Interactions among Employment and Crime for Juvenile Sex-Offenders

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Abstract

Objective: We study the bi-directional relationship between employment and crime for juvenile sex-offenders and investigate the moderating influences of age and employment length.

Method: We develop a bi-variate dynamic binary choice model to allow for interactions between employment and crime. The model takes into account statistical aspects such as state dependence and unobserved heterogeneity.

Results: For a sample of $N = 493$ juvenile sex-offenders, who are observed from age 18 until 28, we find significant negative predictive effects for employment on property offending and vice versa. For other types of offenses the model indicates that the negative correlation with employment is due to selection effects. This holds for all ages, but the negative effect of employment on property offending becomes stronger for the older cohorts, while the effect of property offending on employment decreases in magnitude. Employment length is found to be a mild moderating factor.

Conclusion: The evidence in favor of bidirectional negative relationships that increase in magnitude with age and employment length, suggests the importance of theories that emphasize cumulative (dis)advantage, such as social control theory.

Some keywords: Life-course, Panel data, Reciprocal, Heterogeneity, Moderating effects, Age, Employment quality.

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1 Introduction

The negative association between employment and crime has been emphasized by many theories from different fields of research. Almost all theories hypothesize a reducing effect of employment on criminal activity (e.g., Becker, 1968; Ehrlich, 1973; Merton, 1938; Hirschi, 1969; Sampson & Laub, 1993, 2005). This theoretical assumption is supported by a large body of empirical evidence that is summarized in the recent reviews of Mustard (2010) and Lageson & Uggen (2013).

In the opposite direction, crime and the reactions on offending imposed by society and the criminal justice system are often argued to reduce employment probabilities as a result of stigmatization or the process of job skill erosion (e.g., Lemert, 1967; Freeman, 1999; Western, 2006; Pager, 2007; Pager *et al.*, 2009). This latter finding is found less robust and mixed empirical evidence exists. This holds especially for the effects of incarceration, see the recent discussions in Kling (2006), Apel & Sweeten (2010) and Loeffler (2013).

Finally, factors such as age and employment quality moderate the relationships between employment and crime. For age, intensive employment is found to increase delinquency during adolescence and is associated with a reduction in offending after the transition into adulthood (e.g., Shover, 1996; Uggen, 2000; Paternoster *et al.*, 2003; Uggen & Wakefield, 2008). The influence of employment quality, rather than the mere status of employment, was documented in (Sampson & Laub, 1993; Crutchfield & Pitchford, 1997; Uggen, 1999; Sampson & Laub, 2003; Visher *et al.*, 2005; Uggen & Wakefield, 2008; Van der Geest *et al.*, 2011; Verbruggen *et al.*, 2012). Different definitions of employment quality, such as duration, job satisfaction and the long-term prospects of employment, are used.

The above broad findings, that concern the employment-crime association, are documented for high risk populations and general offender populations. For juvenile sex-offenders such finding have not been shown. Two main reasons exists for why understanding the employment-crime association for juvenile sex-offenders is important.

First, this specific group of offenders has been found to be at high risk for persistent criminal behavior because of problematic background characteristics, like adolescent and childhood deviant behavior, adverse personality and environmental characteristics and low educational levels. These characteristics can cause prolonged criminal activity over the life-course and limit employment chances (Moffitt, 1993).

Second, in many countries finding stable employment has become difficult for juvenile sex-offenders. For example in The Netherlands since 2004, all sex offenders are excluded from several types of employment in which they might be able to spend unsupervised time with children or individuals dependent on their care. A broad range of occupations are included within this rule. For instance taxi- or bus drivers, caregiver jobs, babysitters and janitors at schools.

Given the typically large stigmatizing effects of sexual offending, the problematic background characteristics of juvenile sex-offenders, and their increasing exclusion from the legal labor market, it is important to study the interaction between employment and crime for juvenile sex offenders. Recent studies found that the typical criminal career of a juvenile sex

offender follows a pattern that is similar to that of other juvenile offenders (e.g., Van den Berg *et al.*, 2011; Lussier *et al.*, 2012; Lussier & Blokland, 2014). Also, Van den Berg *et al.* (2014, 2015) have shown that employment reduces criminal behavior for juvenile sex-offenders. To the best of our knowledge no evidence exists for the reciprocal effect of crime on employment for juvenile sex-offenders.

In light of the findings discussed above the current study makes three contributions. First, we study the individual-level relationships between employment and crime for a large sample of ($N = 493$) juvenile sex-offenders, who are observed in early adulthood between ages 18 and 28. This subgroup of offenders received limited attention within the empirical literature, specifically with regard to life-course development and the protective effect of employment. Further insight into this is warranted as legal restrictions and stigmatization are likely to limit the employment probabilities for juvenile sex offenders, while some empirical evidence has indicated that employment has the potential to reduce their criminal behavior. Second, both directions of the relationship between employment and crime for juvenile sex offenders are studied. For general offender populations the effect of employment on crime and the effect of crime on employment has been extensively studied using a variety of methods. For juvenile sex offenders the evidence is limited. Third, we investigate the moderating influences of age and employment duration. This contribution can be viewed as a robustness check for our main contributions, but as the moderating influences of age and employment duration have been firmly established for general offender populations it seems reasonable to assume that similar age-graded and duration-graded perspectives for the employment-crime association are likely for juvenile sex-offenders.

In order to disentangle the interactions between employment and crime we adopt a reduced form modeling approach that resembles the approach of Thornberry & Christenson (1984). In particular, a bi-variate dynamic binary choice model is proposed that simultaneously models the employment and crime outcomes on the individual-level. When compared to Thornberry & Christenson (1984) our model differs in two ways. First, we model the outcomes using binary densities as opposed to adopting a linear model specification. Second, we control for unobserved heterogeneity using random individual-specific effects and age effects. The model is also closely related to the dynamic binary choice models adopted in Hyslop (1999), Keane & Sauer (2009) and Keane (2013). The main difference with their models is that we consider a bi-variate model, but the methodology for controlling for unobserved heterogeneity is similar, see also Alessie *et al.* (2004). In order to study the moderating influences of age and employment duration the baseline model specification is extended to allow for age-varying parameters that capture the predictive effects among employment and crime, the definition of the employment outcome is varied.

The remainder of this paper is organized as follows. The next section discusses theories and empirical evidence for the effect of employment on crime, whereas section 3 investigates the theoretical and empirical evidence for the reciprocal relationship. The theory sections are followed by section 4 which highlights the role of the moderating effects from age and employment duration. The labor market context for juvenile sex offenders is described in section 5. In section 6 details on the aim of the current study are presented, the model and

estimation method is explained (section 7), and section 8 discusses the sample and presents some descriptive statistics. Next, results are presented in section 9 and 10. Finally, section 11 entails a conclusion and discussion of the results, highlights the strengths and weaknesses of the study, discusses policy implications, and directions for future research.

2   How employment affects crime

The link between employment and crime is documented by different theoretical mechanisms. Some theories use an economic point of view to explain the relationship between offending and employment. The underlying framework is the concept of the *'homo economicus'*, or economic man, that views humans as rational beings who weigh the costs and benefits of their behavior out of self-interest and the desire for economic gain (Wadsworth, 2006).

Rational choice theories build on this concept by assuming that individuals make decisions whether to employ legal (paid employment) or illegal means (like stealing, robbing etc.) to obtain the desired outcome (e.g., Becker, 1968; Ehrlich, 1973). Strain theory by Merton (1968) also focuses strongly on utilitarian crimes committed to achieve economic success in society (measured by wealth and material possessions) that cannot be achieved through legitimate means. These theories explain the association between employment and offending by financial aspects that result from time allocation, implying that sufficient wages are the main feature of employment influencing the reducing effect on income-generating crimes.

