

The Dynamic Relationships between Parenting and Adolescent Delinquency: A
Group-based Model Approach

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Parenting has been found as a key factor for adolescent delinquency. Past studies have shown that adolescents who expose to higher level of warmth, induction, and monitoring parenting would be less likely to be delinquents. However, most of these studies present the relationship between parenting and adolescent delinquency statically. That is, researchers show parenting measured at one time predicts adolescent delinquency at the same time or the other time. Researchers seldom demonstrate whether the change of parenting over time influences the change of adolescent delinquency.

Theories of types of delinquents propose two types of delinquents in offender population (Patterson et al., 1992; Moffitt, 1993 & 1997). Early starters show their delinquency in late childhood and persist into adulthood, while late starters show the behavior during mid-adolescence and desist after this period. Although researchers propose several predictions for distinguishing types of delinquents and for explaining their developmental trajectories, parenting is the key factor among them. In predictor analysis, ineffective parenting during late childhood interacts with child's early temperament problems producing early starters. Several studies have demonstrated this argument (Fergusson et al., 2000; Nagin & Land, 1993; Wiesner & Silbereisen, 2003a, b). In within-delinquent-group analysis, parenting has long been demonstrated its impact on adolescent delinquency (Lin, 2002). However, there is no research that systematically explores the relationship between parenting and delinquency over time under types of delinquents framework.

In this study, we ask two questions: 1. How many types of delinquents in a Taiwan sample? 2. How the change of parenting influences delinquent trajectories over time? To achieve these aims, current study uses a longitudinal data set in Taiwan. We use PROC TRAJ, which is developed by Jones and Nagin (2001) to explore types of delinquents in from four

waves of the data. PROC TRAJ also provides options to incorporate time-varying variables (i.e parenting) to predict delinquent trajectories over time. Therefore, we can understand the dynamic relationship between parenting and delinquency over time. The results will add to the existing literature and help us understand types of delinquency and its related covariates.

Literature review

Developmental perspectives show a one-peak curve of prevalence of offending over life course. The prevalence of offending reaches its peak during mid-adolescence and declines when entering adulthood. Two themes emerge regarding this one-peak curve. The continuity argument states that some delinquents will become criminals later, since these people show delinquent behavior over time in this one-peak curve. The discontinuity argument explains the reasons that make the decline of this one-peak curve after period of adolescence.

Basically, researchers have consensus about the continuity of delinquent and criminal behavior over life course. As Nagin and Paternoster (1991) and Sampson and Laub (1992) indicate, the link between early antisocial behavior and later criminal offending is the prominent findings across studies. Based on arrest data and statistics, Bluestein's research (1986) shows there is a small group of offenders who keep their criminal career for a long time. These people although account for only 5% of offender population commit 80% of the total offending. These findings show the importance of tracing the early experience of offenders. Therefore, for studying the continuity of offending history, longitudinal data from childhood to adulthood are required.

Types of delinquents

Since the consensus of the continuity, the discontinuity of delinquent and criminal behavior becomes the next theme in developmental research. Robins (1978), Loeber and LeBlanc (1990), and Sampson and Laub (1992) indicate that not all adolescent delinquents become criminals in their later life. This leads researchers ask: Who will keep their delinquency over time? Who will drop out in the later time?

Theories of types of delinquency provide the answer: the continuity and drop-outs are different types of delinquents. Patterson and Moffitt both developed theories of two types of delinquents to describe the heterogeneity in the offender population over the life course. Patterson and his colleagues (Patterson et al., 1989; Patterson, Reid, & Dishion, 1992; Patterson & Yoerger, 1993) used early and late starters, while Moffitt (1993 & 1997) used life-course-persistent and adolescent-limited delinquents. Patterson and his colleagues proposed a sequence of causal relationships (a coercive model) among child's antisocial behavior, parenting practices and peer variables. Late starters start their deviant behaviors during mid- to late adolescence. Most of these behaviors are considered to be the consequence of peer encouragement or peer pressure as well as inept parenting (Patterson et al., 1992). Moffitt used adolescent-limited delinquents to describe the late starters. For Moffitt, the delinquent behaviors are the result of psychological tensions and social mimicry. Because of modernization, young people reach physical maturation during their adolescence. Adolescents want to be treated as adults and be autonomous, since they feel they are "adults". However, social norms do not give them the rights they want and consequently adolescents experience the tensions between the desire for autonomy and lack of power. The desire to

reduce this tension leads some adolescents to mimic the behavior of their delinquent peers (Moffitt, 1997).

