Life course criminal trajectories of mafia members

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Abstract

Through a novel dataset comprising the criminal records of 11,138 convicted mafia offenders, we compute criminal career parameters and trajectories through Group Based Trajectory Modelling. Mafia offenders report prolific and persistent careers (16.1 crimes over 16.5 years on average), with five distinct trajectories (low frequency, high frequency, early starter, moderate persistence, high persistence). While showing some similarities with general offenders, the trajectories of mafia offenders also exhibit significant differences, with several groups offending well into their middle and late adulthood, notwithstanding intense criminal justice sanctions. These patterns suggest that several mafia offenders are life-course persisters and career criminals and that the involvement in the mafias is a negative turning point extending the criminal careers beyond those observed in general offenders.

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Introduction

Despite the growing relevance that life-course and developmental criminology has acquired since the publication of the seminal report by the National Academy of Sciences in 1986 (Blumstein, Cohen, Roth, & Visher, 1986), most empirical research has focused on general samples during the childhood and early adulthood, with few notable exceptions (Laub & Sampson, 2003; Blokland & Nieuwbeerta, 2005). For years, research focused on crime in general, overlooking the criminal careers of individuals involved in complex crimes. In the last decade, however, several contributions have applied the framework of life-course criminology and criminal career to white collar and organized crime. This research suggested that such offenders may follow patterns partially different than the general population, e.g. that late-onset offenders made up to 60% of the sample (Van Koppen, De Poot, Kleemans, & Nieuwbeerta, 2010), or that the offending frequency remained stable into the 30s (Morgan, Brown, & Fuller, 2018). These results question whether the general findings of the life-course framework apply to organized crime offenders, often characterized by having persistent, prolific and violent criminal careers.

This study analyzes the career of the members of the Italian mafias through a novel dataset (the Proton Mafia Members dataset, hereinafter PMM) relying on the largest sample of convicted organized criminals ever analyzed in the literature. The PMM dataset includes socio-demographic information and the entire official criminal records of 11,138 individuals convicted for a mafia offense in Italy. We computed the individual-level parameters of the criminal career (duration, frequency, specialization, seriousness, and escalation) and applied Group-Based Trajectory Modelling (hereinafter GBTM) to identify distinct offending trajectories. The sample comprised a population of active (on average 16.1 crimes over 16.5 years of career), frequent (on average 1.25 crime per year), and violent (3.45 average violent crimes per individual) offenders. GBTM yielded five distinct trajectories: a low frequency, a high frequency, an early starter, a moderate persistence, and a high persistence group. The trajectories show some similarities with those obtained within more general offending samples (offending peaks during youth or early adulthood and the largest group comprises low-frequency offenders). Yet, organized crime offenders reported significant differences from general offending samples: several individuals showed persistent and prolific criminal careers extending well into adulthood, and in some cases beyond age 50, notwithstanding the increased likelihood of long imprisonment terms due to the intense law enforcement response put in place by the Italian State. These patterns suggest

that involvement into the mafias may be considered a negative turning point in the life of individuals with significant impact on their offending career (Laub & Sampson, 1993). Furthermore, Italian organized crime offenders have been intensely criminalized and are more likely to receive long prison sentences. While we were unable to reconstruct their imprisonment history, it is likely that the strong institutional reactions against the mafias have substantially impacted the offending patterns, forcing some sort of desistance in trajectories which may have otherwise extended for an even longer period.

The rest of this study is organized as follows: the next section summarizes previous research on criminal careers and trajectories on organized crime. The third section outlines the data and the analytical strategy, while the fourth section presents and discusses the results. The last section concludes by considering the limitations of the study and outlining the possible directions for future research.

Criminal careers and trajectories of organized crime offenders

Criminologists have long focused on differences among offenders to explain the nature of criminal involvement (Farrington, 2003). Blumstein et al. (1986) first developed the criminal career paradigm, defining a criminal career as "the characterization of a longitudinal sequence of offenses committed by an individual offender" (1986, p. 12). The framework identifies six parameters for investigating the criminal career of an individual. The primary components are participation (or prevalence), frequency, and duration; the ancillary ones are specialization, escalation, and intermittency. The interplay among the parameters and individual traits, contextual factors, and life events, leads to different outcomes in terms of offending patterns over time. In the last decades, the criminal career paradigm has become a major line of inquiry in criminology, influencing the expansion of the developmental and life-course framework (A. R. Piquero, 2008; N. L. Piquero & Weisburd, 2009; DeLisi & Piquero, 2011; Sullivan & Piquero, 2016).

The expansion of the developmental and life course framework has also benefited from the advancement of statistical methods and particularly from the development of group-based trajectory modeling (GBTM) (Nagin, 2016; A. R. Piquero, 2008). The method is a group-based approach for "identifying distinctive clusters of individual trajectories within the population and for profiling the characteristics of individuals within the clusters" (Nagin, 1999, p. 139). Empirical studies of criminal trajectories have generally found between three and five groups, with four recurrent patterns: "a low-rate group, a high rate group, a moderate

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but declining group, and a late onset group" (A. R. Piquero, 2008, pp. 49–50; Jennings & Reingle, 2012). The research has offered some support to the popular adolescence-limited and life-course persisters taxonomy by Moffit (1993), but has also suggested the existence of additional patterns, such as low-level chronic offenders, adult-onset offenders and abstainers (Jolliffe, Farrington, Piquero, MacLeod, & van de Weijer, 2017; Moffitt, 2006). However, the use of GBTM does not solve the theoretical debate on whether offending patterns derive from distinct categories or continuously distributed characteristics (among many, see Sampson & Laub, 2005b; Skardhamar, 2009).

Notwithstanding its increasing relevance, the research on criminal careers has traditionally focused on juveniles and high-volume crimes (see DeLisi & Piquero, 2011). More recently, however, some studies have examined the criminal development of white-collar crime (Weisburd & Waring, 2001; N. L. Piquero & Benson, 2004; N. L. Piquero & Weisburd, 2009; Morris & Sayed, 2013; Van Onna, Van der Geest, Huisman, & Denkers, 2014; N. L. Piquero, Piquero, & Weisburd, 2016) and organized crime (Kleemans & De Poot, 2008; Van Koppen, De Poot, Kleemans, et al., 2010; Van Koppen, De Poot, & Blokland, 2010; Francis, Humphreys, Kirby, & Soothill, 2013; Kleemans & Van Koppen, 2014; Kleemans, Van Koppen, Van der Geest, Kruisbergen, & Madarie, 2017; Morgan et al., 2018). These works have argued that the career of complex criminals often follows patterns different from the general offending population, particularly for adult-onset offenders. For example, Van Onna et al. (2014) analyzed the trajectories of 644 white-collar offenders prosecuted in the Netherlands. The results yielded four different groups and showed that a significant share of the sample was made of adult-onset offenders. Also Morris and Sayed found mid-adulthood onset among white-collar offenders, although they argue that this type of offenders are more intermittent (i.e. opportunity takers) than persistent offenders (2013). Overall, findings on late-onset have consistently differentiated white collar from volume crime offenders (see Weisburd, Chayet, & Waring, 1990), suggesting that complex crimes may follow specific career patterns.

