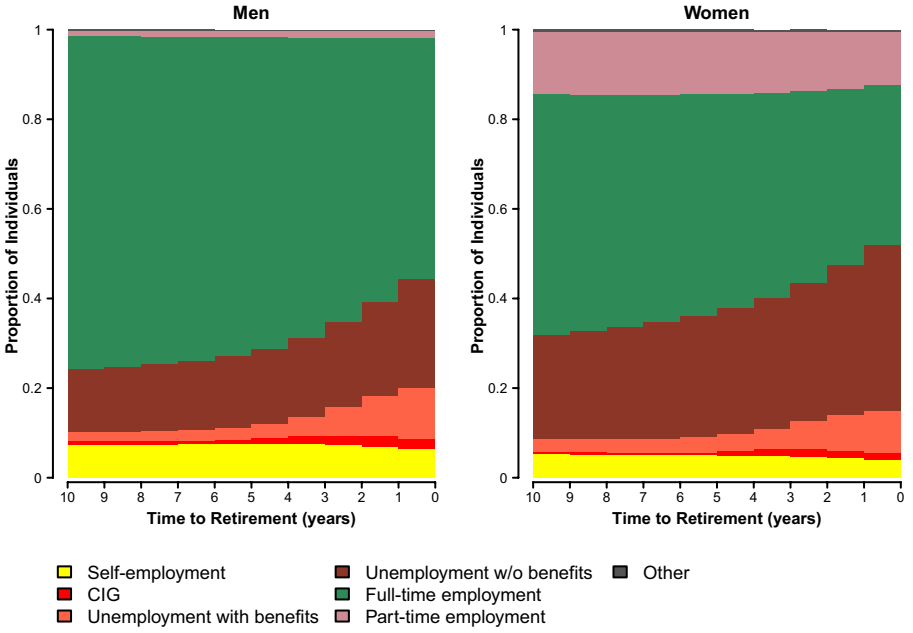

Fig. 1 Distribution of employment states in the 10 years prior to retirement. CIG is the acronym for *Cassa Integrazione Guadagni,* that is, the Italian wage subsidy public scheme. *Source:* Author's elaboration based on the INPS LoSai sample.

employment," the only women-specific group, is characterized by trajectories in which full-time work gives way to part-time work prior to retirement (2% of female retirees fall into this cluster).

Regional disparities in the distribution of ideal-type, late-career trajectories are markedly pronounced (Table 2). Slightly less than 70% of male retirees in the northern regions—traditionally richer and economically more dynamic than the South (Felice 2018)—fall into the full-time dependent work career path, while this is the case for less than 50% of retirees in the South and the Islands. Likewise, fewer male pensioners from the Centre and northern regions went through spells of unemployment, compared with those in the South and Islands regions. Considerable regional disparities also exist for women. The proportion of women belonging to the cluster "Full-time employment" is more than 25 percentage points higher in the North than in the South. The same holds true for the "Part-time employment" trajectory, which is three times as common in the North-East as in the South. By contrast, women in the South are 3–4 times as likely as those in the northern and Centre regions to go predominantly through spells of unemployment/inactivity not covered by any social allowance. In fact, the proportion of women spending most of the 10 years prior to retirement out of the formal labor market is large in all regions, relative to men, but particularly so in the South. Still, the data do not allow me to distinguish between long-term unemployment, voluntary inactivity, and transition into the informal labor market. It is possible that some of the older workers in the South who appear as formally unemployed are actually active in the shadow economy.