In their coercive model, Patterson et al. (1992) also indicated that early starters tend to experience ineffective parenting in childhood and peer rejection during adolescence. Early starters begin their deviant career during late childhood. The dynamic interaction between parents and children is the key to the coercive model. The coercive process shows that if parents use ineffective parenting, such as lack of monitoring and warmth, harsh parenting, or inconsistent parenting, their difficult children would react with more deviant behaviors. The failure in parenting impairs parental psychological functioning, which in turn induces even less effective parenting (DeGarmo et al., 2004). Patterson et al. (1993) also argued that children would experience peer rejection when entering into adolescence. Early starters face peer rejection when they enter adolescence due to their antisocial behavior. This encourages them, if they do not want to be isolated, to make friends with other deviant kids. Therefore, during adolescence, early starters become isolated from conventional associations and tend to relate to deviant peers.

Moffitt (1993) used life-course-persistent delinquents to describe early starters. In her theory, there exists a small group of people who show their delinquent behaviors early and maintain them over time. As Moffitt (1997) put it, these people tend to have deficits in neuropsychological functioning, which refers to the disorder of the anatomical structures and physiological processes of the nervous system. With this defiant physiology, children may be clumsy and awkward, overactive, inattentive, irritable, impulsive, hard to keep on schedule, poor at verbal comprehension, deficient at expressing themselves, or slow at learning new things (p.18). These handicaps result in poor social skills. When interacting with social and

family environment (such as poor parenting practice, family break-down, and poverty), these characteristics induce antisocial behaviors. Therefore, as Nagin and Tremblay (1999) showed those who are physical aggressive, oppositional, or hyperactive may follow the pathway into a delinquent career. Due to a lack of social skills, they find it difficult to do well in school, find a good job, and keep conventional relationships with others. Therefore, life-course-persistent delinquents have longer and persistent criminal careers than the adolescent-limiteds. Since the two typologies propose similar arguments and make similar predictions, I will use early and late starters for convenience in the later discussion.

Theory of Parenting

As we have seen, parenting practice plays a central role both in Moffitt's and Patterson's theories. This calls for a brief review of theory on parenting and delinquency. The most pervasive theory of parenting used today is Baumrind's theory of authoritative parenting. She proposed four types of parenting styles based upon two dimensions: demandingness and responsiveness. As she indicated:

Responsiveness refers to the extent to which parents intentionally foster individuality and self-assertion by being attuned, supportive, and acquiescent to children's needs and demands. Demandingness refers to the claims parents make on children to become integrated into the family and community by their maturity expectations, supervision, disciplinary efforts, and willingness to confront a disputative child. (Baumrind, 1996: 410-411).

Important facets of responsiveness include warmth, reciprocity, clear communication, person-centered discourse, and attachment. Warmth in parents motivates children to participate in cooperative strategies and is associated with the development in children of an

internalized moral orientation. Person-centered parental communication legitimizes parental authority by persuasion and, therefore, tends to be better accepted by the child. Parents who provide explanations will help children, especially adolescents, to internalize values more effectively (Hoffman, 1983).

The second major factor of parenting, demandingness, includes direct confrontations, monitoring, and consistent, contingent discipline. Ineffective monitoring, which is the focus of Gottfredson and Hirshi's argument about construction of low self-control has been related to children's conduct problems (Patterson & Stouthamer-Loeber, 1984; Sampson & Laub, 1994). The contingent use of positive or negative reinforcers immediately following desired or prohibited child behavior is a crucial factor in behavior management. A non-contingent use of discipline tends to be related to deficit in children.

Baumrind refers to parents who are demanding and responsive as authoritative parents. Their children are expected to perform better in social competence than are children whose parents are authoritarian (demanding but not responsive), permissive (responsive but not demanding), or rejecting-neglecting (neither demanding nor responsive). Researchers have reported the effect of authoritative parenting on various child and adolescent outcomes, including conduct problems, substance use, and depression (Ge et al., 1996; Brody et al., 2001; Brody et al., 2004).