The suggestion is confirmed by the few studies analyzing the criminal careers of organized crime offenders. Van Koppen and colleagues identified four offending trajectories in a purposive sample of 854 Dutch organized criminals, with the largest one (accounting for 40% of the sample) made of adult-onset offenders peaking well into their 40s (2010). The second largest trajectory (30%) included persisters, reaching the peak of their criminal activities around their mid-30s. An updated analysis on a larger sample (1,841 offenders)

uncovered six trajectories quite different from the previous analysis. While more than half of the sample was made of very low frequency offenders, the study also identified early bloomers, late bloomers, and chronic offenders (Kleemans et al., 2017). Francis and colleagues studied the career of 3,360 UK-born organized crime offenders, identifying five trajectories. While the largest one (41% the sample) comprised early starters peaking in their early 20s, they also found two groups (26% of the sample) of adult-onset offenders, characterized by low offending during adolescence, growing offending through the early adulthood and peaking in the mid-30s (2013). The authors concluded that only 18% of the sample followed the conventional pattern of offending (high rates during teenage years with a decline at the end of teenage or early adulthood). Recently, Morgan and colleagues analyzed a sample of 3,262 Australian organized crime offenders from age 20 to 42 (Morgan et al., 2018). They identified three trajectories: a late-onset, low offending trajectory (48% of the sample), a moderate offending trajectory (42%) and a smaller trajectory (10%) with very high rates (5.4 yearly offenses on average between age 20 and 42). Remarkably, the three trajectories reported stable offending patterns across time, contrasting with the consolidated evidence of the age-crime curve. Overall, the empirical evidence suggests that organized crime offenders may follow different patterns than general offenders and may thus require different theoretical explanations.

Notwithstanding the limited overlap between the life-course and organized crime literature, several theoretical approaches may explain the life-course mechanisms associated with the involvement into organized crime. First, early involvement into organized crime may be based on social proximity, for example through family connections, mediated by patterns of social learning and family transmission (Farrington, Gundry, & West, 1975; Bandura, 1976; Akers, 1977). For example, some mafias, such as the Italian 'Ndrangheta , heavily rely on kinship by recruiting several members of the same blood family (Paoli, 1994, 2003). The influence of family is not confined to more traditional societies and to the mafias. Also the sons of Dutch organized crime offenders are more likely to be involved in crime (Van Dijk, Kleemans, & Eichelsheim, 2018). Furthermore, new recruits can be drawn from the social relations of the affiliates, through friends of friends and acquaintances within the community, with mechanisms similar to the delinquent subcultures discussed by Cloward and Ohlin, where youths achieve status through illegitimate opportunities due to integration of conventional and deviant levels and interaction across different age levels (Cloward & Ohlin, 1960). For example, recruitment in Shanghai Green Gang often relied on individuals

from the same birthplace (Wang, 2017). These explanations would suggest criminal trajectories of organized crime offenders starting early in life. Second, involvement into the mafias requires criminal skills, namely the ability to use violence. This may favor processes of self-selection. As an example, the Sicilian and American Cosa Nostra recruited youths with criminal expertise after a period of observation (Gambetta, 1993; Arlacchi, 1992; Ianni & Reuss-Ianni, 1972). Similarly, a large portion of the Yakuza's recruits come from juvenile biker gangs called *bosozoku* (Hill, 2003; Kaplan & Dubro, 1986/2003). Along this reasoning, criminal trajectories of organized criminals would exhibit a high number of violent crimes before entering the mafias. Third, admission in the mafias may sometimes occur at a relatively older age when the new member provides specific expertise or resources. This is in line with the explanations pointing up the importance of social embeddedness and social opportunity structure for the involvement into organized crime (Kleemans & De Poot, 2008; see also Van de Bunt, Siegel, & Zaitch, 2014; Kleemans & Van de Bunt, 1999). According to these theories, the social, logistic and organizational requirements of most organized crime activities are higher than volume crimes. Consequently, some organized criminals may become involved only once they have developed skills and competences giving them access to opportunities of involvement. For example, Hill reports of the Yakuza's recruitment of older individuals bringing particular skills to the organizations, including former police officers, computer experts, and accountants (Hill, 2003, p. 84). Accordingly, criminals following similar paths of involvement may report trajectories with a late onset. Overall, the literature offered different concurrent explanations of the involvement into organized crime. Individuals involved through blood ties, social proximity and/or early propensity towards violence may exhibit criminal trajectories with an onset more in line with the classic age-crime curve (early peaks due to social proximity and/or propensity towards violence), whereas individuals exploiting social opportunities occurring due to professional skills may report a pattern of later involvement of organized crime.

In addition to the processes leading to the involvement, theories have also argued that the entry and permanence into organized crime have impact on the criminal careers of individuals. Members of organized criminal groups may be considered particular types of career criminals, chronic offenders or life-course persisters. According to Paoli, entry into the mafias is the result of a Weberian status contract, which determines a change in the social identity and status of the member (Paoli, 2003). Also, membership in the mafias is a life-long commitment, where spontaneous desistance is allegedly exceptional and eventually

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punished. Traditionally, exit from the mafias occurs only at death, although witness cooperation programs and long prison sentences may have introduced additional, forced, exits (La Spina, 2004). These considerations suggest that the trajectories of organized crime offenders may often be prolonged until well into adulthood, at least until death or until long-term imprisonment (in some occasions life-imprisonment) occur.

The arguments exposed above point out that the analysis of the criminal career of organized crime offenders has relevance not only for improving the knowledge on organized crime, which is often responsible for a disproportionate amount of serious offenses. In fact, better understanding of criminal career of organized crime offenders may also contribute to the theoretical development of the life-course framework by testing the generalizability of the age-crime curve and other patterns observed among general offenders (DeLisi & Piquero, 2011). This study aims to enhance the knowledge on the criminal career of organized crime offenders relying on the largest dataset of such type ever analyzed in the literature. It addresses three main research questions: What are the characteristics of criminal trajectories of mafia offenders? Do they differ from those of the general offending population? How do criminal careers parameters differ across trajectories?

Data and Methods

Data

The analysis relies on a unique dataset, the Proton Mafia Members (PMM) dataset, which merges information from two separate data sources provided by the Italian Ministry of Justice: the Criminal Records Registry (*CRR* dataset) and the Prison Administration Department dataset (henceforth *DAP* dataset). The *CRR* dataset contains detailed information on all the final criminal convictions of individuals who have received a final conviction for at least one mafia offense (the inclusion criterion for the sample).[i] Final convictions are criminal sentences that cannot be appealed, e.g. because they were issued by the Supreme Court, or they were issued by lower courts, but not appealed by the defendant. While the mafia offense occurred between 1982 and March 2017, the other criminal records comprise offenses committed between 1941 and 2017. At the time of crime commission, offenders were between 14 and 77 years of age, and the distribution of the year of birth shows that most individuals were born between 1955 and 1970 (Figure 1). As

14 is the minimum age for children to be held criminally liable for any offense, offenses committed before this age would not be recorded in any criminal registry.[ii] For all individuals in the *CRR* dataset, the *DAP* dataset reports socio-demographic variables, information related to the type of mafia organization (e.g., Cosa Nostra or Camorra), and the role that the offenders held within their mafia organization (e.g., affiliate, boss). The Italian Ministry of Justice performed the matching between the two datasets and anonymized the data through unique alphanumeric IDs.

The PMM dataset includes socio-demographic information on 11,138 mafia offenders, who have committed a total of 178,427 criminal offenses. More than a quarter of the crimes in the dataset have been committed between 1990 and 1994 (Figure 1). The sharp decline in the number of crimes committed in most recent years is influenced by the delay in recording more recent offenses in the *CRR* dataset, given the documented length of criminal proceedings in Italy. Based on the violated source and article of the offenses, we classified the crimes into 8 offense categories (Table 1).