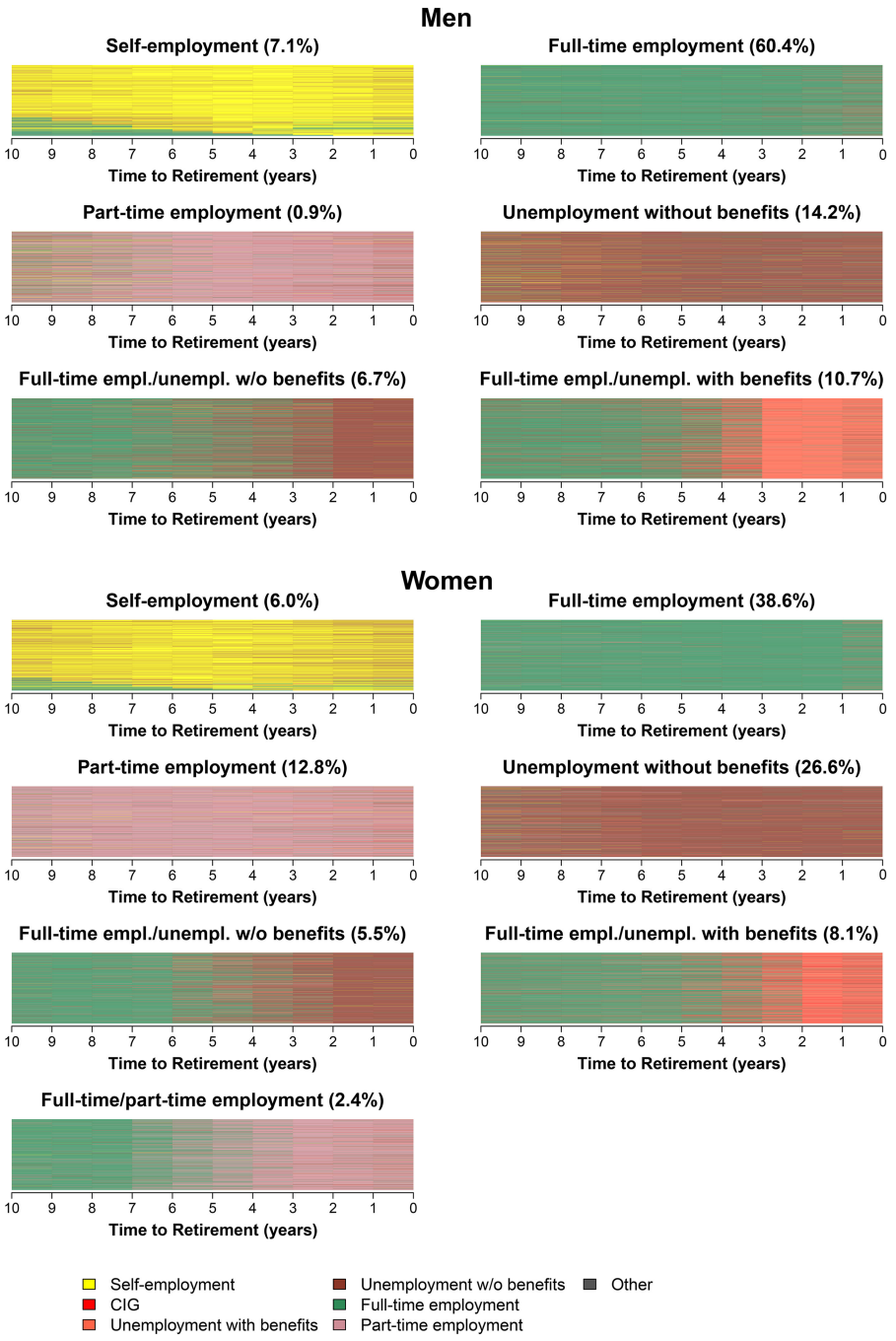

Fig. 2 Clusters of ideal-type, late-career trajectories. Percentages in parentheses refer to the share of individuals falling into each cluster, for men and women separately. For each cluster, 500 representative sequences ordered by the distance from the most frequent sequence in each cluster are shown. CIG = *Cassa Integrazione Guadagni*. *Source:* Author's elaboration based on the INPS LoSai sample.

Table 2 Cluster distribution by macroregion and gender (number and percentage)

Cluster	North-East	North-West	Centre	South	Islands	Total
Men						
Self-employment	2,535	3,932	1,946	1,208	822	10,443
	9.1%	*8.7%*	*7.4%*	*3.9%*	*4.9%*	*7.1%*
Full-time employment	19,314	30,443	16,731	14,645	7,634	88,767
	69.6%	*67.2%*	*63.5%*	*47.7%*	*45.2%*	*60.4%*
Part-time employment	212	331	262	415	128	1,348
	0.8%	*0.7%*	*1.0%*	*1.4%*	*0.8%*	*0.9%*
Unemployment without benefits	2,293	3,074	2,762	7,758	4,981	20,868
	8.3%	*6.8%*	*10.5%*	*25.3%*	*29.5%*	*14.2%*
Full-time employment/ unemployment without benefits	1,401	2,373	1,889	2,731	1,451	9,845
	5.0%	*5.2%*	*7.2%*	*8.9%*	*8.6%*	*6.7%*
Full-time employment/ unemployment with benefits	1,999	5,122	2,773	3,951	1,862	15,707
	7.2%	*11.3%*	*10.5%*	*12.9%*	*11.0%*	*10.7%*
Total	27,754	45,275	26,363	30,708	16,878	146,978
	100.0%	*100.0%*	*100.0%*	*100.0%*	*100.0%*	*100.0%*
Women						
Self-employment	1,271	1,961	863	369	197	4,661
	6.9%	*7.4%*	*5.8%*	*2.9%*	*4.1%*	*6.0%*
Full-time employment	7,791	11,987	6,476	2,223	1,438	29,915
	42.0%	*45.0%*	*43.7%*	*17.5%*	*29.6%*	*38.6%*
Part-time employment	3,084	3,806	1,992	639	412	9,933
	16.6%	*14.3%*	*13.5%*	*5.0%*	*8.5%*	*12.8%*
Unemployment without benefits	3,778	4,072	2,982	7,613	2,176	20,621
	20.4%	*15.3%*	*20.1%*	*60.0%*	*44.8%*	*26.6%*
Full-time employment/ unemployment without benefits	1,015	1,494	956	551	230	4,246
	5.5%	*5.6%*	*6.5%*	*4.3%*	*4.7%*	*5.5%*
Full-time employment/ unemployment with benefits	1,067	2,611	1,116	1,176	317	6,287
	5.8%	*9.8%*	*7.5%*	*9.3%*	*6.5%*	*8.1%*
Full-time/part-time employment	540	700	418	108	91	1,857
	2.9%	*2.6%*	*2.8%*	*0.9%*	*1.9%*	*2.4%*
Total	18,546	26,631	14,803	12,679	4,861	77,520
	100.0%	*100.0%*	*100.0%*	*100.0%*	*100.0%*	*100.0%*