While authoritative parenting equates to positive parenting, harsh parenting would represent the negative parenting. Research has shown the negative effect of harsh or corporal punishment on child and adolescent outcomes (Simons et al., 2000; Chang et al., 2002a, b). With the third wave of the data used in this study, Lin (2002) found the parenting measures work to predict delinquency and depression in her SEM models. Harsh parenting is

especially important for the current study. Although Taiwan has experienced Westernization since the 1980's, harsh corporal punishment is still commonly accepted in the society. Whether or not the effect of harsh parenting measured at early age can work as theory predicts is an empirical question for current study. Besides, like theory of parenting, theories of types of delinquents propose that positive and negative parenting influences the development of delinquency over life course. Therefore, current study includes positive and negative parenting as covariates for delinquent trajectories. Furthermore, past studies of the effect of parenting on delinquency only present a snap shot. That is, researchers use the parenting measures at one time to predict delinquency at the same time or at other time. From developmental perspectives, it is more relevant to ask how change of parenting (positive and negative) over a period of time influences the change of the developmental trajectories of delinquency. Using PROC TRAJ, current study incorporates parenting as a time-varying covariate in the model. We can understand the dynamic relationship between parenting and delinquency by doing so.

Empirical studies in Taiwan

We found only one study that investigated types of delinquents using a sample from a non-Western country. Tzeng (2001) studied the 'one-peak' curve of prevalence of criminals over the life course in Taiwan. First, she showed that the official crime data in Taiwan confirmed the 'one-peak' curve argument as would be predicted by self-control theory, showing an increase of offending during mid-adolescence and a decrease after entering adulthood. Second, she investigated types of delinquents among a high school student sample (age 16 to 18) based on self-report delinquent behavior. She distinguishes early starters and

late starters in this sample by a cut-off of offending prior to age 12 and profiled them for childhood conduct disorder, temperament problems, and low self-control variables. However, although the results confirmed several hypotheses that both Moffitt and Patterson make, the data she used was retrospective and cross-sectional. As Moffitt (1997) emphasized life-course-persistent and adolescence-limited delinquents should be defined on the basis of their natural histories of delinquent behaviors (1997, p.41 and p.43), so cross-sectional data cannot be considered a valid way to identify types of delinquents. In particular, retrospective data are vulnerable to memory bias (Scott and Alwin, 1998); therefore, prospective longitudinal data are required.

For the current study, it will be interesting to ask whether delinquent types found using Western samples will be replicated in a non-Western sample. Further, the progression of offender's behaviors across several time points is also a comparison of interest. This study will provide an assessment as to the generalizability of Patterson and Moffitt's theory to a non-Western country and will test this using prospective longitudinal data collected from Taiwan. The results can be compared to the offender groups identified in the existing literature.

The effect of parenting as covariates of delinquency has gained support in several studies in Taiwan. Wu and his colleagues presented a series of studies about the influence of family impact on adolescent delinquency (Kao et al., 1998; Wu, 2000; Jou and Wu, 2001; Wu and Lei, 2004). They found supportive evidence about the impact of both positive parenting (warmth and control) and negative parenting (harsh parenting) on adolescent delinquency across studies by using the first three waves of the data we used for current study. Using wave 3 of the data, Lin (2002) compared the influence of parenting on depression and

delinquency across Taiwanese and US samples. Her results showed similar patterns for the impact of parenting across nations. Studies using other data sets also support the effect of parenting on various adolescent outcomes (Chen, 2000; Wu, 1998).

Wu (1999) investigated the influence of parents and peers in adolescent behavior during early adolescence. Her study showed that peers have more impact than parents on delinquency, but not on academic performance. Lo (1998) also presented a model that employed careful measurement of deviant peers, parenting, and the outcome variables. He found that deviant affiliation was an important factor for explaining adolescent behavior after controlling for parenting.

Although studies using Taiwanese samples show consistent evidence for the importance of parenting as important covariates of delinquency, we still know little about how these two variables influence delinquency for different trajectory groups. Therefore, we will present a covariate analysis with a more comprehensive and dynamic perspective under types of delinquents framework.