Table 1. CRR Dataset Crime Categories - Absolute Frequencies and Percentages

Crime Category	N	%
Weapons	36,107	20.24
Property	28,634	16.05
Threat & extortion	22,478	12.60
Violent	22,254	12.47
Drugs & smuggling	14,465	8.11
Mafia	13,958	7.82
Misdemeanors	10,659	5.97
Other	29,872	16.74
Total	*178,427*	*100.00*

In terms of criminal characteristics, while the average age at first crime is relatively low (23.84), the first mafia crime occurs relatively later in life (average age 34.26), in line with previous studies finding that organized criminal activities usually take place in the later stages of life (Kleemans & De Poot, 2008; Van Koppen, De Poot, Kleemans, et al., 2010). Nonetheless, when focusing on the process of crime commission in general, the shape of the aggregate age-crime curve follows a well-known trend (Brame & Piquero, 2003) (Figure 1). The mean number of crimes committed increases steeply from age 14 to age 18, reaching its peak at age 25. It then decreases from around age 30, reaching very low levels around age 60, although without

completely converging towards a no-crimes scenario. This indicates that a relevant part of the sample is

active in adulthood and even that a small fraction still commits crimes in late adulthood.

Figure 1. Distribution of mafia members per year of birth (n=11,138); Number of crimes committed by mafia members by year (n=178,427); Distribution of age at first mafia offense in the sample (n=11,138); Mean number of offenses by age (n=11,138)
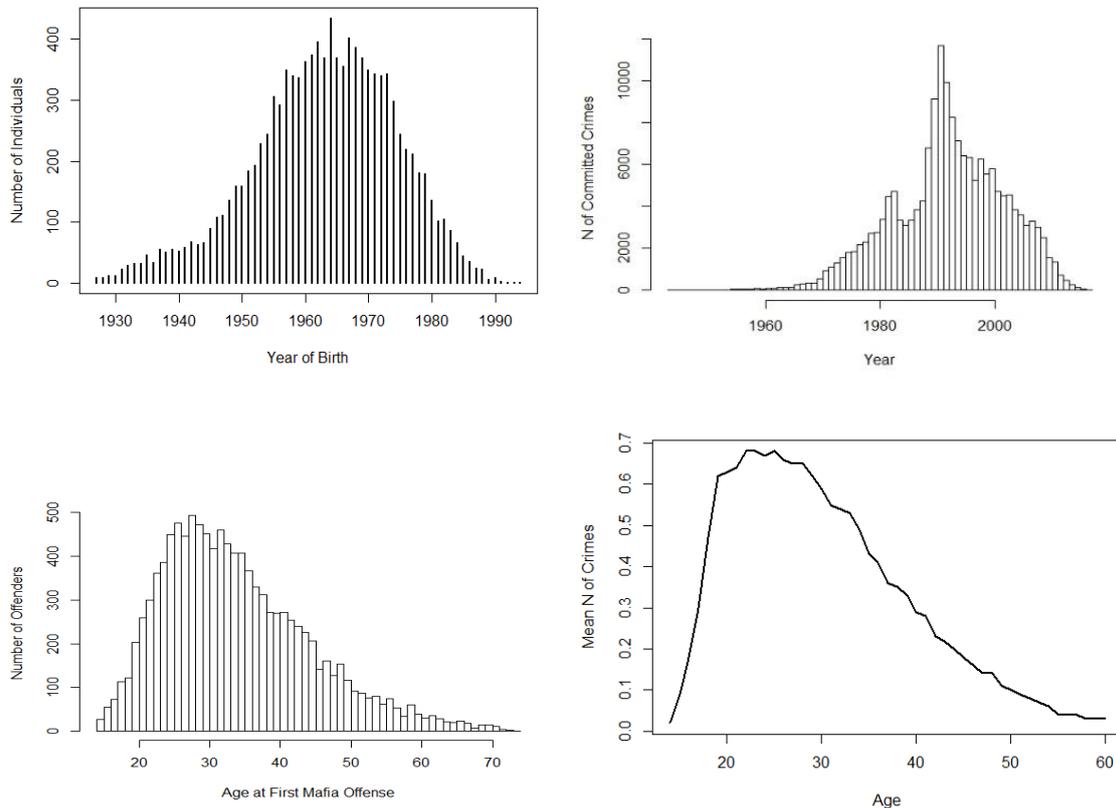
Nearly all mafia members in the sample are males born and residing in Italy, with a low level of education

(Table 2). More than a third (34.18%) was born in the 1960s, and the great majority (82.12%) was born

between 1950 and 1980. Of the four types of mafia, the Sicilian mafia is the most represented, accounting for

more than one third of the individuals.

To analyze the criminal careers of mafia offenders in the PMM dataset, we first computed the criminal

careers parameters for the entire sample. We then performed Group Based Trajectory Modelling to detect the

presence of different developmental strata. Finally, we calculated the average values of the criminal

parameters for the different trajectories to test and assess the existence of different patterns beyond the mere

counting of crimes committed, also verifying the statistical significance of the results.

Table 2. Descriptive Statistics of the Population in the Dataset (N=11,138)

Variable	Statistics	Missing
Sex	98.2% are males	0%
Country of birth	98.4% were born in Italy	0%
Country of residence	99.3% reside in Italy	0.5%
Decade of birth	82% were born between 1950 and 1980	0%
Religion	99% are Catholic	12%
Education	82.4% have between 5 and 8 years of education, 10.12% have more than 13 years of education	17.9%
Mafia association	37.5% belong to the Sicilian Mafia, 30.7% to the Camorra, 16.2% to the Calabrian Mafia and 15.4% to the Apulian Mafia	5.5%
Role	65.2% are associates, 27% underbosses, 6.8% bosses	56%
Mean age at first crime	23.84	0%
Mean age at first mafia crime	34.26	0%
Mean age at first arrest	37.85	0%
Mean number of committed crimes	16.01	0%
Mean number of crime categories	7.16	0%
Mean number of violent crimes*	3.42	0%

Note: * violent crimes include murder, extortion, assault and violent offenses, and robbery.

The Parameters of the Criminal Career

The PMM dataset allows to analyze the criminal career of mafia offenders in line with the paradigm developed by Blumstein et al. (1986). A criminal career is defined as "the longitudinal sequence of offenses committed by an offender who has a detectable rate of offending during some period" (Blumstein, Cohen, & Farrington, 1988, p. 2). Ideally, the study of criminal careers requires longitudinal data on delinquency/offending throughout the life course (Farrington, 1992). Such data are normally collected though longitudinal studies on cohorts of youth, but in some cases also official crime data have been employed despite some limitations (see A. R. Piquero, Farrington, & Blumstein, 2003). Given the peculiarity of our sample, official crime records can provide useful insights into the criminal careers of organized crime offenders. Nevertheless, these sources imply a number of limitations, as official convictions might underestimate the criminal careers of mafia members for several reasons: the dark number (difference between the number of actual crimes and the recorded crimes) may be particularly relevant for organized crime cases (Van Koppen, De Poot, & Blokland, 2010; Francis et al., 2013; Morgan et al., 2018); the PMM dataset only focuses on final convictions, thus excluding pending cases or convictions successfully appealed; some convictions, e.g. for minor offenses and crimes committed by juveniles may not be recorded in the registry as a special benefit to the offender; the Criminal Records Registry only includes offenses relevant to

the Italian law, thus potentially missing crimes committed abroad, although most offenders were born and resident in Italy; the crime year (and therefore the age of the individual) was initially unavailable for nearly 11% of the offenses.[iii] All these considerations suggest that particular care is needed to analyze the criminal career of mafia offenders through official crime data.

