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Friends with(out) benefits: co-offending and re-arrest

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(post-print version; Published source : Ouellet, Frédéric, et al. "Friends with (out) benefits: co-offending and re-arrest." *Global Crime* 14.2-3 (2013): 141-154. Link to publisher version: <http://www.tandfonline.com/doi/abs/10.1080/17440572.2013.787930#.VaZ-ZvIQBEY>)

*** Paper considered for publication in the special issue organize around the Vancouver illicit networks workshop.***

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Friends with(out) benefits: co-offending and re-arrest

ABSTRACT Research shows that co-offending has contradictory effects on rates of re-arrest. On the one hand, group offending may be riskier: for example, co-offenders might be targeted by police or might snitch to protect themselves. Criminal networks may also have indirect effects: offenders embedded in criminal networks commit more offenses and thus should have a higher risk of being arrested at some point. On the other hand, networks generate steady criminal opportunities with relatively low risk of arrest and high monetary benefits (e.g., drug trafficking). Few authors have empirically explored the relation between co-offending and re-arrest. This paper does so, using data from seven years of arrest records in the province of Quebec (Canada). The analysis is designed to explore why some offenders are re-arrested after an initial arrest while others are not. It focuses on the factors involved in re-arrest, considering two distinct levels of measures of co-offending. The first level of analysis takes into account a situational measure that indicates whether a given offense was committed by co-offenders (group offense). The second level is used to examine whether being part of a criminal network influences re-arrest. For offenders embedded in such networks, two network features (degree centrality and clustering coefficient) show that the global position of individuals within the Quebec arrest network are analyzed. Our results suggest that co-offending is a crucial factor that should be taken into account when looking at the odds of being caught again. The use of generalized linear mixed model brings interesting nuances about the impact of co-offending. The paper adds to the recently growing literature on the link between networks and criminal careers.

Keywords: co-offending patterns, criminal networks, re-arrest, criminal career, offense participation.

INTRODUCTION¹

It is well established that there is a relationship between past and future criminal behaviour.²

Piquero, Farrington, and Blumstein emphasize that the study of criminal careers shows the importance of the relationship between past and future criminal activity.³ Under the criminal career paradigm, crime is no longer seen as an isolated act but as an event that is part of a sequence and a context.⁴ A key dimension of active criminal careers is the pattern of co-offending,⁵ which has the potential to affect the development and persistence of criminal behaviour over time. Unfortunately, little empirical work has been completed on this key dimension. For example, little is known about how co-offending patterns influence offending, but also how they affect criminal career duration. It is also worth to note that our knowledge of this key dimension is based almost exclusively on juvenile delinquency; practically no research has explored co-offending in adulthood.⁶ This paper contributes to the criminal career paradigm by

¹ The authors also wish to thank the anonymous reviewers of *Global Crime* and its editor in chief for their comments on the preliminary version of this article.

² Bushway, S., R. Brame, and R. Paternoster. "Assessing stability and change in criminal offending: A comparison of random effects, semiparametric, and fixed effects modeling strategies." *Journal of Quantitative Criminology* 15, no.1 (1999): 23-61; Farrington, D.P. "Developmental and life-course criminology: Key theoretical and empirical issues – The 2002 Sutherland Award Address." *Criminology* 41, no.2 (2003): 221–255; Nagin, D. S., and R. Paternoster. "On the relationship of past to future participation in delinquency." *Criminology* 29, no.2 (1991): 163–189; Nagin, D. S., and R. Paternoster. "Population heterogeneity and state dependence: State of the evidence and directions for future research." *Journal of Quantitative Criminology* 16, no.2 (2000): 117–144; Paternoster, R., C. W. Dean, A. R. Piquero, P. Mazerolle, and R. Brame. "Generality, continuity and change in offending." *Journal of Quantitative Criminology* 13, no.3 (1997): 231–266.

³ Piquero, A. R., D. P. Farrington, and A. Blumstein. "The criminal career paradigm." In *Crime and justice: A review of research*, edited by M. Tonry, 30, 359–506. Chicago: University of Chicago Press, 2003.

⁴ Smith, D. R., W. R. Smith, and E. Noma. "Delinquent career-lines: A conceptual link between theory and juvenile offenses." *The Sociological Quarterly* 25, no.2 (1984): 155-172.

⁵ Piquero, A. R., D. P. Farrington, and A. Blumstein. *Key issues in criminal career research: New analyses of the Cambridge study in delinquent development*. Cambridge, UK: Cambridge University Press, 2007; Piquero, Farrington, and Blumstein. *The criminal career paradigm*, 359–506.

⁶ Piquero, Farrington and Blumstein, *The criminal career paradigm*, 359–506.

focusing on the relationship between patterns of co-offending in adulthood and future criminal involvement.

Co-offending and criminal careers

Studies of offending trajectories have shown that participation in criminal networks is often a relevant factor. Researchers have demonstrated that individuals embedded in co-offending networks are not only aware of more criminal opportunities but have the necessary contacts to take advantage of them.⁷ Others have shown that offenders embedded in co-offending networks have a lower risk of arrest and higher criminal earnings.⁸ These results are consistent with theories that suggest that delinquent peers – friends and relatives who demonstrate antisocial behaviours – are sources of criminal knowledge and opportunity as well as providing knowledge about the techniques needed to succeed in criminal activities.⁹

Few studies have sought to compare the criminal careers of co-offenders with those of lone offenders, and those that have made such comparisons have generally neglected the dynamic patterns of co-offending. In many of these studies, individuals may be considered “co-offenders” if they commit at least one offence with at least one accomplice. With this definition, a significant portion of offenders could be labeled “co-offenders,” even if they also commit solo

⁷ Andresen, M., and M. Felson. “The impact of co-offending.” *British Journal of Criminology* 50, no.1 (2010): 66-81; Morselli, C. *Contacts, opportunities, and criminal enterprise*. Toronto: University of Toronto Press, 2005.