The use of a framework focused on non-economic gains allows for a broader understanding of the relationship between employment and offending (Wadsworth, 2006). For instance, the routine activities approach states that there is an instantaneous effect of employment on offending, as routine activities change daily time structuring. When an individual is engaged in regular employment, time to engage in criminal opportunities is limited (Cohen & Felson, 1979). In a related fashion, when an individual spends more time at their job, the values, attitudes and behavior of others in the same positions are learned. These values and attitudes associated with the job culture will mostly disapprove of criminal activity (Sutherland & Cressey, 1978). In addition, the supervision of co-workers may have an inhibiting effect on offending (Hirschi, 1969).

The empirical findings for the association between employment and offending are mixed. A large proportion of the studies is cross-sectional and can therefore not examine within -individual differences (Uggen & Wakefield, 2008). Longitudinal studies that use careful control methods in an attempt to deduce causality have found a reducing effect of employment on criminal activity for various samples (e.g., Sampson & Laub, 1993, 2003; Crutchfield & Pitchford, 1997; Savolainen, 2009; Uggen, 2000; Wadsworth, 2006; Van der Geest *et al.*, 2011; Mesters *et al.*, 2016). However, some studies found the effect of employment on offending to be dependent on age (Uggen, 2000; Paternoster *et al.*, 2003), job quality (Apel *et al.*, 2006; Van der Geest *et al.*, 2011), or employment stability (Crutchfield & Pitchford, 1997). Some studies found no link between offending and employment (Horney *et al.*, 1995;

MacKenzie & De Li, 2002). In light of these mixed results, it appears the relationship between employment and offending may be conditional (on age, job quality and employment stability).

3   How crime affects employment

There are also theories that suggest that offending affects employment outcomes. Hirschi (1969) states that prior offending can weaken social bonds which may prevent individuals from future employment. Sampson & Laub (1997) also suggest the weakening of conventional bonds to society by the gradual process of cumulative disadvantage and state dependence. Sampson & Laub (1993) identify cumulative disadvantage as the dynamic process of childhood antisocial behavior and adolescent delinquency as a possible cause of adult crime that limits individuals from obtaining adult social bonds. The process of state dependence postulates that delinquent behavior has a causal effect on future delinquent behavior by reducing social capital attributed by conventional social bonds, due to incarceration as well as exclusion form society after incarceration (Sampson & Laub, 1993). Moreover, if an individual is incarcerated it is impossible to obtain specific work experience, this will limit chances of employment after incarceration since job skills are often insufficient (Holzer *et al.*, 2004). Thus, individuals who have spent a considerable amount of time incarcerated become unattractive employees.

It is not merely the lack of job skills that cause ex-offenders to be unattractive employees, the label received after being incarcerated also adds to the unattractiveness (Becker, 1963). Criminal behavior, and interaction with the criminal justice system, labels an individual as an offender, tainting the individuals' self-image and public identity which in turn affects future life outcomes (Nagin & Paternoster, 1991). If an individual has been incarcerated the public will associate the ex-offender with negative characteristics, such as untrustworthiness or aggressiveness (Holzer *et al.*, 2004). An employer can be influences by these assumed negative characteristics not to hire an ex-offenders. Additionally, the self-image of the ex-offender can also be influenced by labeling. This process, the self-fulfilling prophecy (Becker, 1963), causes the ex-offender to conform to the image others have of him or her, the image of a criminal. If an individual develops a criminal self-image he or she might not expect to be hired by employers, and thus will lose faith in finding a job. Moreover, Becker (1963) underlines that the label of offender will reduce associations with non-delinquent peers, conventional institutions and roles, thus limiting employment chances. In sum, some theories state that the official reactions to offending, such as conviction and incarceration, will lead to stigma and the association of the ex-offender with negative characteristics, while others argue that the deterioration of human capital explains the negative influence on employment.

For the effect of offending on employment a large body of literature has documented difficulties of obtaining legal employment after criminal behavior, particularly after detention (e.g., Pager, 2003, 2007; Pager *et al.*, 2009; Apel & Sweeten, 2010; Raphael, 2011; Loeffler, 2013). The majority of studies focus on the consequences of incarceration rather than convictions and a variety of methods are used. Pager (2003) and Pager *et al.* (2009) use field

experiments and find that the mark of a criminal record significantly decreases the probability of getting a job. Apel & Sweeten (2010) and Loeffler (2013) use registered data and advanced statistical methods, such as propensity score matching and instrumental variables regression, to show that a substantial part of the negative relationship might be spurious.

4 The moderating effect of age and employment duration

The empirical evidence for the association among employment and offending is mixed. This might partially be attributable to the moderating influences of age and employment quality, as well as the differences in statistical methods and samples.

4.1 Age

Most theories on the employment-offending association can be positioned in an age-graded framework, indicating the moderating effect of age, where different outcomes for the employment-offending relationship are assumed for different age-groups. In such a framework certain aspects of employment that have a reducing effect on offending for adults may have an increasing effect or no effect for adolescents. Adolescents are usually employed in minimum wage jobs with little prospects due to limited schooling, therefore the likelihood of the presence of delinquent co-workers increases (Wright & Cullen, 2000). Full-time employment may thus increase criminal activity for adolescents, as they are inclined to learn adult values and attitudes from their older co-workers according to learning theory (Sutherland & Cressey, 1978). These behaviors can be positive when the co-workers exhibit conventional behavior. However, less conventional co-workers may introduce the adolescents to deviant behavior, increasing the chances of delinquent behavior (Wright & Cullen, 2000). Also, social control becomes limited as adolescents spend more time away from parents and school when employed. Moreover, due to increased monetary abilities, adolescents are able to spend unstructured time with peers in pubs, clubs and other settings associated with deviance. Adults, however, will be more inclined to use the economic gains of employment to support their family instead of spending it on unstructured time with peers.

Sampson & Laub (1993) also postulate such an age-graded effect as they use a life course developmental perspective that focuses on the changes in relevant institutions of social control that vary by age. For instance, social bonds with family, school and peers are important for the adolescence period. When the value that these social bonds hold for an individual exceeds the costs of offending (e.g., losing friends), delinquency will become less attractive. Sampson & Laub (1993) named this value social capital; the importance that the ties to society hold for the individual. After adolescence, a period of preparation for adulthood follows. This so-called emerging adulthood ranges from about age 18 up to 25 and is characterized by exploration with limited parental control, and with the aim of establishing a unique personal identity (Arnett, 2004). In this period a shift occurs in relevant institutions

of social control, from family, school and peers to more prominent bonds with partners and co-workers. For employment, Arnett (2004) argues that in the early stages of emerging adulthood the individuals will experience job instability (e.g., short and temporary employment) while they are still exploring their options. Yet, in the later stages of emerging adulthood employment explorations become more serious and enduring, since stakes will be higher as stable employment is needed as a foundation for adult life (Arnett, 2004). Overall, several theories state that the nature of employment changes with the coming of age and its effect on delinquency may thus vary per age period or even year.

With regard to the effect of offending on employment, little is known about the influence of age. Sampson & Laub (1993) argue that cumulative disadvantage enhances over time with childhood antisocial behavior and adolescent delinquency causing adult crime due to the weakening of social bonds. Therefore, one might argue that chances of employment will decrease more strongly over time if an individual continues offending. The labeling of an adolescent might also cause difficulties in obtaining employment and education. This might result in a self-fulfilling prophecy, where the self-image of an offender might become more negative over time, decreasing employment chances. This process might be experienced somewhat more by juvenile offenders, as juvenile are still developing a self-image and thus more susceptive to the label of 'criminal' (Arnett, 2004).

4.2   Employment duration

Implicitly the theory by Arnett (2004) also hypothesizes a moderating effect of employment duration when interacted with age. With maturation the importance of stable employment becomes more clear and as stated by Arnett (2004) is needed as a foundation for adult life. Moreover, Sampson & Laub (1993, 2005) view the accumulation of human and social capital as a gradual and cumulative process. Therefore, over time social capital obtained by stable employment will increase due to the accumulating bond to conventional society. This bond will enhance the possibilities for the individual to knife-off the (delinquent) past, engage in routine activities, invest in new relationships that foster social support causing direct or indirect supervision and control, and to allow identity change (Sampson & Laub, 2005, p. 34).