Methods and measures

Population and Sample

Data are from a panel study in a big city in Taiwan since 1996, titled “The Etiology of Adolescent's Substance Abuse: A Social Learning Model.” This research was conducted by Chyi-in Wu, associate research fellow in Academia Sinica, Taiwan and was funded by National Health Research Institute in Taiwan for first three waves (DOH86-HR-621、DOH87-HR-621、DOH88-HR-621). After that, the research was funded by the Institute of Sociology in Academia Sinica. Currently, this panel study is on its 9th wave data collection.

The population is 13-years teenagers in the city in 1996. Since the enrollment rate in junior high school for this age group is close to 99.9%, it is appropriate to use all junior high school students in the city as a sampling frame. Using two-stage cluster sampling in twelve administrative areas of the city, researchers first randomly chose two or three junior high schools in each area (based on how big the area is) and randomly selected one or two classes in 7th grade in each school. When the class was selected, all of the students in that class were included in the sample.

From September to November in 1996, the investigator sent trained interviewers to each selected class. Students filled out the questionnaire in class within 2 hours with interviewers' assistance if necessary. There were 1,434 junior high school students (around 13 years old) in wave one. When visiting the sample class, interviewers also gave teacher questionnaires to the teacher of that class. Each teacher should fill out a 3-page questionnaire for each student in his/her class and returned them in three months. Due to rejection of cooperation from one

teacher, there were 1,394 teacher questionnaires collected in wave one. After finishing data collection for students and teachers, the researcher sent trained interviewers to sample student's family to collect primary caregiver's data (most of them are mothers). The interview took about two hours at their home and a small gift was delivered after the interview. There were 1,109 primary caregivers in wave one. Wave two and three student data were conducted by the same procedures through 1997 and 1999. There are some new students who transferred into sampled classes in wave 2 and wave 3. They were included in later investigation, too. Due to student's moving in or out of class, the third wave contained 1,449 students and teacher's questionnaires (about 94.4% appearing across three waves), and 1,243 primary caregivers (85% appearing across three waves).

Because of the graduation from the original schools, in wave four researchers used phone interview to gather student's data only from late 1999 to early 2000. Around 86% of students in original sample were contacted. In February 2001, researchers conducted the fifth wave investigation by interviewing students at their home. Researchers sent two trained interviewers to student's home and interviewed both student and his/her primary caregiver. 1094 students were interviewed and about 80% of original sample participated in all five investigations. After listwise deleting for missing data in the research variables, the final cases used in this study are 923. There are 476 boys and 447 girls. Because of the missing data, the current research only retains 64% of original sample across five years. The program we used to conduct the group-based model (Proc TRAJ) provides a missing data imputation option via EM algorithm. In the preliminary analysis, we first ran the model with listwise deletion and then ran the model with the missing data imputation. The results are similar in terms of number of groups and estimated parameters (trajectory shapes). Therefore, in the

following analyses, I will present the model with listwise deletion. Because of absence of some measures in the fourth wave, current study used only 1, 2, 3, and 5 waves of the data.

Measures

Delinquency

We got the delinquency measures from student questionnaire and used six time points. The self-report delinquency inventory adapted from the National Youth Survey was used (Elliott & Menard, 1996; Elliott & Morse, 1989). There were 23 items in the original questionnaire. However, due to saving the space of questionnaire, in wave 5, researchers reduced this scale and used five items to measure adolescent self-reported delinquency. They asked respondents: “Did you have the following behavior during past year?” The items are typical delinquent behaviors for adolescents in Taiwan including running away, skipping school, stealing, biting others, and speeding motorcycles. Respondents reported 0 as not committed and 1 as yes. We summed the scores of the five items and gained the mean score for each respondent. For the group-based model, it is better to use the same delinquency measure across waves, so we used the same items to gain the delinquency measure in the rest of waves. In the group-based model analysis, we used the self-reported delinquency in 13, 14, 15, and 17 years old.

Affiliation with deviant peers

Students reported their friends’ behavior with a similar checklist as delinquency inventory. There are 8 items used in this analysis. The question asked: In the past year, among your

good friends, how many of them have done the following behaviors? It includes running away from home or school, destroying things that do not belong to him/her, stealing, speeding, fighting, smoking, and drinking. The response format was 1 (none of them) to 4 (all of them). We summed that together and gained the mean score for each student. The reliability is .77, .90, .92, and .84 across waves.