⁸ Bouchard, M., and H. Nguyen. “Is it who you know, or how many that counts? Criminal networks and cost avoidance in a sample of young offenders.” *Justice Quarterly* 27, no.1 (2010): 130-158 ; Bouchard, M., and F. Ouellet. “A survival analysis of failure in the drug trade.” *Global Crime* 12, no.1 (2011): 70-86; Morselli, C., P. Tremblay, and B. McCarthy. “Mentors and criminal achievement.” *Criminology* 44, no.1 (2006): 17-43.

⁹ Sutherland, E. H. *Principles of criminology*. Philadelphia: J.B. Lippincott Company, 1947; Warr, M., and M. Stafford. “The influence of delinquent peers: What they think or what they do?” *Criminology* 29, no.4 (1991): 851-866.

offences from time to time. Using this narrow definition of co-offender, these retrospective studies have mainly examined the effect of criminal network characteristics (e.g., size and structure) on other dimensions of the criminal career. Some authors have criticized this approach for its failure to account for the dynamics of offending, arguing that offending is better understood as part of a sequence, as suggested by the criminal career paradigm.¹⁰

Co-offending may be defined in at least two different ways, which have important methodological and theoretical implications.¹¹ First, a large proportion of the literature on co-offending attempts to describe offenders who commit infractions with an accomplice(s). For example, Carrington, Hodgson, and van Mastrigt found that between 24% and 35% of arrestees had operated with a co-offender at least once in their lifetime.¹² In theory, such “co-offenders” could be compared to solo offenders in any attempt to explain the decision to work with accomplices.¹³ However, such a comparison fails to recognize that these “co-offenders” may

¹⁰ Piquero, Farrington and Blumstein, *The criminal career paradigm*, 359–506.

¹¹ Van Mastrigt, S. B., and D. P. Farrington. “Co-offending, age, gender and crime type : Implications for criminal justice policy.” *British Journal of Criminology* 49, no.4 (2009): 552-573.

¹² Carrington, P. J. “Group crime in Canada.” *Canadian Journal of Criminology* 44, no.3 (2002): 377–415; Hodgson, B. “Co-offending in UK police recorded crime data.” *The Police Journal* 80, no.4 (2007): 333-353 ; Van Mastrigt, S. B. *Co-offending: Relationships with age, gender and crime type*. Cambridge, University of Cambridge, 2008.

¹³Research shows, for example, that co-offending is more frequent in adolescence than adulthood (See Carrington, *Group crime in Canada*, 377–415 ; Carrington, P. J. “Co-offending and the development of the delinquent career.” *Criminology* 47, no.4 (2009) : 1295-1329; McGloin, J. M., and A.R. Piquero. “I wasn’t alone”: Collective behaviour and violent delinquency.” *The Australian and New Zealand Journal of Criminology* 42, no.3 (2009): 336-353; Piquero, Farrington and Blumstein, *Key issues in criminal career research*; Reiss, A. J. and D. P. Farrington. “Advancing knowledge about co-offending: Results from a prospective longitudinal survey of London males.” *Journal of Criminal Law and Criminology* 82, no.2 (1991): 360-395; Van Mastrigt and Farrington, 2009, *Co-offending, age, gender and crime type*, 552-573; Warr, M. *Companions in Crime: The Social Aspects of Criminal Conduct*. Cambridge, MA: Cambridge University Press, 2002; Warr, M. “Age, peers, and delinquency.” *Criminology* 31, no.1 (1993): 17–40) and that co-offending can be related to an offender’s gender (see Carrington, *Group crime in Canada*, 377-415; Hodgson, *Co-offending in UK police recorded crime data*, 333-353 ; Van Mastrigt, *Co-offending: Relationships with age, gender and crime type*; Daly, R. M. *Delinquent networks in Philadelphia: The structure of co-offending among juveniles*. Pennsylvania, University of Pennsylvania, 2005.

commit a part or even the majority of their offences alone and that their co-offending pattern may change over time –what Reiss and Farrington call mixed solo and co-offending careers.¹⁴

Other studies concentrate on the percentage of offences that involve multiple offenders. The results of this research are quite consistent: between 10% and 17% of police-recorded offences involve more than one offender.¹⁵ The percentage varies according to the type of infraction¹⁶ and the environmental setting (urban vs rural).¹⁷ In these studies, the unit of analysis is the infraction, regardless of the number of offenders involved,

Some authors have proposed another unit of analysis – offence participation – in an attempt to reconcile these two approaches. Offence participation is a measure of the involvement of one individual in one incident¹⁸ and allows researchers to study the situation of individuals at specific

¹⁴ Reiss and Farrington, *Advancing knowledge about co-offending*, 360-395.