For this reason, they used employment stability as a measure of employment quality in their initial empirical work. The findings supported their theory as their measure of employment quality was found important in predicting desistance (Sampson & Laub, 1993). In their later work Sampson & Laub (1993) collected life history narratives from 52 men in the Glueck sample. The findings again supported the assumption that stable employment is a salient life-event that may lead to desistance. Crutchfield & Pitchford (1997) also found that the time spent being employed (duration) significantly reduced offending. However, some studies using stability or duration as a measure of employment found no effect on offending (e.g., Giordano *et al.*, 2002; Piquero *et al.*, 2002).

Studies focusing on the effect of imprisonment found mixed evidence for the moderating effect of employment duration. With regard to stable employment **?** found that if an

individual had stable employment before incarceration they were more likely to be employed when they were released from prison. Often these ex-prisoners would return to their pre-prison employer. This finding highlights the importance of stable employment, since the stigma attached to incarceration and crime seems to have less influence if an individual had stable employment prior to the offense. On the other hand, the study by Nagin & Waldfogel (1995) found that conviction decreases job stability in juvenile offenders. Van der Geest *et al.* (2011) found a similar result, as the juvenile delinquents in their sample had relatively more temporary jobs.

5   The juvenile sex offender and the labor market

The theoretical mechanisms by which employment may reduce offending do not exclude sex offenders. However, specific theories for the interaction between crime and employment for juvenile sex offenders are currently not available. Therefore it is difficult to formulate specific hypothesis regarding the employment-crime association for juvenile sex offenders beyond those that can be derived from the general theories. Despite this, previous empirical studies found juvenile sex offenders to resemble general offender populations: a decreasing effect of employment on crime was found. This evidence, which is discussed in detail below, should be seen in the context of the legal position of sex offenders, which is different with respect to other offenders.

Since 2004, all sex offenders in the Netherlands, the country where this study took place, are excluded from specific types of employment in which they might be able to spend unsupervised time with children or individuals dependent on their care. A broad range of occupations are included under this rule, for instance taxi- or bus drivers, caregiver jobs, babysitters and janitors at schools. For the above reason the employment opportunities for sex offenders are limited. Therefore, they might experience more difficulties in obtaining stable employment than other (ex-) offenders. These limitations make them an interesting group to study, because if employment is found to reduce the offending probability in juvenile sex offenders, reducing employment opportunities for sex-offenders might not be an advisable policy.

Empirically, only a few studies investigated the extent to which employment reduces offending in sex offenders. The studies that were conducted emphasized the importance of stable employment; we are not aware of any studies that have focused on the age-graded effect of the employment-crime association in sex offenders. Kruttschnitt *et al.* (2000) found sex offender treatment and stable employment to be the only aspects related to reduced general recidivism rates in a sample of male adult sex offenders. Another study by Hanson & Harris (1998) found that the sex offenders with the highest reoffense risk were those who lacked stable employment. Within clinical practice the importance of employment is also acknowledged as a rehabilitative factor. The Good Lives Model assumes that sex offenders require certain 'primary goods' like excellence in employment, that can enhance psychological well-being and reduce offending (Laws & Ward, 2011). However, empirical support for the

Good Lives Model is scarce and practitioners use it mainly as a framework that gives an overview of treatment options (Fortune *et al.*, 2012).

We are aware of only one study that explicitly looked into the relationship between employment and offending for juvenile sex offenders. Van den Berg *et al.* (2014) studied a large sample of juvenile sex offenders over a long period from adolescence to young adulthood (age 18 up to 28). They found juvenile sex offenders to start off on the labor market early, but with the coming of age the employment rate stagnates and even declines after age 27. They explain this phenomenon by the fractured employment careers with many short contracts and different job types (regular employment and employment through an employment agency), but also the lack of schooling and unappealing personal characteristics (lacking social skills, low IQ, psychological problems). However, Van den Berg *et al.* (2014) did find a significant reducing effect of regular employment on offending. This finding raises many questions about the mechanisms behind the relationship of employment and offending. Although the sample of juvenile sex offenders faced many (legal) barriers in the obtaining of stable and qualitative employment, and the findings from the study by Van den Berg *et al.* (2014) highlighted low quality and instability of the employment, employment still significantly reduced general offending.

6 The current study

The focus of this study is on the *bi-directional* relationship between employment and crime for juvenile sex-offenders and the influence of the moderating factors *age* and *employment duration* on this relationship. We explore the employment-crime association in two steps.

First, the theoretical and empirical evidence indicates that the relationship between employment and crime is bi-directional. In order to disentangle the bidirectional relationship we propose a bi-variate dynamic binary choice model. A more detailed discussion of the general model is given below. There we also provide a detailed comparison to more common uni-variate dynamic binary choice models. We highlight the advantages of the bi-variate model.

Second, we investigate how both directions of the employment-crime association are moderated by age and employment duration. Theoretically, a variety of mechanisms have been proposed that all suggest that the effect of employment on offending becomes more negative with maturation. Also, evidence has been found that stable employment, or longer employment spells, reduce the probability for criminal behavior more when compared to shorter employment periods.

Less theory is available for moderating influence of age on the effect of crime on employment. It could be argued, following the theory of cumulative disadvantage by Sampson & Laub (1993), that chances of employment decrease with age, for an individual who continues offending. Also, the stigma associated with offending might have a more negative influence on juveniles as they are still developing a self-image (see; Arnett, 2004). The juvenile will thus be more inclined to take-on the label of 'criminal' and starts behaving as such.

Consequently, they would view themselves as unemployable and might not even try to find employment. It could be hypothesized that with age the effect will of crime on offending will become gradually more negative, however the influence of crime on employment chances for juveniles might be greater to start off with. The influence of employment duration on the crime-employment relationship remains unclear. On the one hand, evidence has been found that previous stable employment has a positive effect on employment chances after incarceration (Ramakers *et al.*, 2015). While on the other hand, juvenile delinquents were found to be employed more often in temporary jobs Van der Geest *et al.* (2011) and that overall the employment stability decreases after conviction Nagin & Waldfogel (1995).These mixed results make it difficult to state hypothesis with regard to the influence of employment duration on the relationship between crime and employment.

We extend the bi-variate dynamic binary choice model in novel ways to investigate the moderating influences of age and employment length. In particular, we adopt different definitions for the employment outcome which depend on the length of the employment spell and we allow the parameters that measure the interactions among employment and crime to fluctuate with age.

7 Model and estimation

Next, we discuss the bi-variate dynamic binary choice model that facilitates the simultaneous modeling of the employment and offending outcomes. The baseline model specification is closely related to the specification considered by Alessie *et al.* (2004) and Mesters *et al.* (2016) who build on the earlier work of Thornberry & Christenson (1984). We first establish some notation. For $i = 1, \ldots, N$ individuals and $t = 1, \ldots, T$ time periods we denote by:

- $y_{j,i,t}$: dependent variables: dummies for employment ($y_{1,i,t} = 1$ if the individual i is employed for at least 90 days at age t) and crime ($y_{2,i,t} = 1$ if the individual i commits a crime at age t),

- $x_{i,t}$: the vector of observed control variables for individual i at age t,

- $\mu_{j,i}$: the individual-specific effects ($j = 1, 2$) that we use to control for unobserved heterogeneity, $\mu_{1,i}$ is used for the employment equation and $\mu_{2,i}$ for the crime equation,

- $\xi_{j,t}$: the age dummies ($j = 1, 2$) that we use to control for common age effects, $\xi_{1,t}$ is used for the employment equation and $\xi_{2,t}$ for the crime equation,

- $\epsilon_{j,i,t}$: the disturbance terms.

We use the threshold of 90 days to select an individual into the employment category. This is in accordance with other studies that have used 90 days employment a year as a cut-off point in order to establish if the employment was "serious" (e.g., Verbruggen *et al.*, 2012; Van der Geest *et al.*, 2011; Van den Berg *et al.*, 2014). When the baseline model is extended we will vary this threshold of 90 days to study the influence of employment duration.