For each offender, we computed four classic individual-level parameters of the criminal career (see Blumstein et al., 1986; A. R. Piquero et al., 2003), and namely: duration, frequency, specialization, and escalation (additional descriptive statistics and details on the parameters are in Savona et al., 2017).[iv] The duration of a criminal career is the "length of time that an offender continues to commit crimes once beginning an active criminal career" (Rhodes, 1989, p. 3). We computed the duration as the time span (in years) between the first and the last recorded offense of each individual. The offending frequency records "the average number of crimes committed per year by active offenders" (Farrington, MacLeod, & Piquero, 2016, p. 339) and has been computed by dividing the total number of crimes by the duration.[v] The specialization is the tendency to commit crimes of the same type, with different approaches proposed in the literature (see Sullivan, McGloin, Ray, & Caudy, 2009 for a comprehensive review). Following prior studies, we operationalized specialization through the diversity index (e.g., A. R. Piquero, Oster, Mazerolle, Brame, & Dean, 1999; Sullivan, Mcgloin, Pratt, & Piquero, 2006; Wright, Pratt, & DeLisi, 2008). The index yields a quantitative measure of specialization at the individual level, which represents the probability that any two offenses drawn randomly from an individual's set of offenses belong to two different crime categories (A. R. Piquero et al., 1999).[vi]

The escalation parameter indicates the tendency of an offender to move to more serious offenses throughout the criminal career (Blumstein et al., 1986). To compute the escalation, we first assigned a seriousness score to each crime in the dataset by considering the average statutory penalty expressed in months of imprisonment (therefore minor offenses punished with a fine had seriousness=0, felonies punished with up to life imprisonment had seriousness of about 330-360, depending on the minimum penalty). Other strategies to estimate the crime seriousness were not feasible due to unavailable data on the actual imposed sentences. Maximum penalty as in Van Koppen and colleagues (2010) was unsuitable for the Italian criminal legislation, which often prescribes a minimum and a maximum penalty.[vii] Following Liu et al. (2011), we then computed the escalation as the coefficient of a linear regression of the crime seriousness on a temporal

measure. We adopted two different temporal measures: the escalation by age regresses the seriousness on the offender's age, thus measuring the maturation process of an offender. The escalation by crime regresses the crime seriousness on the progressive offense number in an individual's criminal career, focusing on the experiential process of offenders committing an increasing number of crimes.[viii]

Group-Based Trajectory Modelling

Group-Based Trajectory Modelling (GBTM) is a specialized form of finite mixture modeling that allows to detect similar developmental trajectories within a population or sample, measuring a given outcome over certain time periods. Remarkably, GBTM is an approximation allowing to detect different strata in a given population within very heterogeneous statistical distributions, and to assign individuals to a theoretical trajectory group identified by the model. GBTM was specifically designed by criminologists for the analysis of longitudinal data, and has been extensively applied to many different fields (for a review see Nagin & Odgers, 2010; Nagin, 2016). Whereas the PMM dataset is not properly longitudinal (it includes individuals that were born and lived during different time periods), we applied GBTM to our sample by using the individuals' age as our time unit and pooling all mafia members as an artificial cohort.

There are three different possible GBTM specifications: censored normal, zero-inflated Poisson (ZIP), and the binary logistic distribution. The censored normal model fits continuous data, the ZIP is appropriate for count data with zeros in excess with respect to the expectation under the Poisson assumption and the binary logistic has been developed for dichotomous variables (Jones & Nagin, 2013). Considered our modelled outcome and its statistical distribution (i.e.: number of crimes), we employed the ZIP model.

The particular nature of our data entailed two issues for the effective application of GBTM. First, while most individuals did not commit a crime in any specific year, an extremely small fraction of them were convicted for a high number of offenses. As a result, the majority of the cells in the offenders-by-years matrix have zero offenses, although in a limited number of cases over 100 offenses were recorded. The high inflation of zeroes and the extremely large range of number of crimes committed per age posed problems of variance and false convergence within the matrix. To address this issue, we capped the maximum number of offenses at 15. This choice brought under control the matrix asymmetry, while concerning only a minority of individuals and crimes.[ix] Secondly, our data cover a long time period, with all crimes ever committed by individuals

from several generations (crime years ranging between the 1940s and 2017). Nevertheless, we had no reliable information on deaths, except for the rare occasions when they occurred in prison. Consequently, the age range within the dataset would inevitably generate unequal data distribution between living and deceased individuals. To address this problem we censored age beyond 60, which is still a remarkably old age for trajectory studies (A. R. Piquero, 2008).[x] These two operations allowed to perform solid GBTM models avoiding the risk of false convergence and matrix asymmetry due to variance and extremely skewed distributions.

Results and discussion

Overall, mafia members are prolific (on average 1.25 crimes per year over an average career of 16.45 years) and versatile (average diversity index 0.75) offenders and their careers are marked by clear escalating patterns in terms of crime seriousness (Table 3). This means that, in time, the severity of the crimes tends to increase.

Table 3. Descriptive Statistics of the population in the PMM dataset (N=11,138)

Parameter	Average	St. Dev.	Interquartile range	Missing
Duration (years)	16.45	10.95	16	0%
Frequency (crimes per year)	1.25	1.45	0.97	6.5%
Specialization (diversity index)	0.75	0.13	0.15	4.6%
Escalation by age	6.27	33.56	12.23	7.4%
Escalation by crime number	19.81	71.78	39.56	7.4%

To set up the correct GBTM model, we have first iterated the model starting from a minimum of one to a maximum of eight trajectories to select the optimal number of groups that maximized the Bayesian Information Criterion (BIC), the standard measure to identify the best model (Nagin, 2005). The best fitting model yielded 5 groups, all specified by cubic polynomial order (postestimation diagnostics in the Appendix). The resulting five trajectories are (Figure 2) Low Frequency Offenders (LFO), High Persistence Offenders (HFO), Early Starters (ES), High Frequency Offenders (HFO), and Moderate Persistence Offenders (MPO). Each trajectory group holds specific features and highlights patterned distributions with regard to the criminal career parameters (Table 4, see also Annex Table 5 for the distribution of some socio-demographic characteristics across the identified groups). Overall, the means of nearly all parameters were statistically different for most pairs of trajectories, except for both escalation types (where only the LFO

reported different values, see the Appendix for further details on test statistics) and specialization (where

HPO, HFO and ES showed non-significant pairwise differences).

Figure 2. Trajectories of mafia members
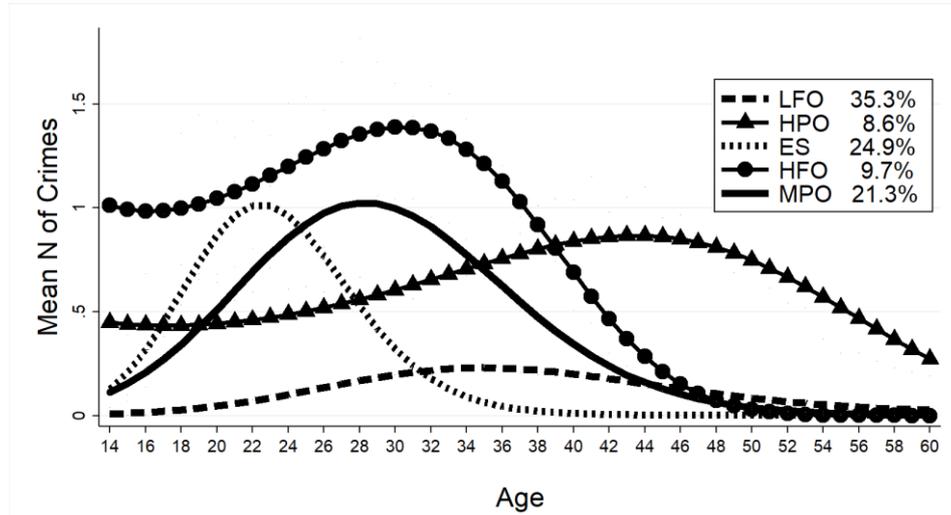
Table 4. Criminal Career Parameters Distribution per Trajectory (averages per trajectory and overall sample)