¹⁵ D'Alessio, S. J., and L. Stolzenberg. "Do cities influence co-offending?" *Journal of Criminal Justice* 38, no.4 (2010): 711-719; Hodgson, *Co-offending in UK police recorded crime data*, 333-353 ; Van Mastrigt, *Co-offending: Relationships with age, gender and crime type*; Van Mastrigt and Farrington, 2009, *Co-offending, age, gender and crime type*, 552-573.

¹⁶ Carrington, *Group crime in Canada*, 377–415 ; Carrington, *Co-offending and the development of the delinquent career*, 1295-1329; Conway, K. P., and J. McCord. "A longitudinal examination of the relation between co-offending with violent accomplices and violent crime." *Aggressive Behavior* 28, no.2 (2002): 97-108; Hodgson, *Co-offending in UK police recorded crime data*, 333-353 ; McCord, J., and K. P., Conway. Patterns of juvenile delinquency and co-offending. In *Advances in criminological theory*, edited by E. Waring, D. Weisburd, L. Sherman and F. Earls, 10, 15-30. New Brunswick, NJ: Transaction, 2002; McCord, J., and K. P. Conway. *Co-offending and patterns of juvenile crime*. Washington, DC: National Institute of Justice, 2005; Piquero, Farrington and Blumstein, *Key issues in criminal career research*; Reiss, A. J. Co-offending and criminal careers. In *Criminal Careers and Career Criminals* (vol. 2), edited by A. Blumstein, J. Cohen, J. A. Roth, and C.A. Visher. Washington, DC: National Academy Press, 1986; Reiss, A. J. Co-offending and criminal careers. In *Crime and justice: A review of research*, 10, 117-170, edited by M. Tonry and N. Morris. Chicago: University of Chicago Press, 1988 ; Reiss and Farrington, *Advancing knowledge about co-offending*, 360-395; Van Mastrigt, *Co-offending: Relationships with age, gender and crime type*; Van Mastrigt and Farrington, *Co-offending, age, gender and crime type*, 552-573.

¹⁷ D'Alessio and Stolzenberg, *Do cities influence co-offending*, 711-719 ; Hindelang, M. J. "With a little help from their friends: Group participation in reported delinquent behaviour." *British Journal of Criminology* 16, no.2 (1976): 109-125.

¹⁸ Frank, O., and P. J. Carrington. "Estimation of offending and co-offending using available data with model support." *Journal of Mathematical Sociology* 31 (2007): 1-46.

points of time and to consider inter-offender, inter-offence, and intra-offence variations. In the very limited number of studies that use the notion of offence participation, co-offending is always presented as an outcome rather than a potential predictor.¹⁹

In this article, it is argued that offence participation is the most precise measure of co-offending and that its use is consistent with the criminal career paradigm. As well, co-offending is shown to be a potential determinant of future re-arrest. While theorists acknowledge the role of co-offending in explaining criminal career patterns, few empirical studies have investigated the relationship²⁰ and the evidence they present is mixed. Offenders who favour group offending tend to desist from criminal activities earlier than solo offenders²¹ but whether a given offence was committed by a solo offender or by multiple offenders has been found to be unrelated to re-offending.²² Delinquent peers – friends and relatives who demonstrate antisocial behaviours – have been found to have a strong influence on offending. Delinquent peers are sources of criminal knowledge and opportunities: youths who are part of large co-offending networks and have strong ties with delinquents are thought to be at risk of committing multiple infractions over an extended period of time.

¹⁹ Carrington, *Co-offending and the development of the delinquent career*, 1295-1329 ; Frank and Carrington, *Estimation of offending and co-offending using available data with model support*, 1-46; Sarnecki, J. *Delinquent Networks*. Cambridge, UK: Cambridge University Press, 2001; Van Mastrigt, *Co-offending: Relationships with age, gender and crime type*; Van Mastrigt and Farrington, *Co-offending, age, gender and crime type*, 552-573.

²⁰ Piquero, Farrington, and Blumstein. *The criminal career paradigm*, 359–506; Piquero, Farrington and Blumstein, *Key issues in criminal career research*.

²¹ McGloin and Piquero, “*I wasn’t alone*”: *Collective behaviour and violent delinquency*, 336-353.

²² Reiss and Farrington, *Advancing knowledge about co-offending*, 360-395.

An alternative view of group (or co-) offending involves the idea of collective behaviour, recently put forward by McGloin and Piquero.²³ Here, the focus is more on the immediate circumstances of infractions: the presence of accomplices on-site allows individuals to engage in unusual behaviour or actions they would not engage in alone.²⁴ The decision-making of such individuals is influenced by the presence of others: crime is facilitated by delinquent peers who, by their presence and encouragements, provide anonymity and a sense of shared responsibility.²⁵ The literature thus suggests two contradictory hypotheses. First, co-offending may stimulate re-offending as individuals embedded in large criminal networks have access to more opportunities, more potential accomplices, and better technical skills. Second, some patterns of co-offending – such as those involving groups with whom the offender does not have strong ties -- may limit future offending as, according to the notion of collective behaviour, most individuals would not engage in criminal actions without the presence of their influential delinquent peers by their side. Co-offenders may thus be less prone to re-offend than solo offenders.