Parenting measures

There were two dimensions in parenting measures: involved vigilant (authoritative) parenting and harsh parenting. We used both student and parental report. The response format was 1 (never) through 4 (always). There were six items in involved vigilant parenting over 4 waves including monitoring and inductive reasoning. There were three items measuring harsh parenting across four waves. Students reported the parenting behaviors for their fathers and mothers. The items and reliability were shown in appendix. We first summed the items and got the involved vigilant and harsh parenting scores for mothers and fathers. After that we summed the two scores together and gained parenting from students' report. We also summed the parental report items and gained the scores for each parenting dimensions. At the final step, we gained the mean scores between student and parental report for each parenting dimensions and that was the variables we used in the following analyses.

Table 1 presents the summary of the measures in this study.

Analytic Strategy

Nagin and his colleagues developed a systematic procedure to analyze the delinquent

trajectories (Nagin and Land, 1993; Nagin, 1999; Jones et al., 2001). Nagin (1999) and Jones et al. (2001) developed a summary of group-based models including statistical background (formulas and equations) and statistical software. They also developed a set of systematic procedures for analyzing the question of the number of groups and their covariates. The advantage of this approach is that it provides a formal basis for determining the number of groups that best fit the data and also provides an explicit metric, the posterior probability of group membership, for evaluating the precision of group assignments (Nagin, 1999). Researchers can avoid the overfitting problem derived from the cutting-point approach by applying these model selection procedures. In addition, the software (i.e. PROC TRAJ) they developed provides coherent options not only for identifying the hidden trajectory groups, but also for incorporating both time-invariant and time-varying covariates in the analysis.

We did the analyses for boys only, since literature have had clear prediction about the patterns of male offenders. First, we present the group-based model for the delinquent trajectories for boys. In this part of analyses, detecting the trajectory groups is to confirm the theory of types of delinquents proposed above. Second, we investigate the relationship between parenting and delinquency by profile analysis for the trajectory groups. As Muthèn (2004) indicated if the theoretical predictors cannot predict the group membership, the results from mixture models (group-based models) cannot be trusted. Therefore, the profile analyses present a confirmation of the results with theory (Muthèn, 2003 & 2004). It also provides preliminary hints for effects of parenting. The last analysis is to investigate the dynamic relationships between delinquent trajectories and parenting across time. We investigate the relationships using time-varying covariate analysis, which is built in PROC TRAJ.

Table 1 Summary of Research Variables

Variables	Respondent	Waves	Number of items	Sample question
Deviance	Students			
Delinquency		0-5 (no 4)	5	Did you have the following behavior during last year? 1. Run away...
Parenting	Students Parents			
Involved vigilant		1-5 (no 4)	6	In the course of a day, how often does your mom know where you are?
Harsh		1-5 (no 4)	3	When you do something wrong, how often does your mom spank or slap you?
Affiliation with Deviant peers	Students	1-5 (no 4)	8	Do you know your friends have the following behavior? 1. Run away...

Results

Group-based model for delinquent trajectories

We used PROC TRAJ (Jones et al., 2001) to estimate the group-based models. D'Unger et al. (1998) suggest a two-stage procedure to select the optimal model. At the first stage, we fitted the same shape of trajectory across groups as the baseline model. Since the result from latent growth model shows a model with quadratic term, we fitted the delinquency as a quadratic form of time. Table 2 shows the results for this model selection process. Nagin and Land (1993) indicated the problem of comparing BICs between two models in group-based models, since $k-1$ groups are not necessarily the nested model of k groups solution. Following the suggestion of Karney and Raftery (1995) and Raftery (1995), if a BIC difference between two models is greater than 6, there is strong evidence for the difference between two models. Therefore, for boys' model, we can easily see three-group model fits the data well. Based on Schwarz (1978) and Kass & Wasserman (1995), Nagin (1999) also provided another statistic for selecting number of groups in group-based models:

$$P_j = \frac{\exp(BIC_j - BIC_{\max})}{\sum_j \exp(BIC_j - BIC_{\max})}$$

P_j denotes the posterior probability that model j is the correct model, where in general, j is greater than 2. As shown in the table, the posterior probability being correct model for 3-group model is 1. Therefore, it is reasonable to select the 3-group model for boys.