Trajectory	1. Low Frequency Offenders	2. High Persistence Offenders	3. Early Starters	4. High Frequency Offenders	5. Moderate Persistence Offenders	*Overall*
N	3,917	955	2,760	1,077	2,366	*11,075**
(%)	(35.37)	(8.62)	(24.92)	(9.72)	(21.36)	*(100)*
Year of Birth	1959	1952	1972	1964	1963	*1963*
N of Crimes	5.52	32.26	12.87	39.74	20.11	*16.10*
Age at First Crime	30.27	21.74	19.33	19.96	19.97	*23.61*
Age of mafia offense	39.35	42.16	25.68	31.03	33.31	*34.27*
Violent Crimes	0.90	6.52	2.67	11.13	3.83	*3.45*
Violent Crimes before mafia	0.46	2.83	1.60	5.59	2.18	*1.80*
Parameters						
Duration	13.32	31.05	10.65	19.15	21.69	*16.45*
Frequency	0.67	1.11	1.60	2.73	1.03	*1.25*
Specialization	0.54	0.72	0.70	0.72	0.74	*0.65*
Seriousness**	50.76	54.44	65.53	73.25	57.93	*58.47*
Seriousness at First Crime	115.11	45.92	95.70	87.71	53.68	*88.52*
Escalation (by Age)	8.29	3.30	7.56	5.17	3.80	*6.27*
Escalation (by Crime Order)	33.95	10.98	16.03	13.09	11.79	*19.81*

* 63 out of 11,138 individuals in the PMM only committed crimes after age 60, and were therefore not included in the trajectory analysis due to temporal censoring.
** The average seriousness does not include the seriousness of the mafia offense (which normally is approximately 240 months). As a result, the average values are lower for all groups, and especially for those with lower number of crimes, as LFO.

Low Frequency Offenders (35.37% of the sample) are the largest group, comprising more than one third of

the sample. This trajectory shows a very low curve, with a slight peak in the mid-30s (frequency about 0.25)

and gradually declining afterwards. On average, offenders assigned to this category were born earlier than the overall sample, committed the lowest number of offenses and violent crimes (5.5 and 0.9 respectively), with the latest age at first offense (30.27) and a later age of entry into the mafias (39.35). They report a below-average duration, the lowest frequency and seriousness. Individuals included in this trajectory follow a late-onset, low-frequency pattern. They join the mafias fully into their adulthood and the mafia offense may be their first conviction (hence the higher seriousness at first crime), when they are likely to have been sentenced to long prison terms. Late involvement into organized crime has often been attributed to the social embeddedness and to the social opportunity structure of organized crime (Kleemans & Van de Bunt, 1999; Kleemans & De Poot, 2008). Individuals may become involved into organized crime due to specific social relations, personal skills, or work-related opportunities (Van Koppen & de Poot, 2013). Socio demographic information presented in Annex Table 5 provide some support to this interpretation. Individuals in this group tend to have higher education compared to other groups and a lower share of them is classified as boss, underboss or lieutenant. Other studies on organized crime trajectories found large proportions of low frequency, adult-onset, offenders. These accounted for up to 40% in the Dutch sample by Van Koppen and colleagues (2010), 48% among Australian offenders (Morgan et al., 2018) and 53% in the more recent Dutch sample (Kleemans et al., 2017). While the mafias need accountants, lawyers, entrepreneurs, and politicians, they also need truck drivers, customs officials, public employees, and bank clerks. Although Moffitt's developmental typology failed to identify this category, late onset offenders have been also found in general criminal career research (Eggleston & Laub, 2002; DeLisi & Piquero, 2011). Some studies criticized the category, arguing that it is inevitably overestimated when relying solely on official records (Beckley et al., 2016; McGee & Farrington, 2010) or even that no such category exists (Sohoni, Paternoster, McGloin, & Bachman, 2014). Nevertheless, a recent systematic review relying on a secondary analysis of seven samples with both official criminal records and self-reported offending always identified this category (Jolliffe et al., 2017).

High Persistence Offenders (8.62%) show a sinusoidal trend over time, starting with non-zero frequencies in adolescence, and offending until well into adulthood (peaking around their mid-40s when mafia members in other trajectories are not active anymore). On average they were born earlier than the rest of the sample, committed a high number of offenses (32.26) and of violent crimes (6.52); more than twenty years pass

between their first crime (at 21,71 on average) and the mafia offense (42.16). The criminal career parameters reveal that individuals in this trajectory have the longest duration (31 years), average frequency and seriousness (1.1 and 54.44, respectively). These offenders are likely to belong to an older generation of mafia members (also considering their average year of birth, i.e.: 1952), and they report an extremely long and prolific criminal career overall. Interestingly, they exhibit a long and violent criminal activity also before their entry into the mafia. There are two possible, concurrent interpretations of this pattern. First, these offenders may have joined the mafias well into their adulthood but after having demonstrated criminal skills that favoured their involvement, as argued by several studies contending that a career in organized crime is available to individuals prone to violence (Gambetta, 1993; Arlacchi, 1992; Ianni & Reuss-Ianni, 1972). Second, since the offense of participation in a mafia association (Article 416-bis of the Italian Criminal Code) was introduced only in 1982, it is also possible that some individuals falling into this trajectory may have entered into the mafias in years when this was not specifically criminalized. Their criminal activity during early adulthood would thus reflect their anticipated involvement into organized crime, possibly prompted by their criminal skills or by kinship and social ties with senior members. This interpretation may find some support in the fact that nearly a quarter of the offenders in this group were classified has having a leader position within the criminal organizations (see Annex Table 5). Furthermore, they continue offending afterwards, despite the very high probability of long prison sentences. While available information prevents more detailed interpretations to these patterns, we note that similar trajectories were found in other studies on organized crime offenders, e.g. the Dutch low-frequency chronic offenders who peaked in their 40s (Kleemans et al., 2017). Due to the length of their offending career, these criminal careers may bear some similarity with career criminals, chronic offenders, or life-course persisters in general criminal career and life-course criminology (DeLisi & Piquero, 2011, p. 295; Jolliffe et al., 2017). However, they do not show the high-frequency patterns during the late adolescence and young adulthood normally associated with these categories.

Early Starters (24.92%) report a trajectory with low intercept but rapidly increasing until a peak around age 23 followed by a steady decline to low frequencies in their 30s. They are younger (average year of birth 1972) than offenders in other trajectories and commit a below-average number of offenses and violent crimes (12.87 and 2.67, respectively). The average onset is at 19.33 and entry into the mafias occurs earlier than

other offenders (at 25.68). This may explain the shortest duration of their criminal career (10.65) and the above-average seriousness (65.53). This trajectory captures mafia members of more recent generations, with a rapid criminal escalation that brought them to join the mafias. Entry in the mafias may have caused long prison sentences and this is reflected in the rapid decline of the trajectory after its peak. The younger age and the abrupt interruption of their mafia career may have prevented some of them to access to the higher ranks in the organizations, as only 11.3% were identified as having a leading position. These results suggests that ES may have joined the mafias in their youth as a result of kinship and social relations with previous members as suggested by several organized crime scholars (Ianni & Reuss-Ianni, 1972; Kleemans & Van de Bunt, 1999; Paoli, 2003). The trajectory shows similarities to others in the literature. For example, Dutch organized criminals comprised about 11% of early starters peaking in their mid-20s (Van Koppen, De Poot, Kleemans, et al., 2010) or 8% early bloomers peaking in the early 20s (Kleemans et al., 2017); similarly, about 60% of UK organized crime offenders were classified among low rate or high rate early starters (Francis et al., 2013). However, we hypothesize that the desistance in our trajectory may likely be caused by incapacitation as their increasingly serious offenses may have attracted the attention of the criminal justice system, putting them under the spotlight of law enforcement agencies and leading to long imprisonment terms. Contrarily to HPO, ES commit a lower number of violent crimes (before and after the mafia offense) consistently with the less frequent recourse to violence in the Italian mafias since the middle of the 1990s (Berlusconi, 2014). Nevertheless, their pre-mafia offenses are concentrated in a shorter time-span and, despite lower levels of violence, they exhibit high levels of seriousness.