Current study

The main objective of this article is to examine how offence participation and offender characteristics are linked with re-arrest in a sample of 415 350 offenders. Both levels of analysis are expected to be influenced by the nature of offending. The design strategy of this study (generalized linear mixed models) allows to answer two related questions: 1) are co-offences (considered in terms of offence participation) followed by higher or lower re-arrest rates? and 2) are offenders embedded in criminal networks more or less likely to be arrested again after an

²³ McGloin and Piquero, “*I wasn’t alone*”: *Collective behaviour and violent delinquency*, 336-353. See also Warr, *Companions in Crime*.

²⁴ Carrington, *Co-offending and the development of the delinquent career*, 301-335; Reiss, *Co-offending and criminal careers*.

²⁵ Warr, *Companions in Crime*.

initial arrest? Four different measures of co-offending are included to account for individual and situational differences.

METHODS

Data

The data for this study covers all individuals arrested in the province of Quebec over a 7-year period (2003-2009). Information was extracted from the MIP (Module d'Information Policière), a centralized database used by virtually all police organizations in Quebec. In using this data we recognized that while an offender may be arrested for multiple infractions at the same time, it is usually not possible to determine how and when the infractions came to the attention of the police. For instance, an offender may have been under investigation for a certain time, during which he or she committed a number of infractions without being immediately arrested; alternatively an offender may confess a number of additional crimes after being arrested. In both cases, police officers do not necessarily have the resources to document the incidents, search out alleged victims, etc., so these crimes may well be dismissed at a later date. To avoid these problems, we analyzed only those infractions that occurred closest to the date of arrest.²⁶ Non-criminal incidents and offences that are necessarily committed by solo offenders were also excluded from the analysis.²⁷

Official data provide information on three levels of analysis: offences, offenders, and offence participation.²⁸ An offence is a criminal event that has several characteristics, such as a location,

²⁶ 13.6% of arrests concerned more than one infraction.

²⁷ Several types of offences were excluded: for example, discharging a firearm with intent, impaired or reckless driving, and failure to comply with probation or bail conditions.

²⁸ Van Mastrigt and Farrington, *Co-offending, age, gender and crime type*, 552-573.

a date of occurrence, and a type (e.g. violent, property). An offender is an individual who has been arrested for commission of an offence. Offenders have distinctive features (gender, age) and may be embedded in networks of criminal relations. There may also be more than one offender involved in a given offence: offence participation represents the criminal involvement of one person in one incident.²⁹ If an offence was committed by only one offender, there is only one offence participation; if more than one offender was involved, the number of offence participations per offence is equal to the number of offenders involved in the offence. Suppose that offence 1 was committed by offenders A and B, and that offence 2 was committed by offenders B and C. There are then 2 offences (1 and 2), 3 offenders (A, B, and C), and 4 offence participations (1A, 1B, 2B, and 2C). Offence participations allow considering inter-offender, inter-offence, and intra-offence variations. Van Mastrigt and Farrington have argued that offence participation is the only measure that can be used to compare figures from different sources since, for example, a single offence may be reported by more than one offender.³⁰ This argument is especially important in studies of co-offending: consistent with van Mastrigt and Farrington, we find co-offending to represent 10.2% at offence level, 20.3% at offence participation level, and 26.9% at offender level. Our sample thus includes 629 183 offences committed by 415 350 different offenders, for a total of 708 764 offence participations. However, in this case, considering offence participations and offences separately adds very little to the analysis. Consequently, only two levels of analysis are considered: offence participations (which include offences) and offenders.

²⁹ Carrington, *Co-offending and the development of the delinquent career*, 1295-1329; Frank and Carrington, *Estimation of offending and co-offending using available data with model support*, 1-46.

³⁰ Van Mastrigt and Farrington, *Co-offending, age, gender and crime type*, 552-573.

Variables: Offence participation level

In looking at subsequent arrest, the dependent variable is a dichotomous measure of whether an offender was arrested again after an initial arrest (1=yes). More than two-fifths of offence participations (41.4%) were followed by subsequent arrests. Recall offender B who was arrested a first time for an offence committed with offender A and a second time for an offence committed with offender C. Offence 1 generates two offence participations, one that was followed by another arrest (offender B) and one that was not (offender A). Similarly, offence 2 generates two offence participations (offenders B and C), neither of which was followed by subsequent arrest. Offender B appears twice in the sample but the value of the dependent variable is different for each of the offence participations.

The variable “Group offence” indicates whether or not a particular offence involved multiple offenders (1=yes). Table 1 indicates that 20% of offense participations were committed with at least one accomplice, a proportion slightly higher than those of other studies, in which group offenses account for 10% to 17% of offense participations.³¹

Seven other dichotomous variables are introduced at this level of analysis. These variables control for expected time effect and offense characteristics. It is quite possible that offenders in the sample were arrested before 2003 or after 2009. A variable controls for the “Time of exposure” (in months) to account for possible variations in the length of the period being considered. For example, an individual arrested in December 2009 would be exposed to the possibility of subsequent arrest for only one month, while someone who was arrested in January

³¹ D'Alessio and Stolzenberg, *Do cities influence co-offending*, 711-719 ; Hodgson, *Co-offending in UK police recorded crime data*, 333-353; Van Mastrigt, *Co-offending: Relationships with age, gender and crime type*.