Table 2 Bayesian Information Criterion (BIC) for Model Selection for Delinquency

Group Number	BIC	p
1	-1369.2237	0
2	-1271.98711	0
3	-1251.96984	1
4	-1262.9187	0

Bold means the selected model

In the second stage, we allowed the shapes of the trajectories across groups to be different. That is, we can fit different functions of time on delinquency for each group. In this stage the model selection process is very time consuming. PROC TRAJ allows us to fit the cubic relationship between time and the outcomes at most. Therefore, we could have four choices of the shape for each group (i.e. flat line, linear, quadratic, and cubic). For a three-group model, there are 3^4 (81) possibilities to try. The strategy we used here is that we fitted the model as parsimonious as possible. If the linear form can fit the data as well as the quadratic form (in terms of BIC), then we choose the linear form.

Table 3 presents the final model. For boys, one flat line and two curved lines are presented. The intercept of the flat line is not significant indicating that this group has zero mean delinquency over time. The intercept, slope, and quadratic terms of the two curved lines are all significant. Figure 1 presents the predicted mean of delinquency for each group over time. The program also estimates the proportion for each trajectory group. Around 34 percent of boys in this sample show no delinquency over five years, so we named the group as 'never'. We have two offending groups. 56 percent of boys have low delinquency before age 15, but have a jump after that. This corresponds to the late starters in Patterson's theory, so we name them as 'late starters'. Around 10 percent of boys increase their delinquency

after age 13. This group corresponds to the ‘early starters’ in Patterson’s theory. Interestingly enough, both Patterson and Moffitt predict that early starters are around 5 to 10 percent in the male population. Here we see the correspondence between the data and the theory.

Table 3 Estimated Parameters in Group-Based Model for Delinquency: Boys
(Estimated Group Proportions in Parenthesis)

N=476	Parameter	Coefficients	Standard Error
Never (34.13%)	Intercept	-13.40	892.82
Late starter (55.73%)	Intercept	13.07*	6.17
	Slope	-25.51**	8.37
	Quadratic	10.44**	2.80
Early starter (10.14%)	Intercept	-36.00**	9.12
	Slope	46.29**	12.11
	Quadratic	-14.32**	3.98

* p<.05 ** p<0.01

Group-based models also provide the estimates of the posterior probabilities for individuals on each trajectory group. The program creates a group variable and assigns individuals into a given group based on the highest probability. Table 4 shows the mean probabilities within each group. The numbers on the diagonals represent the mean probabilities of individuals who are assigned to that group. Nagin (2004) suggested that if the mean probabilities on the diagonals are over .70, the model has good classification. Thus, in our analysis, although the diagonal of the first group in boy sample shows slightly below .70, all other probabilities perform well. Therefore, the classification for both models is still acceptable.