There are also some noticeable trends in the prevalence of ideal-type career trajectories over time (Figure 3). Indeed, there is an increase in the share of women with retirement trajectories marked by full-time and part-time employment, and a sizable decline of those spending most of the decade prior to retirement in formal unemployment. These trends may be associated with pension reforms that raised the statutory retirement age, making it increasingly costly for women to leave the labor market while waiting to meet the age requirements to claim pension benefits, particularly from 2011 onward (Moscarola et al. 2016). In the case of men, we observe an increase in the share who go through spells of unemployment covered by unemployment benefits—notably after the 2011 debt crisis—to the detriment of direct transition from full-time work to retirement. Although quantitatively marginal, we also observe an increase in the share of men with retirement trajectories marked by part-time employment. While some of the observed trends may stem from sluggish

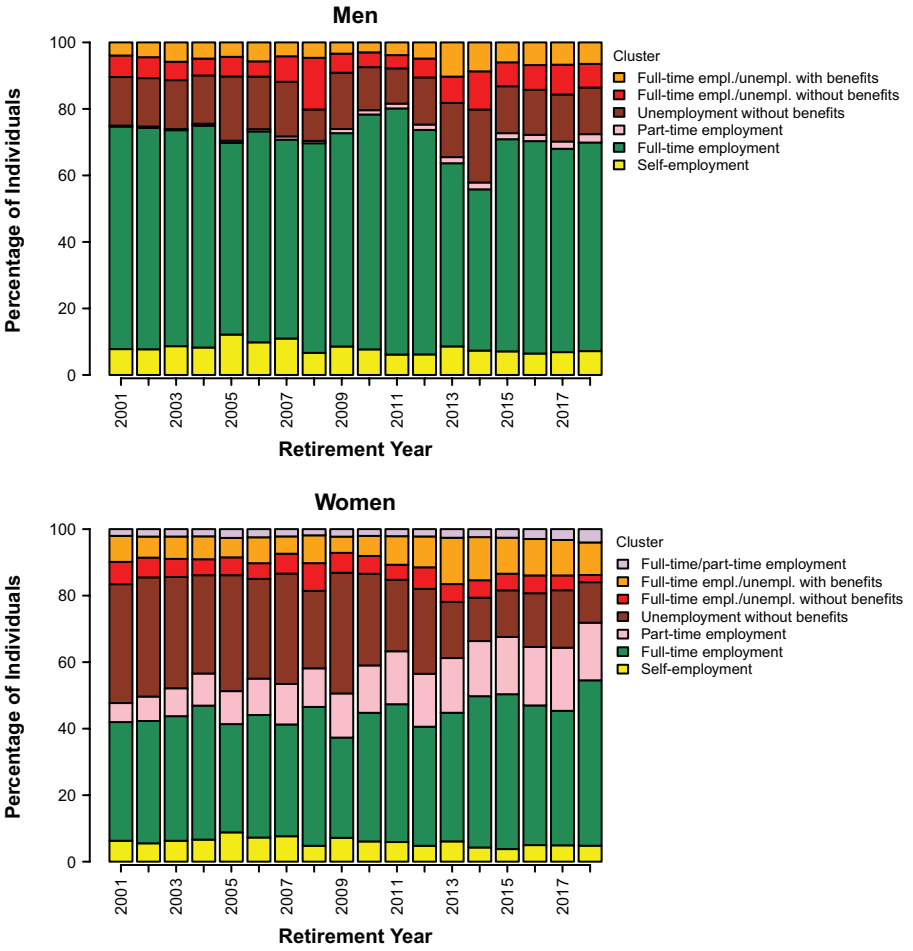

Fig. 3 Proportion of ideal-type employment trajectories by retirement cohort. *Source:* Author's elaboration based on the INPS LoSai sample.

economic conditions in the 2010s (Lorenti et al. 2019), they also likely reflect structural changes in the Italian labor market induced by reforms aimed at increasing the length of working life (Carta and De Philippis 2021).