For the crime variable three different definitions of crime are considered that are related to serious, property and violent offenses. The exact crime types that are included in each outcome variable are discussed below. Some experimentation has been done with a separate category for sexual offending, but the number of occurrences for this crime type were too small to yield any significant results. It is thus important to clarify that all individuals have already committed a sexual offense before the start of the observational period. This implies that initial conditions matter as many differences between the individuals might have already been established prior to the sampling.

The vector of observed control variables is the same for both the employment and the crime equations. It includes controls for marriage, children and exposure (percentage of time spent out of prison per year). All these control variables can potentially influence employment and crime. To control for unobserved heterogeneity we include random individual-specific effects ($\mu_{i,j}$) and fixed age dummies ($\xi_{j,t}$). The age dummies are common for all individuals.

The model equations for the employment outcome are given by

$$y_{1,i,t} = \begin{cases} 1 & \text{if } y_{1,i,t}^* > 0 \\ 0 & \text{if } y_{1,i,t}^* \leq 0 \end{cases}, \qquad y_{1,i,t}^* = y_{1,i,t-1}\gamma_{11} + y_{2,i,t-1}\gamma_{12} + x_{i,t}\beta_1 + \xi_{1,t} + \mu_{1,i} + \epsilon_{1,i,t}, \quad (1)$$

where outcome $y_{1,i,t} = 1$ indicates that individual i was employed for more than 90 days at age t. Corresponding one-to-one with $y_{1,i,t}^* > 0$, which transforms the binary outcomes for $y_{1,i,t}$ into continuous outcomes of the latent process $y_{1,i,t}^*$. This process is interpretable as the transformed probability for employment, which is determined by six different components: $y_{1,i,t-1}\gamma_{11}$ measures the effect of the previous employment outcome on the current employment probability, $y_{2,i,t-1}\gamma_{12}$ captures the effect of the previous crime outcome, $x_{i,t}\beta_1$ captures the effects of the observed control variables, $\mu_{1,i}$ is the individual-specific effect, $\xi_{1,t}$ is the age dummy and $\epsilon_{1,i,t}$ the disturbance term.

A similar structure is utilized for the crime outcome $y_{2,i,t}$, which is related to the latent process $y_{2,i,t}^*$. We have

$$y_{2,i,t} = \begin{cases} 1 & \text{if } y_{2,i,t}^* > 0 \\ 0 & \text{if } y_{2,i,t}^* \leq 0 \end{cases}, \qquad y_{2,i,t}^* = y_{1,i,t-1}\gamma_{21} + y_{2,i,t-1}\gamma_{22} + x_{i,t}\beta_2 + \xi_{2,t} + \mu_{2,i} + \epsilon_{2,i,t}, \quad (2)$$

where the latent process $y_{2,i,t}^*$ is determined by the lagged outcomes of employment $y_{1,i,t-1}\gamma_{21}$ and crime $y_{2,i,t-1}\gamma_{22}$, the observed control variables $x_{i,t}\beta_2$, the individual-specific effect $\mu_{2,i}$, the age dummy $\xi_{2,t}$ and the disturbance term $\epsilon_{2,i,t}$.

We assume that the individual-specific effects $\mu_{j,i}$ are random which has the advantage that the correlation between the individual-specific effects of the employment and crime equations can be modeled. The interpretation of this coefficient is discussed below. A disadvantage of this random assumption versus an alternative fixed effects assumption is that there can be correlation between the random effects $\mu_{j,i}$, the control variables x_t, and the initial conditions $y_{j,0}$. If this correlation is not accounted for several problems will occur (see discussion; Mundlak, 1978) and Chamberlain (1980) for linear models and Wooldridge

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(2005) for nonlinear models. We follow Wooldridge (2005) and model the random effects $\mu_{j,i}$ as functions of the control variables and the initial observations.

$$\mu_{1,i} = \delta_{10} + \sum_{s=1}^{T} x_{i,s}\delta_{1s} + y_{1,i,0}\lambda_{11} + y_{2,i,0}\lambda_{12} + v_{1,i},$$

$$\mu_{2,i} = \delta_{20} + \sum_{s=1}^{T} x_{i,s}\delta_{2s} + y_{1,i,0}\lambda_{21} + y_{2,i,0}\lambda_{22} + v_{2,i}, \tag{3}$$

where

$$\begin{bmatrix} v_{1,i} \\ v_{2,i} \end{bmatrix} \sim N\left(\begin{bmatrix} 0 \\ 0 \end{bmatrix}, \begin{bmatrix} \sigma_{v,1}^2 & \rho_v \\ \rho_v & \sigma_{v,1}^2 \end{bmatrix} \right), \tag{4}$$

However, the premise that the parameters δ and λ capture the correlations between the random effects and the initial observations and control variables remains the same. Under the assumption that we can adequately capture these correlations in this manner the remaining individual-specific effects $v_{1,i}$ and $v_{2,i}$ follow a bi-variate normal distribution which has mean zero and correlation parameter ρ_v.

Finally, the disturbances in (1) and (2) are modeled by a bi-variate normal distribution with correlation parameter ρ_ϵ. In particular, we have

$$\begin{bmatrix} \epsilon_{1,i,t} \\ \epsilon_{2,i,t} \end{bmatrix} \sim N\left(\begin{bmatrix} 0 \\ 0 \end{bmatrix}, \begin{bmatrix} 1 & \rho_\epsilon \\ \rho_\epsilon & 1 \end{bmatrix} \right). \tag{5}$$

which corresponds to the familiar bi-variate probit model for the outcomes $y_{1,i,t}$ and $y_{2,i,t}$. Alternatively we could assume that the disturbances follow an extreme value type 1 distribution to obtain a logit model for the outcomes. The benefit of the normal assumption is that the contemporaneous correlation can be captured between the outcomes through the correlation parameter ρ_ϵ.

The complete baseline model is given by equations (1), (2), (3) and (5). All parameters of the model can be summarized in the vector ψ. The estimation of the model parameters is performed by the Monte Carlo maximum likelihood methods that are developed in Mesters & Koopman (2014).

7.1 Discussion and relationship to uni-variate models

Now that the baseline model has been described it is useful to discuss its interpretation. The main parameters of interest are γ_{11}, γ_{12}, γ_{21} and γ_{22}. The parameters γ_{11} and γ_{22} capture the state dependence [1] in the employment and crime outcomes. In other words, they capture the predictive effect of being employed or criminally active at age $t-1$ on the corresponding transformed probabilities for employment and crime at age t. The parameters γ_{12} and γ_{21} capture the predictive cross-effects from crime on employment and from employment on crime.

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[1]state dependence is the process of previous criminal delinquent behavior increasing the chances of future criminal behavior due to incarceration and exclusion from society, which reduces the social capital attributed by conventional social bonds Sampson & Laub (1993). The same can be assumed for employment, as previous employment will increase chances of future employment, simultaneously increasing social capital.

First, regardless of the control variables, we emphasize that we are not estimating the effect of employment at age t on being criminally active at age t. The estimates for the parameters γ pertain to predictive effects of employment and crime at age $t-1$ on these outcomes at age t. Getting consistent estimates of crime on employment at the same ages requires instrumental variables. Valid instruments are not available for the current study and in general they are typically not available for individual-level longitudinal studies. Nevertheless, the predictive estimates remain very relevant from a policy perspective. For instance, if being employed predicts a lower crime rate for the next age period this would still yield important implications for policy development.