High Frequency Offenders (9.72%) report high frequencies from the beginning of their career (intercept at age 14 around 1), peaking at 30 and converging toward 0 in their 40s. This trajectory comprises the most active mafia members, born averagely in 1964 and committing the highest number of offenses (nearly 40) and violent crimes (11.13). They report both an early onset (19.96) and an entry into the mafia before the sample average (at 31). They prolong their very active criminal career for 19 years on average, with the highest frequency (2.73) and seriousness (73.25). Under several perspectives, high frequency offenders conform to the prototypical mafia member, with an early, violent and prolonged criminal career as suggested by already mentioned studies arguing that criminal skills and violent attitudes are driving the involvement into organized crime. About 23% of the individuals have actually achieved a leadership position in the

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criminal groups (Annex Table 5). HFO's prolific career was possibly interrupted by detention, since they were probably heavily involved in the violent mafia wars observed in Italy in the 1980s and early 1990s when mafia-related homicide rates and other violent crimes dramatically peaked. The interpretation is supported also by their average year of birth (1964), which makes it realistic to place them in that historic frame. This may have triggered the institutional reaction of the criminal justice system who imprisoned these offenders thus leading to the rapid decrease observed in their trajectory. This could explain the differences between HFO and HPO: HPO are on average older than HFO, both in terms of cohort effect and in terms of entry into the mafias. Conversely, HFO report a significantly higher frequency and number of violent crimes (both overall and before the mafia offense) as they were likely on the front line in the most violent period in the recent history of the Italian mafias. Compared to other organized crime samples, HFO follow trajectories broadly comparable to the Dutch high-frequency chronic offenders (Kleemans et al., 2017) and Australian high offending trajectories (Morgan et al., 2018) although the decline in the trajectory is more abrupt due to the likely strong incapacitation effect of prison sentences following the strong targeting of the criminal justice system against mafia members during the 1980s and the 1990s. The high frequency and violence of their criminal careers makes HFO similar to chronic offenders, career criminals, and life-course persisters found in general samples.

Finally, *Moderate Persistence Offenders* (21.36%) report a trajectory starting with low frequency, peaking at 28, and declining afterwards (convergence towards zero at age 50). On average, MPO were born in the same year of the whole sample (1963), committed an above-average number of offenses (20.11) and violent crimes (3.83). Similarly to HFO, most of the offenders were born in around the early 1960s, the onset is at about age 20, the entry in the mafias is in their early 30s, and the duration is above average (21.69). However, contrarily to HFO, MPO report much lower frequency, seriousness and violent offending.

The small but growing literature on the trajectories of organized crime offenders showed heterogeneous patterns, suggesting that this minority of offenders may substantially depart from the forms observed in the general offending population. By relying on the largest sample of organized criminals ever analyzed, we found some similarities with results from general offender samples. Even for mafia offenders, we found criminal careers mostly peaking during youth or young adulthood; trajectories showing desistance, although at different ages (Sampson & Laub, 2003); the largest trajectory comprised low-frequency offenders (A. R.

Piquero, 2008). The results did not generate trajectories with peculiar patterns, such as the large share of late-onset offenders in Van Koppen et al. (2010) or the rather flat, medium- and high-frequency, trajectories in Morgan et al (2018). The trajectories also share some patterns with the categories often employed in developmental and life-course criminology studies (Jolliffe et al., 2017).

The similarity with general offending trajectories, however, should be interpreted with caution due to the limitations of our data. The relatively older age of onset and peak of most trajectories is likely due to the use of official data, which inevitably biases the crimes count of our sample (Blokland & Nieuwbeerta, 2010). The analysis underestimates the number of crimes, particularly for those individuals and trajectories reporting low frequencies during their teens. For example, ES and MPO reported an intercept close to 0, but their actual offending activity may have started at an earlier age, making them more similar to HPO and HFO. Furthermore, since the literature showed that a significant proportion of late-onset offenders has actually committed offenses during their youth (Beckley et al., 2016), we assume that a share of our LFO may have in fact offended at an earlier age. These limitations are nearly inevitable when analyzing organized criminals, a specific minority who actively attempts to hide its activities and is often involved in crimes with low reporting rates (e.g. extortions, possession of weapons and explosives).

Along with the similarities with general offending samples, our findings show interesting differences. Several mafia offenders exhibit long lasting-careers, high frequencies, and a high number of violent offenses. This is contrary to the evidence from general, adult samples where these patterns are limited to a small percentage of high-rate chronic or persisters offenders (Blokland & Nieuwbeerta, 2005; Sampson & Laub, 2003). The duration observed in mafia offenders is more in line with studies on sample of serious offenders (Ezell, 2007; A. R. Piquero, Brame, & Lynam, 2004). Our sample prolonged offending suggests that the path of involvement and permanence into the mafias entails a long-lasting impact on the criminal career, making it a negative turning-point in the life of individuals (Laub & Sampson, 1993; Sampson & Laub, 2003). The path of joining the mafias plays an important role into an offender's criminal activity, and Paoli contended that entry into the mafias entails a status contract affecting the social and psychological role of an individual (Paoli, 2003). The transition into the mafias indeed provides "an opportunity for identity transformation" and that allows "for the emergence of a new self or script", which determines a negative impact on offending careers (Sampson & Laub, 2005a, p. 34). Previous studies have applied the turning point framework to gang

membership (Thornberry, Krohn, Lizotte, Smith, & Tobin, 2003; Melde & Esbensen, 2011, 2014) showing that that several individual and environmental processes of gang membership increase individuals' offending. However, while gang membership is frequently short in duration, mafia membership is normally considered a permanent state and may thus have a more long-lasting impact on the offending career of an individual.

The extended trajectories and duration of the criminal careers of the mafia offenders are particularly remarkable considering that these offending patterns have not developed in a social vacuum. Contrarily, the Italian State has progressively increased its efforts to tackle the mafias, with better law enforcement strategies and harsher criminal justice measures (La Spina, 2004, 2014). As a reaction to mafia activities, Italy has increased the penalties for several offenses often committed by mafia members. For example, in 1982 the original penalties for the participation in mafia association (Article 416-bis of the Criminal Code) were from three to six years of imprisonment for simple participants and from four to nine years for directors and leaders, respectively (if the mafia association was armed, penalties were four to nine years and five to nine years for participants and leaders, respectively). Through the years the penalties have been repeatedly increased in 2005, 2008 and 2015 and today the standard penalties are from ten to fifteen years and from twelve to eighteen years for participation and leadership, respectively (12-20 years and 15-26 years, respectively, if the association is armed). Similarly, penalties for extortion have increased remarkably. The Italian Criminal Code initially imposed three to ten years, which could increase to four to fifteen years if the extortion was committed by more people. With several legislative interventions, the penalties have substantially increased and today extortion committed by a member of a mafia association is punishable with between seven and twenty years of imprisonment. Furthermore, convictions for mafia offenses entail closer monitoring in prison, exclusion from probation and parole programs, unless offenders cooperate with the prosecution service. Even after the sentence is served, the law allows additional preventive measures imposed on offenders and the authorities monitor released offenders very closely. The growingly harsh criminal policies deployed in the last decades have certainly impacted on the probability of detection, arrest, conviction and long sentences. In turn, the measures have likely affected the criminal careers of mafia offenders, e.g. reducing the duration (due to longer and stricter imprisonment) and increasing the frequency (due to better investigations and more successful prosecutions). The impact may be even stronger in the

forthcoming years, when the most recent reforms will influence the final convictions (a single conviction for mafia participation or extortion may entail a sentence of even more than twenty years of imprisonment).