Overall, sequence and cluster analyses confirm that a nonnegligible share of individuals who retired in Italy between 2001 and 2018 experienced some form of employment instability, measured in terms of deviation from the full-time employment paradigm.

Survival Analysis

Columns 1 and 2 of Table 3 display results from complementary log-log regressions for men. For reasons of space, the estimated hazard ratios for the duration-specific

Table 3 Postretirement mortality and ideal-type, late-career trajectories

	Men (1)	Men (2)	Women (3)	Women (4)	Men/Women (5)
Cluster (ref. = full-time)					
Self-employment	1.086**	1.095**	1.209**	1.210**	1.109***
	(0.034)	(0.034)	(0.083)	(0.083)	(0.034)
Part-time employment	1.180†	1.155	1.017	0.992	1.159†
	(0.105)	(0.103)	(0.060)	(0.059)	(0.103)
Unemployment without benefits	1.246***	1.134***	1.215***	1.122**	1.131***
	(0.028)	(0.027)	(0.052)	(0.049)	(0.026)
Full-time employment/ unemployment without benefits	1.269***	1.080*	1.127†	1.007	1.064*
	(0.037)	(0.033)	(0.080)	(0.072)	(0.032)
Full-time employment/ unemployment with benefits	1.088**	1.099**	1.153*	1.185*	1.083**
	(0.034)	(0.034)	(0.081)	(0.084)	(0.033)
Full-time/part-time employment			1.174	1.118	1.090
			(0.126)	(0.120)	(0.117)
Woman (W)					0.463***
					(0.014)
Self-employment × W					1.038
					(0.076)
Part-Time Employment × W					0.837†
					(0.089)
Unemployment Without Benefits × W					0.985
					(0.044)
Full-Time Employment/ Unemployment Without Benefits × W					0.953
					(0.073)
Full-Time Employment/ Unemployment With Benefits × W					1.125
					(0.085)
Year of Birth	0.979***	0.973***	0.997	0.992	0.976***
	(0.002)	(0.002)	(0.005)	(0.005)	(0.002)
Age at First Job	0.984***	0.985***	1.010*	1.008†	0.991***
	(0.003)	(0.003)	(0.005)	(0.005)	(0.002)
Retirement Age	1.101***	1.087***	1.089***	1.082***	1.086***
	(0.003)	(0.004)	(0.009)	(0.009)	(0.003)
Work After Retirement	0.592***	0.612***	0.644***	0.668***	0.622***
	(0.013)	(0.014)	(0.037)	(0.038)	(0.013)
Occupation (ref. = blue collar)					
Manager	0.750***	0.789***	0.766	0.781	0.794***
	(0.042)	(0.045)	(0.135)	(0.137)	(0.043)
White collar	0.810***	0.845***	0.983	1.008	0.883***
	(0.017)	(0.018)	(0.035)	(0.036)	(0.016)
Macroregion (ref. = Centre)					
North-East	1.072**	1.083**	1.033	1.056	1.070**
	(0.028)	(0.029)	(0.052)	(0.054)	(0.025)
North-West	0.997	1.011	1.109*	1.141**	1.037†
	(0.024)	(0.024)	(0.052)	(0.053)	(0.022)
South	0.884***	0.864***	0.958	0.915	0.879***
	(0.022)	(0.021)	(0.053)	(0.053)	(0.020)
Islands	0.844***	0.845***	1.021	1.003	0.871***
	(0.025)	(0.025)	(0.073)	(0.073)	(0.024)

Table 3 (continued)

	Men (1)	Men (2)	Women (3)	Women (4)	Men/Women (5)
Disability Pension		1.924***		2.665***	2.055***
		(0.053)		(0.157)	(0.052)
Survivor Pension		1.309***		1.109†	1.154***
		(0.083)		(0.066)	(0.050)
Indemnity Pension		1.074†		0.899	1.091*
		(0.042)		(0.202)	(0.042)
Social Pension		2.211***		5.219***	2.556***
		(0.098)		(0.437)	(0.102)
Number of Weeks on Sickness/Injury Leave		0.998		0.994*	0.997†
		(0.002)		(0.003)	(0.002)
Number of Sickness/Injury Leave Episodes		1.010†		1.008	1.009*
		(0.005)		(0.008)	(0.004)
Number of Observations	1,431,429	1,431,429	775,508	775,508	2,206,937
Number of Deaths	16,458	16,458	3,921	3,921	20,379

Notes: Results are from complementary log-log models. Dependent variable is death occurrence (0,1). The variables number of full weeks in sickness/injury leave and number of sickness/injury leave episodes refer to 10 years prior to retirement. All models include 18 duration dummy variables (baseline hazard). Coefficients are expressed in the exponentiated form (hazard ratios). Robust standard errors are shown in parentheses.