To explain how the model controls for unobserved heterogeneity, we first consider only the model for the employment outcome itself:

$$y_{1,i,t} = \begin{cases} 1 & \text{if } y^*_{1,i,t} > 0 \\ 0 & \text{if } y^*_{1,i,t} \leq 0 \end{cases}, \qquad y^*_{1,i,t} = y_{1,i,t-1}\gamma_{11} + x_{i,t}\beta_1 + \xi_{1,t} + \mu_{1,i} + \epsilon_{1,i,t},$$

Here the influence of crime has been removed completely and the model reduces to a uni-variate dynamic binary choice model. The model can distinguish between unobserved heterogeneity ($\mu_{1,i}$) and state dependence $y_{1,i,t-1}\gamma_{11}$, see for more discussion Hyslop (1999). Both phenomena (unobserved heterogeneity and state dependence) can explain why employment in period t can predict employment in period $t+1$. The distinction between the influence of unobserved heterogeneity, which creates spurious persistence, and the state dependence is important. The former would suggest that individuals remain employed because of underlying characteristics, such as abilities and preferences, that select them into employment whereas the latter suggests that structural features of being employed have a direct effect on being employed in the next period. Think for example about the social bonds and financial security that employment creates which could be a direct motivation to remain employed.

A similar uni-variate model can be formulated for the crime outcomes.

$$y_{2,i,t} = \begin{cases} 1 & \text{if } y^*_{2,i,t} > 0 \\ 0 & \text{if } y^*_{2,i,t} \leq 0 \end{cases}, \qquad y^*_{2,i,t} = y_{2,i,t-1}\gamma_{22} + x_{i,t}\beta_2 + \xi_{2,t} + \mu_{2,i} + \epsilon_{2,i,t},$$

In this model the influence of employment has been removed. Similarly, this uni-variate model can explain persistence in the crime outcomes by either unobserved heterogeneity and state dependence. These different explanations for persistence in crime outcomes have extensively been discussed from a theoretical perspective in Nagin & Paternoster (2000). It is important to note that only if the control variables adequately capture the unobserved heterogeneity the estimate for the state dependence parameter γ_{22} is consistent.

Now lets turn to the bi-variate model. In addition to the uni-variate models, the bi-variate model can account for cross-effects between employment and crime. Following a similar reasoning as above, if crime in period t predicts employment in period $t+1$ this can be due to correlated unobserved heterogeneity (correlation between random effects ρ_v) or due to the cross effect from crime on employment (parameter γ_{12}). The same holds for the predictive effect of employment on crime. Hence, if the estimate for ρ_v is equal to zero we

could estimate both equations separately.

When the parameter ρ_v is a priori set to zero while in reality it is not zero, then the spurious correlation is typically attributed to the cross-effects. Generally, under the assumption that the true spurious correlation ρ_v is negative, the cross dependence parameters would be overestimated. In particular, we would assign the spurious correlation between employment and crime to the structural parameters γ_{12} and γ_{21}

This distinction between unobserved heterogeneity and cross-effects is important for understanding the dynamic relationship between employment and crime. For example if the parameter γ_{21}, which captures the lagged effect of employment on crime is not significant but ρ_v is significant and negative, than this would imply that individuals who select into employment with a higher probability and at the same time select into crime with a lower probability. In this scenario there would be no advantage of increasing employment opportunities for juvenile sex offenders since the negative correlation is entirely spurious. In our empirical study we show the results from bi-variate and uni-variate models to demonstrate these different implications.

7.2 Extensions for moderating age and employment length

The basic dynamic binary choice model is extended in several ways to investigate the moderating influences of age and employment length. First, to investigate the moderating effects of age on the structural part of the relationship between employment and crime we model the parameters γ as age-varying processes. In other words, we change γ_{11}, γ_{12}, γ_{21} and γ_{22} into $\gamma_{11,t}$, $\gamma_{12,t}$, $\gamma_{21,t}$ and $\gamma_{22,t}$, for $t = 18, \ldots, 28$. To retain a parsimonious model we use flexible cubic spline functions to model the time-varyimg parameters, see for more discussion (Poirier, 1976). This approach is justified if we assume that the interactions between employment and crime vary smoothly with age.

Second, to investigate the moderating effect of employment duration we adopt a simple strategy that consists of changing the definition of the employment variable. In the current model specification the threshold for "serious" employment is 90 days. We vary this definition to study the moderating effect of employment duration. Investigating the influence of employment duration in this manner is convenient since the entire model is adjusted to one change in the construction of the model parameters. When we then compare the parameters for different definitions of employment we can highlight for which duration of employment there exists interactions with crime.

8 Data

8.1 Sample

The research group of 493 juvenile sex-offenders was established using a sex offense as the selection offense, committed between 1988 and 2001. Their age at the selection offense ranged from 10 to 17 years, with an average of 14.4 years (SD 1.8). The selection offense consisted of

at least one conviction for a contact sexual offense (where physical contact between offender and victim occurred) ranging from sexual assault to rape. During the sampling offense all perpetrators had an active role. About 16% of the sample committed the offense with at least one co-offender, the remaining 84% were solo offenders. In 2009 and 2010 information was collected from register records about offending, employment and personal life circumstances (marriage and parenthood) and is complete since age 18. The mean follow-up time by then was 14 years, the sample members were between age 18 and 40 with an average of 28.7 years (SD 3.9). Before the end of the observation period, seven persons died and fourteen emigrated (according to the Dutch Municipal Personal Records Database).

Previous research found a high prevalence for psychological and psychiatric disorders in sex offenders (e.g., Seto & Lalumière, 2010; Smallbone, 2006; Van Wijk *et al.*, 2005). Moreover, (juvenile) sex offenders were found to be socially isolated, as their social skills were less developed causing difficulties in their social functioning within society (e.g., Seto & Lalumière, 2010; Van Wijk *et al.*, 2005). For the current sample we found similar adverse background characteristics. About half of the sample members have been diagnosed with a psychiatric or psychological disorder. 80% had limited social interactions with peers and 81% had low self-esteem. Moreover, the sample is characterized as, on average, highly neurotic and introvert. All in all, the current sample of juvenile sex offenders strike as vulnerable, with profiles comparable to high-risk juveniles in other studies. (e.g., Verbruggen *et al.*, 2012; Van der Geest *et al.*, 2011). Furthermore, Van den Berg *et al.* (2011) showed that not only the profiles of the juvenile sex offenders are comparable, but that also their criminal career are similar to those of other high-risk juvenile samples.

8.2   Register Data

Three sources of register data were used: judicial documentation, municipal marriage and parenthood registrations, and centralized employment records.

All information on employment was obtained from the database 'SUWINET' of the Ministry of Social Affairs and Employment in the Netherlands and from the trade register of the Netherlands Chamber of Commerce (Kamer van Koophandel). The first data source holds individual level information on employment by an employer, by an employment agency and social benefits. In order to use the employment data in our analysis, the number of days employed was calculated from the start to end date of an employment contract. The second data source refers to business ownership information, and registration and termination date of the business were used to compose the employment variable. Combining the two data sources we constructed a variable that counts the number of days per year an employment contract(s) spanned. We included employment when a sample member had regular employment with an employer, was a business owner, was employed through sheltered workshops for the (mentally) disabled, or employed through a temporary employment agency. Permission for the use of this data was granted by the Ministry of Social Affairs and Employment.

The offending data originates from the Judicial Documentation (JD) registered at the Judicial Documentation Center in Almelo. The JD, can be considered as a 'rap sheet'

and contains all offenses registered for prosecution in the Netherlands, regardless of the verdict. The offenses in the JD are registered by date of perpetration, offense committed (coded according to the Dutch Criminal Code, Wetboek van Strafrecht), conviction date and sentence. For this study we excluded all offenses for which the sample member was acquitted or when prosecution dropped the case on 'technical grounds' (mainly when the case was expected to end in acquittal). For our dependent variable crime $y_{2,i,t}$ we consider 3 categories for defining the outcome: property, violent and a broader category of all serious offending. The property offending category includes embezzlement, theft, forgery and counterfeiting, breaking and entering, burglary, fraud and dealing in stolen property. The violent offending category includes assaults, threats, homicides, sexual offenses, robberies and kidnapping. The serious offending variable contains: sexual offending, (non-sexual) violent offending, property offending and other offending (consisting mainly of drug offenses and offenses as described in the Dutch law on weapons and ammunition). The offending data is complete for all sample members from age 12 up to the end of the data collection. However, for the analysis we used age 18 to 28, since we are interested in the effect of employment on offending and our employment data is complete from age 18 and onward. The Dutch Ministry of Security and Justice granted permission for the use of this data.