The action of the criminal justice system has certainly impacted the criminal careers of our sample, although we could not access to detailed data on imposed penalties and actual imprisonment periods.[xi] The offenders of our sample were convicted of serious offenses (including murders, extortion, drug trafficking criminal association, and of course mafia association) which entailed very long imprisonment periods and in several cases life imprisonment. Incapacitation has likely impacted on the assessment of the trajectories and criminal careers, most likely by reducing the offending frequency and forcing some sort of desistance, especially in the trajectories of the offenders convicted in the last years (A. R. Piquero, 2008, p. 31).

These considerations suggest to assess our findings on persistence and desistance in mafia offending also under the light of the criminal justice reaction against this population. Regarding persistence, the remarkable intensity and duration of mafia offenders' criminal careers is even more exceptional once the incapacitating impact of the Italian criminal justice is considered. Despite being the target of intense institutional reactions, an important share of mafia offenders reports extended offending trajectories and very active criminal careers. These patterns suggest that several offenders actually conform to the patterns observed in chronic offenders, life-course persisters, and career criminals and that mafia membership may determine a particularly detrimental, long-lasting, negative turning point (DeLisi et al., 2011; Sampson & Laub, 2005a). Regarding desistance, also mafia offenders appear to be life-course desisters, showing offending trajectories declining only well into their adulthood (Sampson & Laub, 2003). However, we contend that the observed desistance is at least in part the result of incapacitation rather than actual cessation of offending behavior. Without imprisonment, several mafia members may have continued into their offending careers until an extraordinarily advanced age, with some possibly continuing until their very last years.

Conclusions

While the literature on organized crime trajectories hypothesized that organized offenders may follow life-course offending patterns remarkably distinct from general offenders, our assessment on the largest dataset ever analyzed provided mixed support to this argument. The trajectories of Italian mafia members show some similarities with the those identified among more general offending samples, particularly the largest

trajectory group comprises offenders reporting a small number of offenses and low frequencies and most offending trajectories peak during their youth. These similarities, however, come along with important peculiarities of our sample. The criminal careers of mafia offenders are very long and prolific, include several violent offenses, and extend well into adulthood. The pathways leading to involvement and permanence into the mafias have a significant impact on offending careers, a negative turning point likely affecting the duration, seriousness and frequency of criminality (Laub & Sampson, 1993; Melde & Esbensen, 2011).

Our study has several limitations, in part already discussed in the previous sections. First, the PMM dataset includes only official convictions. Thus, notwithstanding the intense law enforcement efforts against the mafias, our data likely focus on a fraction of the total illegal activities perpetrated by the individuals in the sample. Second, we did not have information on actual detention periods and on the death of the individuals. This affected our capacity to estimate the intermittency in the sample as well as to analyze into greater detail the causes of desistance. Nevertheless, the GBTM showed that some trajectories extended well into the 40s and 50s, when some individuals in the sample may have faced long imprisonment periods (including life imprisonment) or may have died due to several reasons. Third, due to data protection and feasibility reasons, our analysis covers only individuals with a final conviction for a mafia offense. Consequently, our sample contains less information on the last decade due to the length of criminal proceedings for mafia cases. Last, the high share of missing information for some socio-demographic characteristics warrants caution in the interpretation of the relation between the trajectories and roles in the organization and the levels of education.

The research can be extended towards several directions. While this study focused on the whole sample, future assessments may analyze birth cohorts or individuals having joined the mafias in a specific period to uncover possible variations and provide further insight on the impact of the law enforcement actions on the criminal careers of mafia offenders. Additionally, comparisons could be made among the main types of Italian mafias (Cosa Nostra, Camorra, 'Ndrangheta and Apulian criminal organizations), or with the careers of other organized criminals, e.g. in the Netherlands or Australia, to inquire about similarities and differences across disparate types of criminal groups. Furthermore, it may be important to assess the processes leading to the involvement into the mafias by analyzing the offending career before the commission of the mafia

offense. This would enable a better understanding of the impact of joining the mafia as a turning-point into the individuals' life. Lastly, the framework of life-course criminology could contribute in determining whether different socio-demographic and offending characteristics explain the criminal careers of mafia offenders and the time of entry into the mafias.

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Appendix

To identify the best model, we compared the Bayesian Information Criterion (BIC) values of each model,

selecting the one maximizing the BIC. The comparison from 1 to 6 groups led to the decision to select the 5-

groups model (Annex Table 1). Annex Table 2 also provides the parameters estimates of the selected model.

Annex Table 1. BIC Values of Models From 1 to 6 Groups

Number of Groups	BIC (N=520,525)	BIC (N=11,075)
1	-463,250.03	-463,240.40
2	-414,801.34	-414,780.17
3	-378,190.70	-378,157.97
4	-313,331.40	-313,287.12
5	**-310,236.06**	**-310,180.23**
6	-320,859.33	-320,791.95

Annex Table 2. Parameter Estimates for the Selected Model

Group	Parameter	Estimate	St. Error	T for H0: Parameter=0	Prob > |T|
1	Intercept	-8.85214	0.30691	-28.842	0.000
	Linear	0.77692	0.02921	26.594	0.000
	Quadratic	-0.01820	0.00089	-20.391	0.000
	Cubic	0.00011	0.00001	12.206	0.000
2	Intercept	-10.84794	0.38703	-28.029	0.000
	Linear	0.74796	0.03367	22.212	0.000
	Quadratic	-0.01557	0.00093	-16.678	0.000
	Cubic	0.00009	0.00001	11.532	0.000
3	Intercept	1.73399	0.32546	3.328	0.000
	Linear	-0.17057	0.02774	-6.148	0.000
	Quadratic	0.00692	0.00075	9.244	0.000
	Cubic	0.00008	0.00001	-11.747	0.000
4	Intercept	-17.25476	0.39228	-43-985	0.000
	Linear	1.90133	0.04215	45.111	0.000
	Quadratic	-0.06022	0.00143	-42.242	0.000
	Cubic	0.00053	0.00001	36.448	0.000
5	Intercept	3.73335	0.30654	12.215	0.000
	Linear	-0.36293	0.03308	-10.971	0.000
	Quadratic	0.01715	0.00115	14.924	0.000
	Cubic	-0.00025	0.00001	-19.088	0.000

To further ensure the validity of the selected model, we also computed three postestimation diagnostics: the

Average Posterior Probability ($AvePP_j$), the Odds of Correct Classification (OCC) and the difference

between the posterior probability of group membership P_j and the probability of group membership π_j. As

indicated by Nagin (2005), the $AvePP_j$ should be greater than 0.7, the OCC greater than 5 and the difference

between P_j and π_j should converge towards 0. The model is accurate when all the three conditions are met.

In our case, all three measures confirmed the reliability of the results (Annex Table 3).