†$p<.10$; *$p<.05$; **$p<.01$; ***$p<.001$

interval dummy variables are not shown.[6] When controlling for the baseline set of potential confounders described earlier, all late-career trajectories deviating from full-time employment are positively associated with postretirement mortality risk, relative to the cluster of reference, "Full-time employment" (column 1). The greatest increased risk—27%—is attached to the "Full-time/unemployment without benefits" trajectory, suggesting that the scarring effect of unemployment is harmful if it follows full-time employment and is not covered by unemployment allowances.

The main threat to the validity of these results is represented by reverse causality dynamics, whereby unobservable health conditions affect both retirement trajectories and postretirement mortality. Results in column 2 suggest that some reverse causality is indeed at play, as witnessed by the loss of magnitude and statistical significance of our hazard ratios of interests and by the strong positive association between the various types of allowances and postretirement mortality risk. Still, all retirement trajectories but the one dominated by part-time employment remain significantly associated with higher postretirement mortality risk. In particular, men who spent most of the decade prior to retirement in formal unemployment have a postretirement mortality risk that is 13% higher than those who transitioned from full-time private employment into retirement. Going from full-time employment to unemployment is

[6] Full results, including estimated baseline hazards, are reported in Tables E2 and E3 in the online appendix.

associated with an increase in postretirement mortality risk of 10% if unemployment is covered by allowances and by 8% if not.[7]

Results for women are reported in columns 3 and 4 of Table 3. When controlling for the baseline set of potential confounders (column 3), retirement trajectories featuring unemployment spells not covered by allowances are strongly associated with higher postretirement mortality risk. Increased postretirement mortality risk emerges also in the case of trajectories dominated by self-employment and those characterized by transition from full-time to unemployment, with and without social allowances. To address reverse causality concerns, in column 4, I include controls for the reception of allowances related to physical or mental impairment prior to retirement and for the number of episodes/weeks spent in sickness/injury leave. Unlike for men, the retirement trajectory associated with the greatest increase in postretirement mortality risk is the one dominated by self-employment spells (21%), followed by those characterized by transition from full-time private employment to unemployment covered by allowances (19%) and by prolonged unemployment (12%). Holding part-time employment or transitioning from full-time employment into unemployment not covered by allowances has no appreciable association with postretirement mortality risk. In fact, the hazard ratio of women who transition from full-time employment to unemployment without benefits prior to retirement falls below 1 when controlling for the reception of allowances related to physical and mental impairment. It is possible that women who leave full-time employment and enter formal unemployment do so voluntarily, even if they have not reached the requirements for accessing pension benefits, possibly upon their partner's retirement (Bloemen et al. 2019; Pozzebon and Mitchell 1989), and this may be beneficial for their health (Zang 2020).

Labor market dynamics in Italy are characterized by strong gender stratification, with women being more likely to experience employment instability over the life course, mostly because of difficulties involved in reconciling work and family/caring responsibilities (Saraceno 2018). One may, therefore, expect late-career trajectories to differ in the way they shape postretirement survival across sexes. To directly test this hypothesis, I run a model, based on the full sample, in which late-career trajectories are interacted with a dummy variable taking a value of 1 for female individuals. Results are reported in column 5 of Table 3. None of the coefficients of the interaction terms are statistically significant at conventional levels, except for the part-time employment × woman term. The latter suggests that late-career trajectories dominated by part-time employment spells yield less harmful consequences for women than men. A plausible explanation is that greater social stigma is attached to men opting for part-time employment, which is a more frequent and acceptable career choice for women. Thus, apart from part-time employment, late-career patterns deviating from full-time employment are associated with worse postretirement survival chances irrespective of gender.

To further investigate whether deviations from full-time employment yield particularly harmful consequences across specific socioeconomic population strata, in Table 4, I allow for heterogeneity in the association between late-career trajectories

[7] This difference is surprising as one may expect unemployment allowances to have, *ceteris paribus*, a protective effect on health. Still, the difference between the two estimated coefficients is statistically non-significant ($p > \chi^2 = .66$).

and postretirement mortality based on prevalent occupation and region of residence. Columns 1 and 2 report results for men. In column 1, clusters are interacted with dummy variables taking a value of 1 if the prevalent occupation is white collar or manager. Results suggest that the association between retirement trajectories and postretirement mortality risk does not significantly differ across occupational groups, broadly defined. In column 2, I interact clusters with a dummy variable taking a value of 1 if the region of residence is either North-East or North-West. I find that the positive association between postretirement mortality risk and trajectories marked by unemployment spells not covered by allowances is stronger for men living in the northern regions, where deviations from the full-time private employment for mature workers are less frequent than in the rest of Italy.