Additionally, several control variables were used, all measured at the individual level. These control variables are exposure (percentage of time out of prison per year), marriage and children. These variables are all dynamic variables and may lead to changes in offending (Sampson & Laub (1993); e.g. for marriage and divorce: Bersani *et al.* (2009); Stolzenberg & D' Alessio (2007)). Exposure will influence offending since in our sample not all individuals have served time in prison: for the sample members who were in prison their time-at-risk or exposure time to re-offend will be shorter than for the never incarcerated sample members (e.g., Nagin *et al.*, 2009). By including marriage and children we control for their influence on the relationship between offending and employment.

9 Bivariate model results

Next we discuss the estimation results for the sample of juvenile sex-offenders. In this section we discuss the estimates from the model discussed in Section 7 and in the next section we discuss the results from moderating age and employment length.

We estimated the parameters of the bi-variate dynamic binary choice model and the estimates are presented in the top panel of Table 1.

The estimates indicate that the state dependence in employment is high. The coefficients for γ_{11} are all large (≈ 1.4) and significant. This indicates that working at least 90 days at age t is a strong predictor for working at least the same amount of days at age $t + 1$. Recall that the coefficient γ_{11} measures the structural predictive effect of employment. It thus implies that certain features of employment, such as social bonds and financial means, have strong effects on remaining employed. We notice that the value of the coefficients barely changes when employment is analyzed simultaneously with different crime types. This implies that

the effect of employment on future employment is quite independent from the effects of the different crime types.

The predictive cross effect of property crime on employment as measured by the parameter γ_{12} is significant and negative. We do not find significant and negative effects for violent crimes and the overarching category of serious crimes on employment. This indicates that there is something in the nature of violent and other crimes such as weapons violations that does not have a negative effect on future employment probabilities. First, it learns us that background checks are definitely not the only mechanism by which crime affects employment, because if this were the case than all crime types would affect employment. A possible explanation is that the financial gains of property crimes motivates individuals to not participate in legal employment. We develop this possibility further in the discussion and there incorporate the evidence from the next section.

The predictive cross-effect of employment on property crime significant and negative. For violent and serious offenses this effect is not significant. From the negative structural interaction among employment and property crime we draw the following conclusions ... *please add*

The state dependence in the offending outcomes is sizable for serious and property offenses. For violent offenses it is less. *please add*

The control variables for the employment equation show that marriage and exposure both increase the utility of employment, indicating that life events do influence each other and should be studied in combination, as suggested by Shanahan (2000). The fact that exposure increases the utility of employment is as expected since imprisonment interrupts life course transitions and therefore will arguably have a negative influence on employment opportunities (Apel & Sweeten, 2010). Periods without or with little incarceration will therefore positively influence the employment utility. For parenthood a small negative effect is found. The control variables for the offending equation indicate that marriage has a small negative effect on the offending utility. This is in accordance with several empirical studies which found marriage to reduce the offending probability (Bersani *et al.*, 2009). Exposure has a negative effect on the offending utility, while parenthood has a positive effect.

In the bottom panel of Table 1 we present the results of the restricted model where the spurious correlation parameters ρ_v and ρ_ϵ are fixed at zero. We refer to these estimates as the uni-variate estimates, because as discussed in Section 7.1 under this restriction the models for employment and crime can be estimated separately. We find that incorrectly fixing the spurious correlation parameters to zero leads to overestimating the cross-effects among employment and offending. For example, the effect of employment on serious offending is -0.264 and significant according to the univariate model whereas the bivariate model estimates the effect at -0.099 and it is testing not to be significant.

Overall the bivariate model separates structural effects from spurious correlations in a panel data setting. The model also distinguished the two different structural relationships. It showed that both structural effects (offending on employment and employment on offending) are negative and significant for property offenses, indicating that the association between property offending and employment is indeed reciprocal.

Table 1. Parameter Estimation Results

Parameter	Work 90 days	Serious Offending	Work 90 days	Property Offending	Work 90 days	Violent Offending
	Bi-variate Estimates					
γ_{11}	1.474^* $_{0.070}$	-	1.495^* $_{0.070}$		1.491^* $_{0.080}$	
γ_{12}	-0.176 $_{0.095}$	-	-0.253^* $_{0.122}$		0.058 $_{0.145}$	
γ_{21}	-	-0.099 $_{0.091}$		-0.264^* $_{0.124}$		0.011 $_{0.135}$
γ_{22}	-	0.294^* $_{0.089}$		0.324^* $_{0.093}$		0.105 $_{0.141}$
β_1	0.320 $_{0.167}$	0.016 $_{0.191}$	0.320 $_{0.165}$	-0.099 $_{0.270}$	0.316 $_{0.173}$	-0.152 $_{0.260}$
β_2	-0.070 $_{0.085}$	0.250^* $_{0.091}$	-0.074 $_{0.086}$	0.163 $_{0.116}$	-0.077 $_{0.085}$	0.284^* $_{0.115}$
β_3	3.501^* $_{0.367}$	-2.319^* $_{0.341}$	4.045^* $_{0.709}$	-1.324^* $_{0.315}$	4.036^* $_{0.879}$	-2.634^* $_{0.619}$
$\delta_{0,1}$	-4.390^* $_{0.371}$		-4.958^* $_{0.697}$		-4.970^* $_{0.957}$	
$\delta_{0,2}$	-	1.058^* $_{0.358}$		-0.256 $_{0.348}$		0.807 $_{0.667}$
λ_{11}	0.430^* $_{0.093}$		0.380^* $_{0.154}$		0.434^* $_{0.100}$	
λ_{12}	-0.170 $_{0.096}$		-0.288^* $_{0.146}$		-0.310^* $_{0.147}$	
λ_{21}		-0.307^* $_{0.102}$		-0.099 $_{0.122}$		-0.241 $_{0.135}$
λ_{22}		0.360^* $_{0.104}$		0.380^* $_{0.154}$		0.511^* $_{0.163}$
$\sigma_{v,1}$	0.307^* $_{0.068}$		0.293^* $_{0.065}$		0.302^* $_{0.079}$	
$\sigma_{v,2}$		0.308^* $_{0.070}$		0.324^* $_{0.093}$		0.299^* $_{0.092}$
ρ_v	-0.167^* $_{0.046}$		-0.169^* $_{0.053}$		-0.119^* $_{0.059}$	
ρ_ϵ	-0.119^* $_{0.053}$		0.001 $_{0.069}$		-0.181^* $_{0.073}$	
	Uni-variate Estimates					
γ_{11}	1.492^* $_{0.075}$	-	1.507^* $_{0.075}$		1.496^* $_{0.081}$	
γ_{12}	-0.298^* $_{0.090}$	-	-0.398^* $_{0.128}$		-0.024 $_{0.202}$	
γ_{21}	-	-0.264^* $_{0.081}$		-0.461^* $_{0.104}$		-0.115 $_{0.275}$
γ_{22}	-	0.307^* $_{0.101}$		0.463^* $_{0.135}$		0.114 $_{1.203}$
β_1	0.331^* $_{0.166}$	-0.034 $_{0.193}$	0.323 $_{0.172}$	-0.140 $_{0.293}$	0.321 $_{0.318}$	-0.173 $_{0.487}$
β_2	-0.063 $_{0.086}$	0.249^* $_{0.092}$	-0.072 $_{0.084}$	0.164 $_{0.129}$	-0.075 $_{0.178}$	0.282 $_{0.645}$
β_3	3.977^* $_{0.479}$	-2.335^* $_{0.834}$	4.201^* $_{0.634}$	-1.362^* $_{0.355}$	4.346^* $_{0.523}$	-2.631^* $_{0.436}$
$\delta_{0,1}$	-4.842^* $_{0.482}$		-5.097^* $_{0.651}$		-5.269^* $_{0.420}$	
$\delta_{0,2}$	-	1.118 $_{0.794}$		-0.168 $_{0.405}$		0.842 $_{5.490}$
λ_{11}	0.405^* $_{0.097}$		0.416^* $_{0.099}$		0.422^* $_{0.184}$	
λ_{12}	-0.132 $_{0.093}$		-0.064 $_{0.114}$		-0.166 $_{0.252}$	
λ_{21}		-0.224^* $_{0.099}$		-0.184 $_{0.124}$		-0.290^* $_{0.144}$
λ_{22}		0.316^* $_{0.102}$		0.332^* $_{0.135}$		0.480 $_{0.262}$
$\sigma_{v,1}$	0.278^* $_{0.070}$		0.272^* $_{0.068}$		0.289^* $_{0.066}$	
$\sigma_{v,2}$		0.272^* $_{0.064}$		0.276^* $_{0.086}$		0.263 $_{0.537}$
ρ_v	0		0		0	
ρ_ϵ	0		0		0	

The sample includes $N = 493$ individuals and 11 time periods ($t = 18, \ldots, 28$).