2003 was exposed to arrest for the whole 7-year period. The age at the time of the offence is also expected to have an impact on future behaviour. In our sample, offender age presents an asymmetric distribution because of the important concentration of young adults (47% of the sample were less than 30 years old). To better capture the effect of age and to normalize the distribution, nine categories were created (less than 17, 18-19, 20-24, 25-29, 30-34, 35-39, 40-49, 50-59, 60 or older³²). As offending is more frequent in large metropolitan cities,³³ we introduced a variable that distinguishes infractions committed in Montreal (Montreal = 1).³⁴ (As reported in Table 1, 20% of offense participations were committed in Montreal.) Finally, as many authors document the differential effects of type of crime on offending, we use four general categories for type of crime: violent crimes (e.g. assault, the reference category, which represents 45.2 % of offense-participations), crimes against property (e.g., car theft, fraud), market crimes (e.g. drug trafficking), and other crimes (e.g., prison escape). Crimes against property, market crimes, and other crimes account respectively for 35.5%, 14.5%, and 4.8%.

Variables: Offender level

The second co-offending measure is also dichotomous and indicates whether an offender has committed at least one known co-offence during the 7-year period (1=yes). This variable aims to compare co-offenders and solo offenders. Table 1 indicates that 27% of offenders had committed

³² To correct the asymmetry of this distribution, Statistics Canada categorization was used.

³³ Felson, M. The process of co-offending. In *Theory for practice in situational crime prevention. Crime Prevention Studies*, 16, edited by M. J., Smith and D. B., Cornish. Monsey, NY: Criminal Justice Press, 2003.

³⁴ The Montreal population (n=1 620 693) is 3 times larger than that of any other city in our sample (Statistics Canada, 2008).

at least one offense with a partner in the study period, a proportion similar to what has been observed in other studies.³⁵

Two additional variables were extracted from a larger network analysis. A global arrest network was built: relationships were assumed between individuals who were involved in the same offence. “Degree” is the number of different individuals connected to a given offender, a measure of the size of a personal network, ranging in the sample from 1 to 32 contacts. “Clustering coefficient” indicates how well connected an offender’s contacts are. It is a standardized measure that ranges from 0 to 1. A high clustering value means that the overall network is composed of smaller tightly knit (or dense) groups or cliques. At the individual level a high clustering coefficient indicates that an offender belongs to a dense personal network of co-offenders. Both these measures are, of course, only available for offenders who committed at least one co-offence: by definition, solo offenders do not have criminal networks.

Gender was included as a control variable. As expected, the vast majority of the study population (78.3%) was male.

³⁵ Hodgson, *Co-offending in UK police recorded crime data*, 333-353; Van Mastrigt, *Co-offending: Relationships with age, gender and crime type*; Carrington, *Group crime in Canada*, 377-415.

Table 1: Descriptive statistics

	Mean (s.d.)
Level 1: Offense participation (N=708 764)	
Re-arrest (yes/no)	0.41
Time of exposure (months)	39.1 (23.2)
Age (years)	33.1 (13.3)
Montreal (yes/no)	0.22
Property crime (yes/no)	0.35
Market crime (yes/no)	0.15
Other crime (yes/no)	0.05
Group offense (yes/no)	0.20
Level 2: Offenders (N=415 350)	
Sex (0=Female, 1=Male)	0.78
Co-offending (yes/no)	0.27
Network features: Degree (number of contacts)	2.1 (1.9)
Network features: Clustering coefficient	0.3 (0.4)

Limitations

The current study is not without limitations. First, although the database provides information on all those arrested in Quebec between 2003 and 2009, few variables are available on offenders' individual characteristics. Second, offenders included in this study were all arrested at least once during the period under consideration and some of these offenders thus served prison sentences during this period. As these offenders were not free to commit crimes during the time they were incarcerated, they were not at risk of being re-arrested. In other words, they had less "street time" to accumulate arrests. The nature of the data does not allow us to control for these periods of incarceration. While a limitation, such a problem is not uncommon in the study of recidivism.³⁶ Finally, official data give only a partial picture of co-offending patterns. We know that an offender has benefited from a criminal network only if both he and his partners were arrested. Due again to the nature of the data, individuals who rely on a criminal network for purposes other

³⁶ Laub, J. H., D. S. Nagin, and R. J., Sampson. "Trajectories of Change in Criminal Offending: Good Marriages and the Desistance Process." *American Sociological Review* 63, no.2, 225-238.

than meeting suitable co-offenders (e.g., for criminal opportunities, learning criminal skills, etc.) or are arrested for crimes other than those they have committed in groups cannot be considered co-offenders in this study.

Analytic strategy

The data collected in connection with the objectives of this study required the use of generalized linear mixed (GLM) models using HLM version 6.06. The logic behind GLM is similar to logistic regression; we are looking to predict the likelihood of occurrence of an event, in this case, re-arrest. These models incorporate both offense participation factors and offender factors. This type of multilevel models fits very well with repeated measures data,³⁷ and takes into account the dependence of error terms that can avoid violating regression assumption. It considers the fact that each offense is vested in an individual (offenses committed by the same individual share a common variance).