Annex Table 3. Postestimation Diagnostics for Detected Trajectories

Group	Label	$AvePP_j$	$\pi_j.$	P_j	OCC	$(\pi_j - P_j)$
1	Low Frequency Offenders	0.88	0.33	0.35	33.16	0.02
2	High Persistence Offenders	0.91	0.09	0.08	123.45	-0.01
3	Early Starters	0.89	0.25	0.24	43.15	-0.01
4	High Frequency Offenders	0.89	0.1	0.09	89.89	-0.01
5	Moderate Persistence Offenders	0.86	0.21	0.21	37.02	0

After the computation of the average parameters per trajectory, we performed two test statistics (Annex

Table 4). Firstly, one-way ANOVA revealed that there are statistically significant differences across the

mean values of the parameters for all trajectories. Secondly, we run pairwise post-hoc tests using Bonferroni

normalization to check which groups actually differ from each other in relation to computed parameters.

Annex Table 4. ANOVA and Bonferroni Post-hoc Pairwise Comparison Results

Parameter	ANOVA (Prob > F)	Non-Significant Pairwise Comparison (p>0.1)
Violent Crimes	0.000	All significant
Age First Crime	0.000	HFO vs MPO
N of Crimes	0.000	All significant
Age of Mafia Offense	0.000	All Significant
Violent Crimes	0.000	All Significant
Violent Crimes Before Mafia	0.000	All Significant
Duration	0.000	All significant
Frequency	0.000	HPO vs MPO
Diversity Index	0.000	HPO vs ES; ES vs HFO; HPO vs HFO
Seriousness	0.000	HPO vs MPO; LFO vs HPO
Seriousness at First Crime	0.000	HPO vs MPO; ES vs HFO
Escalation (Age)	0.000	LFO vs ES; HPO vs HFO; HPO vs MPO; ES vs HFO; HFO vs MPO
Escalation (Order)	0.000	HPO vs ES; HPO vs HFO; HPO vs MPO; ES vs HFO; ES vs MPO; HFO vs MPO

Annex Table 5. Percentage Distribution of Socio-Demographic Variables per Trajectory

Variable		1. Low Frequency Offenders	2. High Persistence Offenders	3. Early Starters	4. High Frequency Offenders	5. Moderate Persistence Offenders	Overall
Decades of Birth	1920-1940	6.6	8.2	0.4	0.1	0.6	3.3
	1941-1960	40.8	74.3	4.6	31.4	32.1	31.9
	1961-1980	49.0	17.5	78.1	65.8	66.9	59.0
	1981-2000	3.7	0.0	17.0	2.7	0.3	5.9
	Missing	*0.0*	*0.0*	*0.0*	*0.0*	*0.0*	*0.0*
Mafia Association	Sicilian	43.4	32.3	27.8	33.1	32.5	35.2
	Campania	24.2	31.3	30.9	34.1	32.8	29.2
	Calabrian	21.4	14.8	13.0	9.6	11.0	15.4
	Apulian	6.2	14.4	22.3	17.7	18.4	14.7
	Lucana	0.2	0.2	0.4	0.1	0.3	0.3
	Missing	*4.6*	*7.1*	*5.7*	*5.5*	*5.3*	*5.3*
Role	Associate	27.2	23.4	33.1	27.1	29.3	28.8
	Boss/Underboss/Lieutenant	11.3	24.5	11.3	23.0	17.6	14.9
	Killer	0.1	0.1	0.6	1.2	0.5	0.4
	Missing	*61.5*	*52.0*	*55.0*	*48.5*	*52.7*	*55.9*
Education	Less than 5 years	4.39	6.07	2.07	3.71	4.44	3.9
	Between 5 and 8 years	62.68	72.04	69.64	68.06	71.56	67.6
	Between 9 and 13 years	13.94	5.34	7.32	6.50	6.55	9.2
	More than 13 years	2.27	1.36	0.43	1.30	0.40	1.3
	Missing	*16.72*	*15.18*	*20.54*	*20.43*	*16.99*	*18.0*

[i] Mafia offenses include mafia association (Article 416-bis of the Italian Criminal Code), electoral deal between politics and mafia (Article 416-ter of the CC), assistance to the associates (Article 418 of the CC), and any other offense aggravated by the use of the mafia method or the purpose to benefit a mafia association (now under art. 416-bis 1 of the CC, previously Art. 7 of Decree Law 152/1991 converted into Art. 7 of law 203/1991).
Most of the individuals included were convicted for mafia association. Italy introduced a specific crime of mafia association into the Italian Criminal Code (Art. 416-bis) in 1982. A mafia association is a criminal association whose members use the intimidatory power of the association and the consequent conditions of subjection and silence (the so-called *omertà*) to commit serious offenses and obtain other unjust advantages (see La Spina, 2014, p. 594). Participation in and direction of a mafia association are offenses separate from the specific crimes committed by the members of the association.

[ii] In addition, available data are likely to underrepresent the number of crimes committed when offenders were aged between 14 and 17, as less strict judgment procedures apply to such young offenders (in particular, offenders need to be judged to be capable of forming the necessary criminal intent in relation to the specific offense).

[iii] To overcome the problem of missing data and input the crime year for each offense, we have adopted a probabilistic method that relies on the availability of information on the year of punishment for all the crimes in the dataset. Indeed, to calculate the year of crime commission Y we have performed a weighted random sampling of the lag L, which is the difference between the year of the punishment I and the actual Y. The sampling was based on $P(L|I, C)$. This is the conditional probability of the lag given both I and C, where this last term represents the crime category to which the offense belongs. In this way, we imputed the crime year assuming that crimes belonging to the same category and punished at the same age have similar lag distributions.

[iv] Another individual-level parameter, the intermittency (the time gaps between crimes) was discarded due to limited information about the actual detention periods served by the individuals in the sample.

[v] As a consequence, the frequency could not be computed for offenders with duration =0 (e.g. offenders reporting only one offense during their career or more offenses in the same year).

[vi] A diversity index of zero indicates that the offender is completely specialized on one type of crime. Conversely, a value of the index approaching 1 relates to an offender engaging in a diversity of crime categories. The parameter was missing for 4.6% of the sample (offenders with only the mafia offense).

[vii] For example, extortion (Article 629 of the Italian Criminal Code) carries a standard penalty of between five and ten years of imprisonment, while robbery (Article 628) between four and ten, and corruption (Article 319) between six and ten.

[viii] It was impossible to identify the statutory penalty for all the different criminal violations in the dataset (reported at the paragraph level, for a total of more than 40,000 distinct types of violations). Based on the most frequent offenses, we ensured that the seriousness was correctly reported for about 95% of the total offenses in the PMM dataset. The escalation parameter is thus missing when a) offenders committed only one crime; or b) offenders committed only two or more crimes in the same year; or c) offenders committed crimes in different years, but seriousness scores were unavailable for at least two years.

[ix] The cap at 15 crimes per year only affected about 0.09% of the cells in the offenders-by-years matrix, and the discarded crimes accounted for 3.3% of total crimes.

[x] The age censoring affected about 0.1% of the cells in the matrix and about 0.76% of the total offenses in the PMM dataset. To test the robustness of the results, we have also replicated the analysis with a censoring at 50. We obtained again five trajectories with very similar trajectories and distributions of the sample among them. The results are available upon requests to the authors.

[xi] A detailed understanding of the impact incapacitation is further complicated by specific features of the Italian criminal justice system. First, trial in absentia is allowed and has frequently occurred against mafia suspects, who have often actively avoided arrest, in some instances for decades. Thus, penalties imposed upon conviction would hardly be representative of actual conviction periods for our sample. Second, Italy admits both concurrent and consecutive sentences, depending on particular characteristics of the crimes and of the context of commission. Third, detention is the normal pretrial measure for mafia cases and it can last for several years. Consequently, even with better data on actual incarceration periods, it would be nearly impossible to match associated offenses and related penalties.