In the case of women, the relationship between retirement trajectories and postretirement mortality differs along the occupational dimension only. Column 3 in Table 4 shows that having a white-collar background (but not a managerial one) mitigates the adverse consequences of going through trajectories deviating from full-time employment, as compared with having a blue-collar background. For instance, white-collar women who go through prolonged unemployment prior to retirement have a 13% ($1.213 \times 1.179 \times 0.789$) higher mortality risk than the reference group of blue-collar women in full-time employment. In contrast, blue-collar women who go through prolonged unemployment prior to retirement have a 21% higher mortality risk than blue-collar women in full-time employment. Likewise, white-collar and blue-collar women who transition from full-time employment to unemployment not covered by allowances prior to retirement have a postretirement mortality risk that is 6% ($1.143 \times 1.189 \times 0.689$) lower and 14% higher, respectively, than women with a blue-collar background in full-time employment. A possible interpretation of these findings is that, while leaving full-time employment prior to retirement could be a personal choice for white-collar women, it could be the result of involuntary circumstances for blue-collar women. Finally, column 4 documents that the relationship between late-career trajectories and postretirement survival among women does not vary significantly by region.

Overall, results presented in this section suggest that late-career deviations from full-time employment tend to come with worse postretirement survival chances. A policy-relevant question could then be what is the human cost implied by such increased postretirement mortality risk? To answer this question, I estimate cluster-specific survival rates using the parameters from sex-specific complementary log-log survival models, which control for late-career employment trajectory and year of birth, setting year of birth at sex-specific mean values. Estimates of cluster-sex-specific survival rates at 5, 10, and 15 years from retirement are reported in Table E5 in the online appendix. Upon retirement, the 10-year survival rate of a man belonging to the average birth cohort falling in the "Full-time employment" cluster is about 93%. It drops to about 92.5% for the "Self-employment" and the "Full-time employment/unemployment with benefits" clusters, and to about 90% for the remaining clusters. Turning to women, the 10-year survival rate of a woman belonging to the average birth cohort ranges from about 95.6% if she falls in the "Unemployment without benefits" cluster to 96.5% if she falls in the "Full-time employment" cluster. Assuming all individuals in the sample belong to the average birth cohort and applying sex-specific cluster weights reported in Table 2, under differential mortality, we

Table 4 Heterogeneity analysis

	Men (1)	Men (2)	Women (3)	Women (4)
Self-employment	1.066†	1.097*	1.362***	1.160
	(0.037)	(0.052)	(0.111)	(0.144)
Part-Time Employment	1.167	1.088	1.108	0.939
	(0.112)	(0.132)	(0.081)	(0.100)
Unemployment Without Benefits	1.117***	1.051†	1.228***	1.038
	(0.028)	(0.028)	(0.065)	(0.063)
Full-Time Employment/Unemployment Without Benefits	1.060†	1.026	1.143	0.949
	(0.037)	(0.039)	(0.099)	(0.109)
Full-Time Employment/Unemployment With Benefits	1.093*	1.117**	1.293**	1.238*
	(0.040)	(0.044)	(0.115)	(0.131)
Full-Time Employment/Part-Time Employment			1.231	1.319
			(0.156)	(0.226)
White Collar	0.824***		1.189**	
	(0.022)		(0.070)	
Manager	0.738***		0.905	
	(0.056)		(0.276)	
Self-employment × Manager	1.175		0.625	
	(0.221)		(0.369)	
Part-Time Employment × Manager	1.324		0.462	
	(1.340)		(0.484)	
Unemployment Without Benefits × Manager	1.284†		0.876	
	(0.181)		(0.368)	
Full-Time Employment/Unemployment Without Benefits × Manager	0.994		1.470	
	(0.199)		(0.867)	
Full-Time Employment/Unemployment With Benefits × Manager	0.960		0.693	
	(0.314)		(0.727)	
Full-Time Employment/Part-Time Employment × Manager			—	
			—	
Self-employment × White Collar	1.121		0.723*	
	(0.085)		(0.116)	
Part-Time Employment × White Collar	0.878		0.754*	
	(0.236)		(0.096)	
Unemployment Without Benefits × White Collar	1.048		0.791**	
	(0.058)		(0.067)	
Full-Time Employment/Unemployment Without Benefits × White Collar	1.083		0.689*	
	(0.076)		(0.109)	
Full-Time Employment/Unemployment With Benefits × White Collar	1.022		0.816	
	(0.070)		(0.117)	
Full-Time Employment/Part-Time Employment × White Collar			0.799	
			(0.192)	

Table 4 (continued)