RESULTS

Predicting re-arrest

Table 2 presents the main results from generalized linear mixed models analyses. Due to the large size of our sample, almost every relation is statistically significant; our interpretation is therefore based on the strength of coefficients. Model 1 includes only control variables. The best predictor in this model is at the individual level (level 2) and is in the expected direction: men are more likely than women to be re-arrested during the window period (Odds ratio =1.675; $p < 0.001$). This result holds even when controlling for the variety of offense participation factors included in

³⁷ Van Der Leeden, R. "Multilevel Analysis of Repeated Measures Data." *Quality and Quantity* 32, no.1 (1998): 15-29.

model 1. The age at the time of the offence (Odds ratio =0.911; $p<0.001$) as well as the location (Odds ratio =1.127; $p<0.001$) are also found to be factors that have a strong impact on future arrest. Criminologists have emphasized the effect of age on criminal behaviour. For instance, in 1983 Hirschi and Gottfredson pointed to age as an attractive predictive factor of key elements of the criminal career, such as recidivism and desistance.³⁸ Blumstein, Cohen, and Farrington argue that aging criminals are more likely to desist from offending than younger ones.³⁹ Participation in offending is thus seen as a key dimension that varies with age. Our results also indicate that the probability of re-arrest decreases with age or, conversely, that the younger the offender is at the time of offense the more likely he is to be arrested again.

Crimes committed in the Montreal area (the most populous area in Quebec) are 12.7% more likely to be followed by a subsequent arrest than those committed in other areas of the province. This result does not support the hypothesis advanced by Alessio and Stolzenberg that large cities offer anonymity and make identification more difficult,⁴⁰ making it easier for offenders to avoid sanctions in such settings. It may be easier to find an accomplice in metropolitan areas⁴¹ and, as shown elsewhere, criminal networks increase criminal opportunities. Finally, in comparison to violent crimes (reference category), property crimes are 18.9% more likely to be followed by another arrest, while market crimes are 2.9% less likely.

³⁸ Hirschi, T., and M. Gottfredson. Age and the explanation of crime. *American Journal of Sociology* 89, no.3 (1983): 552-584.

³⁹ Blumstein, A., J. Cohen, J. A. Roth, and C.A Visher. *Criminal careers and "Career Criminals."* Washington, D. C.: National Academy Press, 1986.

⁴⁰ D'Alessio and Stolzenberg, *Do cities influence co-offending*, 711-719.

⁴¹ Felson, *The process of co-offending*, 153.

The impact of co-offending

Co-offending measures are introduced in models 2 and 3. Model 2 compares co-offenders to solo offenders (n = 415 350). Model 3 analyzes the specific effects of two network features on future arrest; it thus includes only co-offenders – individuals who collaborated with at least one other offender during the 7-year period (n = 125 426). The results are unexpected. First, offence participations related to group offences are less likely to be followed by subsequent arrest. The effect is robust (and strong) as it is similar in both models (Odds ratio=0.298; p<0.01). Second, at the individual-level, co-offenders are more likely to be arrested again, compared to solo offenders. The effect is strong and significant (Model 2; Odds ratio =5.610; p<0.001). Third, both network measures are strongly related to future arrest, but in opposite directions (model 3). Offenders with larger criminal networks have greater odds of being re-arrested (“Degree”; Odds ratio =1.337; p<0.001), while the odds of being re-arrested are lower for offenders belonging to narrower networks (“Clustering coefficient”; Odds ratio =0.446; p<0.001). The opposing effects obtained in models 2 and 3 need further discussion; two competing explanations are discussed below. In addition to more traditional discussions of recidivism, notions borrowed from the criminal career paradigm appear to be useful in better understanding co-offending.

Table 2: Generalized linear mixed models predicting future arrest

	Model 1		Model 2		Model 3	
	All offenders		All offenders		Co-offenders	
	γ	OR	γ	OR	γ	OR
Level 1: Offense participation	(N=708 764)		-		(N=293 356)	
Time of exposure	0.02**	1.021	0.02**	1.024	0.03**	1.030
	(0.00)		(0.00)		(0.00)	
Age	-0.09**	0.911	-0.05**	0.951	-0.06**	0.938
	(0.00)		(0.00)		(0.00)	
Montreal	0.12**	1.127	0.15**	1.164	0.29**	1.332
	(0.01)		(0.01)		(0.01)	
Property crime	0.17**	1.189	0.17**	1.189	0.26**	1.297
	(0.01)		(0.01)		(0.01)	
Market crime	-0.03**	0.971	-0.12**	0.886	-0.16**	0.850
	(0.01)		(0.00)		(0.01)	
Other crime	0.06**	1.064	0.01	1.009	0.00	1.003
	(0.01)		(0.01)		(0.02)	
Group offense			-1.21**	0.298	-1.29**	0.275
			(0.01)		(0.01)	
Level 2: Offenders	(N=415350)		-		(N=125426)	
Sex	0.52**	1.675	0.51**	1.660	0.47**	1.592
	(0.01)		(0.01)		(0.01)	
Co-offending			1.72**	5.610		
			(0.01)			
Networks features: Degree					0.29**	1.337
					(0.00)	
Networks features: Clustering					-0.81**	0.446
					(0.01)	

DISCUSSION

An arrest is an event that forces most offenders to decide whether or not to continue offending. Patterns of co-offending may influence that decision in many ways. While several studies have focused on re-arrest, few have looked at the relationship between re-arrest and co-offending within a large pool of offenders. Controlling for well-known predictors, our results suggest that co-offending is a crucial factor that should be taken into account when looking at the odds of being caught again. Interesting nuances about the impact of co-offending are also suggested. The use of generalized linear mixed model analyses allows us to examine not only the contribution of

co-offending patterns at different levels but also the dynamics behind arrests for each offender. It was unexpected that opposite effects would be observed between offence participation and offender levels. This counter-intuitive result obviously raises questions about the benefits of co-offending.