The standard errors are displayed in lower case brackets and the * indicates significance at the $\alpha = 0.05$ level.

The parameter estimates δ_s^j, for $j = e, o$ and $s = 18, \ldots, 28$ are not shown as they are not of interested for our research question.

Figure 1. Predictive effects for different values of the employment threshold. The x-axes indicate the number of working days used to define the working indicator. The rows indicate: (i) serious offenses, (ii) property offenses and (iii) violent offenses.
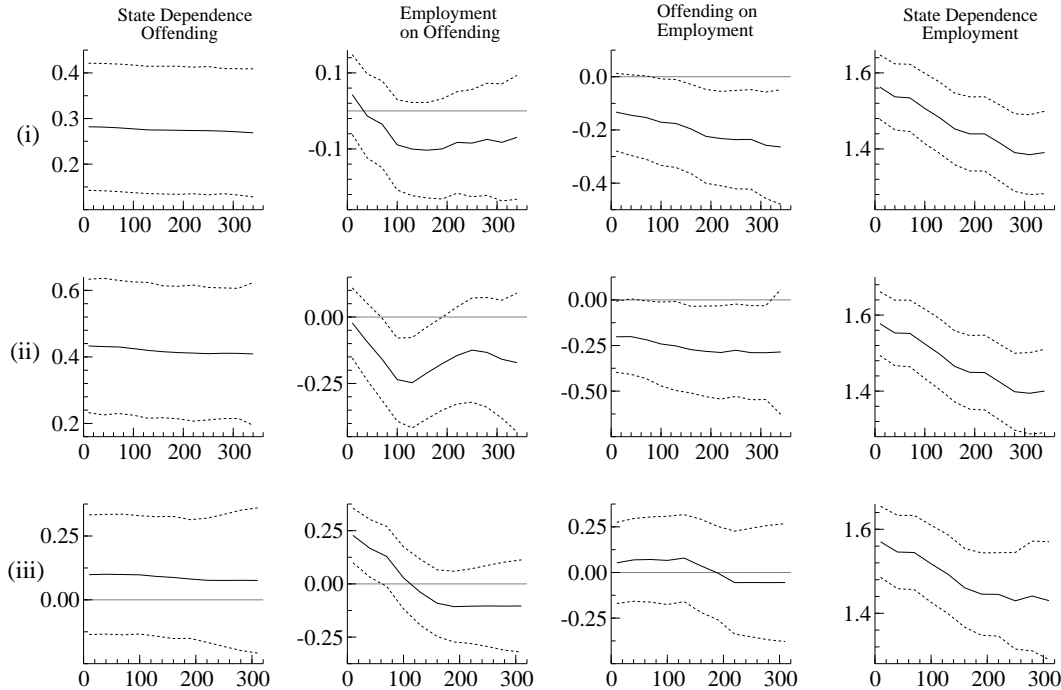
# 10 Interactions with moderating influences

10.1 Employment length

Next, we investigate the moderating influence of employment duration. Following empirical and theoretical literature it is expected that the more days an individual is employed the more persistent the employment process becomes, causing a decrease in offending utility. In order to study the effect of employment duration, we vary the definition of the employment variable according to different durations of employment per year. Several analysis are conducted, where individuals are considered as employed when employment totals 10 days a year, 30 days a year, 50 days, and so forth until 350 days per year.

Figure **??** shows the structural parameter estimates from this analysis for serious, property and violent crimes. We find that *please add*

10.2 Age

Using the probit panel data model with time-varying structural parameters, this section focuses on studying the moderating influence of age on the employment-offending association. In particular, the structural parameters are modeled using flexible cubic spline functions such that the effects are allowed to vary with age. In Figure 2 we show all four estimated structural

Figure 2. Age-graded predictive effects among employment and offending. The x-axes indicate the age of the individuals. The rows indicate: (i) serious offenses, (ii) property offenses and (iii) violent offenses.
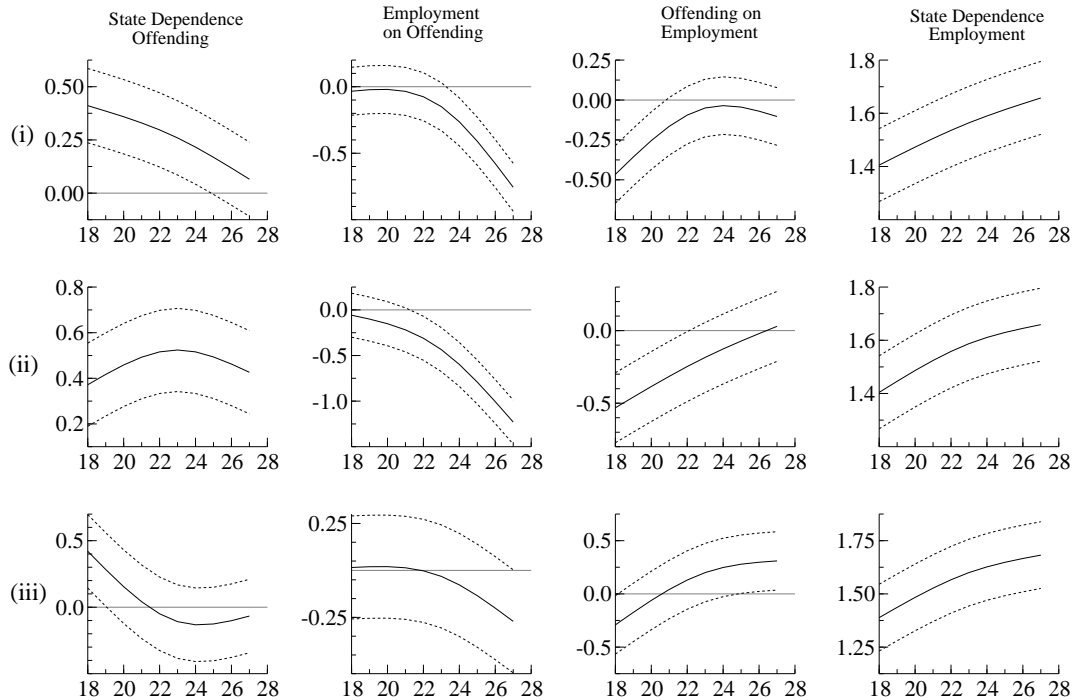
time-varying parameter paths: $\gamma_{11,t}$, $\gamma_{12,t}$, $\gamma_{21,t}$ and $\gamma_{22,t}$, for $t = 18, \ldots, 27$.

We find that *please add*

11 Conclusion and discussion

In this study we analyzed a large sample of juvenile sex-offenders who have been followed from emerging adulthood into adulthood (age 18-28). Our main variables of employment and offending were constructed using objective registered information. The aim of this paper was to study the *bi-directional* relationship between employment and crime for juvenile sex-offenders and the influence of the moderating factors *age* and *employment duration* on this relationship.