	Men (1)	Men (2)	Women (3)	Women (4)
North		1.094***		1.086
		(0.025)		(0.066)
Self-employment × North		1.013		1.069
		(0.061)		(0.158)
Part-Time Employment × North		1.145		1.084
		(0.204)		(0.138)
Unemployment Without Benefits × North		1.208***		1.130
		(0.052)		(0.093)
Full-Time Employment/Unemployment Without Benefits × North		1.129*		1.097
		(0.066)		(0.159)
Full-Time Employment/Unemployment With Benefits × North		0.908		0.909
		(0.058)		(0.127)
Full-Time Employment/Part-Time Employment × North				0.773
				(0.169)
Number of Observations	1,431,429	1,431,429	775,508	775,508
Number of Deaths	16,458	16,458	3,921	3,921

Notes: Results are from complementary log-log models. Dependent variable is death occurrence (0,1). Coefficients are expressed in the exponentiated form (hazard ratios). Robust standard errors are shown in parentheses. All models control for year at birth; age at first job; retirement age; work after retirement; reception of disability, survivor, indemnity, and social pension benefits; number of full weeks in sickness/injury leave in 10 years prior to retirement; and number of sickness/injury leave episodes in 10 years prior to retirement. All models include 18 duration dummy variables (baseline hazard). Columns 1 and 4 include controls for macroregion of residence. Columns 2 and 4 include controls for occupational status.

$^{\dagger}p < .10$; $^{*}p < .05$; $^{**}p < .01$; $^{***}p < .001$

would observe 11,194 and 3,011 deaths in the first 10 years after retirement for men and women, respectively. If all individuals in this hypothetical sample belonged to the "Full-time employment" cluster, the expected number of deaths over the same period would be 9,965 men and 2,682 women. In both cases, shifting all individuals to the full-time employment trajectory would reduce the number of deaths in the first decade after retirement by about 11%.

Sensitivity Analyses

Column 1 of Tables E6 and E7 in the online appendix report results from specifications in which I control for cohort-sex-specific quintiles of average inflation-adjusted gross income in the 10 years prior to retirement, observable in the *Estratti Conto*, in addition to the full set of baseline controls, for men and women. While potentially endogenous to the type of late-career employment trajectory, preretirement average gross income serves as a proxy for life-time income and socioeconomic status, which

may plausibly correlate with both retirement trajectories and health. Results remain qualitatively and quantitatively unchanged. It is worth stressing that, in the case of men, there is an inverse relationship between high income levels and mortality; this is not the case for women, however. In fact, women with higher income are exposed to higher mortality risk than those at the bottom of the income distribution, consistent with evidence of an inverse socioeconomic gradient reported in previous studies focusing on Italian women (Costa et al. 2017). Columns 2–6 of Tables E6 and E7 report results from specifications in which, in addition to full baseline controls, I control for the total number of transitions across employment states in the decade prior to retirement, the number of transitions to unemployment with and without unemployment allowances, and the number of yearly spells of unemployment with and without unemployment allowances. The purpose is to assess whether retirement trajectories matter on top of the simple characterization of single (un)employment events. Overall, results are robust to this check, except for the retirement trajectory characterized by transition from full-time employment to unemployment covered by unemployment allowances: when controlling for the number of spells of unemployment covered by unemployment allowances, its association with postretirement mortality risk loses statistical significance.

Table E8 displays the results of a model in which I interact ideal-type, late-career trajectories with a dummy variable for the reception of pension allowances related to physical or mental health impairment. The purpose of this model is to test whether individuals who deviate from full-time employment trajectories are exposed to a higher postretirement mortality rate, even if they do not receive any allowance related to physical or mental health impairment (i.e., they are presumably in good health upon retirement). Results suggest that, indeed, for both men and women, healthy individuals who go through trajectories marked by deviations from full-time employment face higher postretirement mortality than healthy individuals in the full-time employment cluster. In addition, results suggest that health issues—proxied by the reception of health-related pension allowances—magnify men's postretirement mortality risk of going through trajectories deviating from full-time employment, but not women's.

Finally, I carry out sequence and cluster analysis using semesters, rather than years, as the time unit for identifying employment trajectories. This is meant to alleviate concerns that yearly spells may mask important heterogeneities in late-career employment patterns. I compare the semester-based approach with the baseline one by looking at the adequacy of different cluster solutions, clusters' composition, and cluster assignment, as well as the results from survival analysis in which semester-based clusters are the predictors of interest. Overall, as further documented in online appendix F, the two approaches yield similar results.

Discussion

The relationship between employment and retirement in advanced economies has deeply changed in recent decades. The traditional life course paradigm of a smooth transition from paid work to pension income has given way to late-career trajectories that have become differentiated and unstandardized. Scholars have started to investigate the socioeconomic consequences of these changing patterns, whereby senior

workers experience different employment conditions, along heterogeneous paths. Still, while there is already evidence that heterogeneity of retirement patterns may have important implications for income inequality of older people, little attention has been paid to the implications that these very same patterns may have for health inequality and, in particular, mortality and survival chances in old age. The present work, which examines the relationship between late-career employment trajectories and postretirement mortality for a large sample of Italian retirees formerly employed in the private sector, is a first attempt to address this gap.