Numerous studies use official data to test propositions about recidivism.⁴² If re-arrest is interpreted as a measure of recidivism, it is clear that the vast majority (73.2%) of offenders do not re-offend. Such an assertion is consistent with the expected deterrent effect of arrest⁴³ but it is not a sufficient explanation. In the present study, we find that recidivism is less likely after a group crime (offense participation level). This finding is consistent with Carrington, who demonstrated that group crimes are committed by a minority of individuals highly involved in crime as well as a majority of others who were persuaded to join the minority group at least once but are ultimately unlikely to reoffend (especially alone).⁴⁴ However, regardless of the sequence

⁴² See for example : Benda, B., R. Corwyn, and N. Toombs. "Recidivism among adolescent serious offenders: Prediction of entry into the correctional system for adults." *Criminal Justice and Behavior* 28, no.5 (2001): 588-613; Huebner, B., S. Varano and T. Bynum. "Gangs, guns, and drugs: Recidivism among serious, young offenders." *Criminology and Public Policy* 6, no.2 (2007): 187-222; Langan, P. A and D. J. Levin. *Recidivism of prisoners released in 1994*. Bureau of Justice Statisticians: Special Report. Washington, DC: US Department of Justice, 2002; Lattimore, P., C. Visher and R. Linster. "Predicting rearrest for violence among serious youthful offenders." *Journal of Research in Crime and Delinquency* 32, no.1 (1995): 54-83; Lussier, P., and G. Davies. "A person-oriented perspective on sexual offenders, offending trajectories, and risk of recidivism : A new challenge for policymakers, risk assessors, and actuarial prediction ?" *Psychology, Public Policy, and Law* 17, no.4 (2010): 530-561; Proulx, J., M. Tardif, B. Lamoureux, and P. Lussier. How does recidivism risk assessment predict survival? In *Remaking relapse prevention with sex offenders: A sourcebook*, edited by D. R. Laws, S. M. Hudson and T. Ward. California: Sage, 2000; Stoolmiller, M., and E. A. Blechman. "Substance use is a robust predictor of adolescent recidivism." *Criminal Justice and Behavior* 32, no.3 (2005): 302-328 ; Trulson, C., M. DeLisi and J. Marquart. "Institutional misconduct, delinquent background, and re-arrest frequency among serious and violent delinquent offenders." *Crime & Delinquency* 57, no.5 (2011): 709-731.

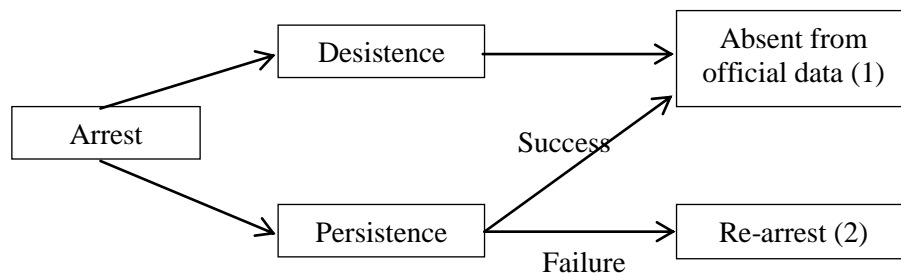
⁴³ Pratt, T. C., F. T. Cullen, K. R. Blevins, L. E. Daigle, and T. D. Madensen. The empirical status of deterrence theory: A meta-analysis. In *Taking stock: The status of criminological theory*, edited by F. T. Cullen, J. P. Wright and K. R. Blevins, 367-395. New Brunswick, NJ: Transaction, 2006.

⁴⁴ Carrington, *Co-offending and the development of the delinquent career*, 301-335.

of offense participation and its characteristics, the simple fact of being involved with other offenders significantly increases the likelihood of re-arrest (individual level). It is therefore tempting to conclude that co-offending is not particularly beneficial.

While a discussion of the validity of arrest data as a source of information on criminal careers is well beyond the scope of this paper,⁴⁵ its wide use in co-offending research raises an important question: how do we separate offenders who stop offending (“desisters”) from offenders who successfully commit further infractions (“arrest avoiders”)? Figure 1 shows a typical decision point: after an arrest, individuals decide either to stop or to persist in offending. Those who desist stop appearing in the records of the criminal justice system while recidivists appear on the judicial radar only if they fail to avoid arrest. In other words, criminological research based on official data will classify “desisters” and successful recidivists in the same category of offenders: those who are not re-arrested. The issue is relevant because solving the problem of how to distinguish between these two categories could further clarify the relation between co-offending and re-arrest.

Figure 1: Criminal careers and the justice system



⁴⁵ See Skogan, W. E. “The validity of official crime statistics: An empirical investigation.” *Social Science Quarterly* 55, no.1 (1974): 25-38.

It is clear that the very nature of official data does not allow us to distinguish successful recidivism from desisting and it is thus not possible to assess the proportion of offenders in our sample who desist from those who persist in crime. We cannot rule out that failure will have a deterrent effect on offenders, prompting them to stop offending. Shover and Thompson show the existence of a strong link between past success in avoiding sanctions and desistance: those who fail are more likely to cease criminal activities.⁴⁶ However, offenders can also learn from their failures and contacts with officials of the justice system can encourage innovation in crime. Gallupe, Bouchard, and Caulkins show that successful criminals are those who possess personal traits such as the ability to learn from previous experiences and to implement appropriate behavioural changes.⁴⁷ Offenders may well adapt and become more efficient following an arrest.