In the first step of the empirical study we separated the overall correlation into a structural and a spurious part. We found, in correspondence with the theoretical literature, that when employed the utility of offending was negatively affected and with prior offending chances of employment were reduced. The estimates were both significant for property offending only. For the more general class of serious offenses and its sub-class of violent offenses we found no significant effects.

We also found employment to be persistent: when an individual is employed in the previous year the current net utility that is derived from employment increases. The same was

found for offending: prior offending increases the net utility of future offending. Combined, this shows that a 'vicious' circle exists of offending increasing the utility of future offending and decreasing the utility of employment. This conforms to the process of cumulative disadvantage hypothesized by Sampson & Laub (1993). However, as the employment-offending association is reciprocal with strong state dependence, the workings of 'hooks for change' as postulated by Sampson & Laub (1993) also fit our findings. Once someone manages to gain employment (of sufficient duration) this will reduce the utility from offending, and the likelihood that employment is continued is also increased.

When we compared the results from the bi-variate model to those from a univariate model, we found that the univariate model overestimates the effect of the effect of employment on crime and vice versa. This was made clear by the estimates for the spurious correlation parameter that provided further evidence that a part of the relationship between employment and offending is spurious. Univariate random effects models cannot capture this type of spurious correlation. In particular, we identified both time-invariant and contemporaneous spurious correlations between employment and offending outcomes. Overall, we found that individuals who on average gain more utility from employment gain less utility from offending.

Next, we studied the age-graded effects of employment on offending. Several theoretical age-graded frameworks state that the younger age cohorts (age 18 up to about 20) will experience little benefit in terms of reduced offending from being employed. However, with maturation the effect of employment on offending will become stronger, leading to a reducing effect from employment on offending for the older age cohorts, i.e. those in the last stages of early adulthood. The analysis in this study confirmed this theoretical framework. Our analysis even showed that within the same sample the effect of employment on offending switches in sign, from a very small positive effect at young ages to a large negative effect for the older age cohorts.

The remaining structural effects showed that the effect of offending on employment over time becomes less important and even non-existent at the older ages, indicating that an offense affects employment for the younger ages more than for the individuals in the later stages of emerging adulthood. It could be that those individuals in the later stages of emerging adulthood follow a criminal career and are not employed. Therefore rendering a lesser effect of previous offending on employment. However this seems counter-intuitive since one would expect that at in the older ages offending would have a more negative effect on employment, since adults are held responsible for their own actions. In the final analysis this is explained by the interaction between age and employment duration: the individuals with employment contracts spanning more than 180 days a year experience a negative effect of offending on employment that becomes more negative with the coming of age. Indicating that for the older age cohorts with longer employment duration offending will have a more negative effect than for the younger individuals with short employment contract.

Further, we found that offending has an increasing effect on offending, however this effect becomes smaller with the coming of age. This could point to the counter-intuitive aging-out of crime effect, where the effect of prior offending over time reduces the utility of future

offending. Individuals could therefore be less inclined to offend when they are at the end of the emerging adulthood period. For employment the opposite is detected, over time the effect of employment becomes more positive. This could denote to a certain aging-in employment effect where holding a job at the older ages has a larger increasing effect of future employment than in the early ages of adulthood. Again, this could indicate the salience of employment for the older age cohorts as an instrument for desistance or the simple aging-out of crime.

Many theories and empirical studies underline the importance of employment quality. In the third step of our empirical study we looked at variation in employment duration as a measure of employment quality. Following theoretical and empirical literature one would expect that the more days an individual is employed, the more persistent the employment process becomes, causing a decrease in offending utility. The analysis confirmed this hypothesis as it showed that with the increase of number of days employed per year the estimates become more negative, fluctuating after about 90 days of work a year. Nevertheless, we found that from even a day of work a year the estimates are already negative, indicating that the mere status of employment can already negatively influence the utility of offending. However, the effect fluctuates and it is often not significant.

Prior offending lowers the chance of having stable employment. The estimates became more negative with increases in employment duration, suggesting that offending will reduce short employment duration less than prolonged employment duration. This conforms to the idea that short employment contracts are more likely to be temporary or seasonal jobs, and that offending is likely to affect people's opportunities to hold long-term contracts For both state dependence estimates (employment and offending) we found them to be almost identical for the different measures of employment duration and age cohorts. This leads us to conclude that the effect of previous employment on employment and previous offending on offending appears to be moderated only by age.

In our final analysis the interaction between age and employment quality is investigated. Both state dependence estimates (employment and offending) were almost identical for the different measures of employment duration and age cohorts. This is in accordance with the findings in the previous step, and underlines our conclusion that the state dependence for offending and employment is only moderated by age. This also underlines our interpretation that people age out of crime and age into employment, independent of other variables like employment duration.

The structural effect of employment on offending becomes more negative over time for all measures of employment duration. Important is that the curves of 90 days and 180 days or more employed are similar, with little effect for the younger ages and after age 22 a decreasing magnitude in the estimates. Interestingly, an increasing effect for the 10 days curve for the effect of employment on offending in the younger age cohort is found. In the empirical and theoretical literature a possible increasing effect of intense employment on offending was hypothesized for adolescents and young adults. However we find that only a few days of work a year has an increasing effect on offending for the younger age cohorts, while intensive work (long duration) has no effect. Why we find this remains unclear, it could be that it is just a simple effect of not having enough time as a young adult to spend with peers due

to intense work. Causing limited offending possibilities induced by peers for these young adults with longer employment durations. Regarding the structural effect of offending on employment we again find interesting results for the individuals in the 10 days curve. For the first age cohorts little effect is found, however after age 22/23 the effect of offending becomes less salient and even shifts in sign having an increasing effect on employment for the older age cohorts. Implying that offenders are more prone to have a short employment duration, possibly because they hold limited value to the employment itself. The 90 days curve follows a similar path where the effect of offending becomes almost 0. With the coming of age it seems that the individuals with less stable employment are becoming less and less influenced by offending. Probably due to the effect of aging-out of crime. For the individuals employed for 180 days or more a year the effect of offending on employment is negative and over time decreases even more. As we would expect, since the people who work many days a year will hold a certain value as well as little time can be spend in an unstructured setting.

In conclusion, we used novel statistical techniques in order to unravel the complex association between employment and offending. We found that not only is the association reciprocal, it is also influenced by moderating factors such as age and employment duration and the interaction between them. In particular, effects may shift over the life-course, possibly due to a change in mindset or a change in relevant institutions of social control with the coming of age as indicated by Arnett (2004) and Sampson & Laub (1993). Our findings have clear policy implications. Most saliently, our findings - somewhat counter-intuitively - advise against employment policies for criminally active young people. Our findings do advise employment past the emerging adulthood, regardless of duration. Our findings also show that offending becomes increasingly detrimental to full societal integration (in terms of holding long term jobs) at higher ages.

This study has strong points. First of all we used a prospectively gathered, rich dataset consisting of long-term objective and detailed information on offending and employment. Moreover, we employed advanced methods to control and allow for reciprocal effects, state dependence and unobserved heterogeneity. On the other hand our study has limitations. Our employment variable might be thought of as incomplete, since we were only able to look at official employment registration, and we have no measures of 'unofficial' labor. Also, there is no knowledge of whether the individuals were employed full-time or part-time. However, it is likely that most contracts would have been (almost) full-time given that the employment records showed that very few applied for supplementary benefits that citizens in the Netherlands are entitled to if their income is below a certain minimum. Also, we do not know whether people were cohabiting or otherwise romantically involved: we only know from the register data if people have officially registered as partners whether by marriage or through a registered partnership. We also do not have data on disabilities, or drugs addiction, or mental health issues. All in all, through the register data we could only study the 'outside appearance' of these individuals?lives. More in-depth research with for instance interviews is needed, to be able to further disentangle the employment-offending association. Yet, the next step will be to use the registered data to look at individual characteristics (beyond age) to determine whether the effect of employment is moderated by stable individual

characteristics such as intelligence, personality characteristics or educational level.

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