The main findings suggest that late-career trajectories marked by periods of unemployment—especially if prolonged and not covered by social allowances—are related to lower postretirement survival chances. Heterogeneity analysis further suggests that the scarring effect of prolonged unemployment for senior workers in Italy is particularly accentuated for individuals belonging to disadvantaged occupational categories, at least in the case of women. For disadvantaged women, prolonged unemployment in later life could be particularly harmful, as it may add to the consequences of weak labor market attachment over the life course, jeopardizing their ability to secure adequate retirement income in old age, which ultimately impinges on health and survival chances (Leombruni et al. 2010). Heterogeneity analysis also suggests that the scarring effect of prolonged unemployment in later life is particularly harmful in areas where deviations from full-time employment trajectories are less frequent. This result complements studies that showed that unemployment has greater detrimental effect on well-being when the rate of unemployment is low (Clark 2003). Previous research suggests that, in general, there may be multiple mechanisms through which employment instability leads to higher postretirement mortality risk (Benach et al. 2014), including exposure to unhealthy working conditions over the life course (Quinlan et al. 2001), psychosocial stress (Muntaner et al. 2010), and material deprivation (Siegrist and Theorell 2006). The INPS data, however, do not provide enough information to allow direct testing of the roles of such alternative channels.

While my work refers to a specific empirical context, these results could be of interest to countries facing the challenge of stretching the length of working life to alleviate the pressures of increased longevity on their social security systems. First, the results highlight the importance of policies aimed at improving the employment opportunities of displaced senior workers and at ensuring adequate welfare assistance in cases of prolonged unemployment. They also point to the need for policy solutions that provide alternatives to stepping out of the labor market before meeting pension requirements for senior workers who may struggle with full-time employment commitments. More specifically, these findings call for life course–oriented labor market policies whereby workloads can be calibrated to life phase–specific skills, abilities, and needs. Facilitating shorter working hours, for instance, may not only encourage people to keep working, but may actually enable them to do so (Eurofound 2016). While part-time work has been historically less common in Italy than in other European countries, the incidence of late-career trajectories marked by part-time employment among Italian senior workers has increased over time, especially among women. Reassuringly, I find that, after adjusting for potential confounders, late-career trajectories characterized by part-time employment are not significantly associated with higher postretirement mortality risk relative to full-time employment trajectories. This aspect is particularly relevant for senior female workers, who may

opt for part-time work to deal with caring commitments in a context where caring responsibilities—particularly toward the elderly—continue to reflect a gendered division of labor (Saraceno 2018).

Some caveats and limitations apply. First, lack of information concerning relevant socioeconomic characteristics, such as education and marital/family status, limits the ability to control for potential confounders. In addition, although I try to attenuate reverse causality concerns by dropping individuals who experienced prolonged sickness- or injury-related leaves in any of the 10 years prior to retirement and by controlling for the reception of pension benefits related to mental and physical impairment, health selection dynamics might still be at work. Notably, the empirical strategy I adopt does not allow me to rule out endogeneity concerns completely. For this reason, the results cannot and should not be read in terms of causality. Second, lack of detailed information about individual lifestyle habits, postretirement health, and financial condition reduces the scope for uncovering mechanisms whereby specific employment trajectories channel into lower survival. Third, the analysis is based on a sample that is representative of individuals formerly and formally employed in the private sector in Italy, which limits the generalizability to the Italian population as a whole.

Despite its limitations, this study has a number of strengths. First, it uses ideal-type, late-career trajectories identified through sequence and cluster analysis to explain differences in postretirement mortality risk, rather than individual features determining such trajectories (such as the number and duration of unemployment spells). In doing so, it tackles a limitation of most existing studies that investigate the relationship between health and labor market events, characterizing the latter in static terms. Second, it makes use of longitudinal register data to track employment patterns. In contrast to survey data based on retrospective information, register data are not affected by recall bias. Hence, they ensure greater reliability and precision in the reconstruction of employment trajectories. Moreover, the data used here allow me to exploit information, such as the reception of unemployment benefits and allowances alike, that adds to the completeness of employment biographies, but that is rarely accounted for in studies of this type. Third, while most studies employed subjective measures of health and well-being, I adopt an objective measure of health—mortality—that is not exposed to self-reporting issues. Future research may seek to provide further insights by means of more fine-grained analyses. For instance, one may also account for transitions into lower paid or lower status jobs. Information about previous firm type (e.g., small to medium vs. large) or industry of employment could also be used to build more accurate measures of occupational history and allow for fuller investigation of drivers and consequences of late-career employment trajectories. ■

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