Given this, it seems important to analyze our results from the perspective of criminal success: the absence of a new arrest would then mean that an offender had successfully avoided arrest while persisting in offending. This idea is supported by various studies that show that, for most offenses, the risk of arrest is relatively low: it varies between 3% and 6% for certain crimes against property and drug dealing, and rises to 10% for a majority of violent crimes.⁴⁸ From the perspective of criminal success, it can be hypothesized that the majority of individuals arrested persist in offending but that only a minority are re-arrested.

⁴⁶ Shover, N., and C. Y. Thompson. "Age, differential expectations, and crime desistance." *Criminology* 30, no.1 (1992): 89-104.

⁴⁷ Gallupe, O., M. Bouchard, and J. Caulkins. "No change is a good change? Restrictive deterrence in illegal drug markets." *Journal of Criminal Justice* 39, no.1 (2011): 81-89.

⁴⁸ Farrington, D. P., P. A Langan, and M. Tonry. *Cross-national studies in crime and justice*. Washington: Bureau of Justice Statistics, U.S. Department of Justice, 2004: 51; Blumstein, Cohen, Roth, and Visser, *Criminal careers and "Career Criminals,"* 60.; Bouchard, M., and P. Tremblay. "Risks of arrest across drug markets: A capture-recapture analysis of hidden dealer and user populations." *Journal of Drug Issues* 35, no.4 (2005): 733-754.

Offenders can benefit from their past experiences.⁴⁹ They can also learn from the experiences of other offenders. This “cooperative learning” might explain why the risks of re-arrest are lower after a group offence (offense participation level). In group crimes, offenders learn to cooperate and this learning can be used to better plan and organize the next offense, e.g., by dividing the work according to respective competences, providing more supervision, etc. Also, less experienced offenders may acquire expertise in crime by observing their more experienced partners in action. It has been shown that offenders who receive mentoring during the early stages of their criminal career have higher monetary profits.⁵⁰

On the individual level, however, our results indicate that the simple fact of being the member of a criminal network increases the odds of getting arrested again. Among other risks, having accomplices exposes offenders to the possibility of being the victim of an informer. Each actual or ex- partner in crime is liable to be arrested and if arrested could provide information on accomplices in exchange for leniency from judicial authorities. This risk is in accord with results showing that larger criminal networks (network degree) are associated with higher risk of future arrest. This interpretation must be tempered by consistent results in the literature showing that membership in an extended criminal network increases the frequency of criminal opportunities and activity.⁵¹ On this perspective, if we were able to control for criminal activity we might find that, if the number of crimes committed (λ) is held constant, offenders who rely on a criminal network would not have an increased chance of being re-arrested. The idea of criminal

⁴⁹ Gallupe, Bouchard and Caulkins, *No change is a good change?*, 81-89.

⁵⁰ Morselli, Tremblay and McCarthy, *Mentors and criminal achievement*, 17-43.

⁵¹ Hochstetler, A. “Sprees and runs: The construction of opportunity in criminal episodes.” *Deviant Behavior* 23, no.1 (2002): 45-74; Morselli, C., and P. Tremblay. “Délinquance, performance et capital social.” *Criminologie* 37, no.2 (2004): 89-122; Tremblay, P. Searching for suitable co-offenders. In *Routine activity and rational choice: Advances in criminological theory*, edited by R. V. Clarke and M. Felson. New Brunswick, NJ: Transaction.

success fits well with our other measure of criminal networks, which suggests that offenders who are part of a narrower network are less likely to be re-arrested. This analysis supports the conclusions of Bouchard and Ouellet, which highlight the importance of looking at the size and structure of offenders' criminal networks in understanding failure and achievement in criminal careers.⁵² If this interpretation is correct, we could conclude that, in terms of criminal success, there would be benefits to co-offending.

Although based on limited information, this study highlights the importance of patterns of co-offending for understanding future criminal behaviour. Our study not only reinforces the idea that habits of co-offending are a central dimension of active criminal careers but also recognizes the importance of considering these patterns from different perspectives.

In conclusion, it should be noted that much of the discussion is based on assumptions that need to be verified in further research. There are limitations to this study that, if overcome, might provide further insight into the effect of criminal networks. In particular, we argue that any explanation of desistance and criminal achievement is incomplete without reference to co-offending patterns. As was noted, official data do not accurately represent co-offending patterns, membership in criminal networks, or actual offending (offending without arrest). Research efforts using other types of data are necessary to deepen our understanding of various aspects of co-offending. In order to understand criminal behaviour, it is important to know how criminal groups operate, how they are formed (e.g., inclusion of new members, nature of partnership), their internal workings (e.g., hierarchy, processes, planning), etc. Criminal networks are not static; they evolve and

⁵² Bouchard and Ouellet, *A survival analysis of failure in the drug trade*, 70-86.

change over time. Uncovering the dynamics of these groups can help us understand individual behaviour. In this sense, it is also necessary to improve our knowledge about the interaction between criminal networks and patterns of co-offending, not only how these networks influence the decision to commit a crime but also how they structure patterns of co-offending.