Figure 1 Trajectory Groups of Delinquency for Boys

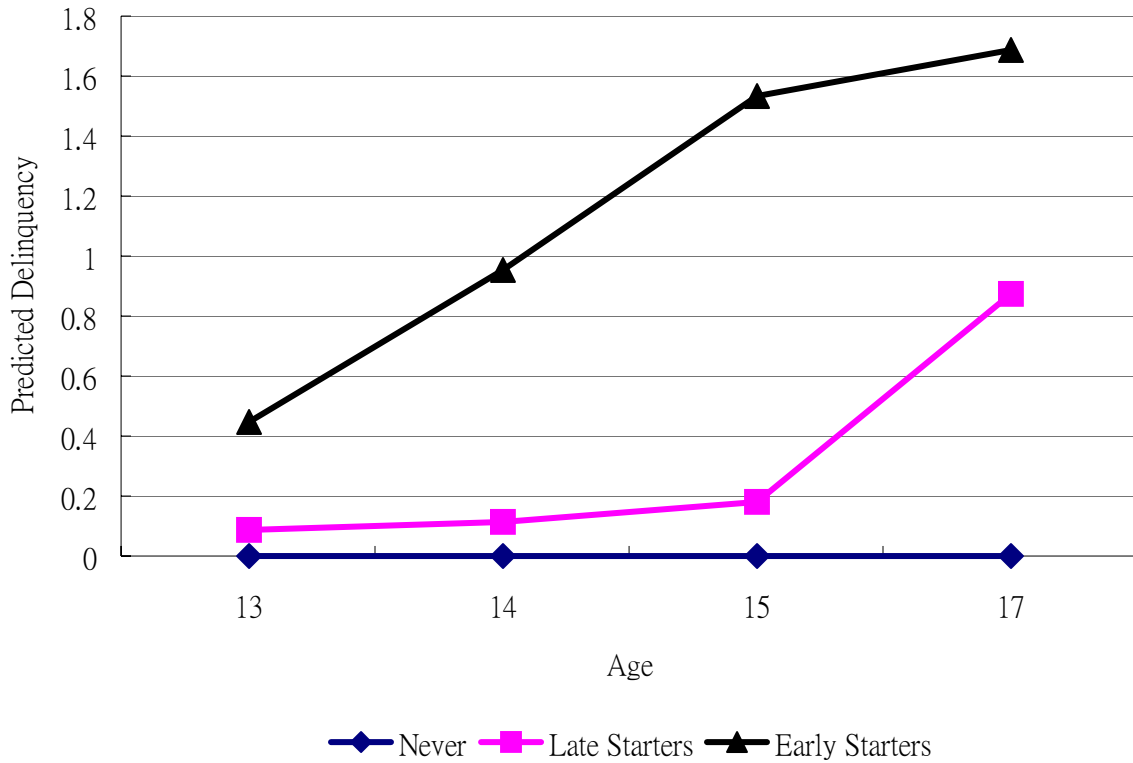


Table 4 Mean Probabilities for Delinquency Group Membership: Boys

	Never	Late starters	Early starters
Never	0.6826	0.2941	0.0233
Late starters	0.0000	0.9351	0.0649
Early starters	0.0000	0.0821	0.9179

In sum, the group-based model presents a good classification of delinquent trajectories of adolescents over 5 years. The result surprises us since for boys the groups are just like what Patterson and Moffitt predicted. Current data show fewer groups than all the studies in Western countries. The size of ‘early starters’ is larger than what theory expects and the

results from previous studies. This could be because most of the delinquency measures are minor offending, while previous studies used criminal offenses. The 'late starters' group consists of over half of the boys in the sample. Moffitt (1997) indicated that the late starters could be treated as 'normal' during mid-adolescence period, since they are commonly seen and almost every adolescent could commit some level of delinquency. From this perspective the size of 'late starters' group shown here is reasonable.

Parenting profile for the delinquent trajectory groups

We start our discussion of the relationship between parenting and the trajectory groups from the profile analysis. Table 5 presents means of parenting and deviant peers measures for developmental groups. The first set of variables is measured at the first wave of data collection (age 13). The second set of variables is created by averaging the variables across waves. The initial level of the three theoretically important variables answers the questions of how early parenting and delinquent peers associate with delinquent trajectory groups, while the time-averaging variables show us the cross-time effect of the parenting and delinquent peers on group membership.

Table 5 Descriptive Statistics (Means) by Trajectory Groups: Boys

Variables	Never	Late starter	Early starter
Early variables			
Affiliation with Deviant peers	6.53	6.89	7.58
Harsh parenting	3.78	3.89	4.24
Involved vigilant parenting	8.29	7.59	7.58
Averaging across waves			
Affiliation with Deviant peers	7.54	8.49	9.94
Harsh parenting	5.96	6.56	7.54
Involved vigilant parenting	13.94	12.48	12.13

In table 5, we can see early starters have highest score on delinquent peers and harsh parenting and lowest score in involved vigilant parenting. Corresponding to Patterson's coercive theory and Moffitt's neuropsychological functioning argument, early starters experience higher harsh parenting and less positive parenting practices. The high level of affiliation with deviant peers also corresponds to Patterson and Moffitt's argument that early starters would incline to associate with deviant peers due to their delinquency and peer rejection.

The late starters in boy sample experienced a similar level of positive parenting; however, they experience less harsh parenting and they affiliate with fewer deviant peers than early starters at this early period. These may be the reasons that they do not have high levels of delinquency in the early stage of life course.

We now move on to time-averaged variables. The results are similar to those above. For boys, early starters still experience a high level of time-averaged harsh parenting and

delinquent peers, although the difference seems trivial. However, late and early starters have similar levels of involved vigilant parenting. In general, we barely see a distinction between late and early starters in these time-averaged variables. This corresponds to theories of types of delinquents that during the age range of current data (early to mid-adolescence), it is hard to distinguish early and late starters via these theoretical variables in the later time period. As Moffitt indicated, the outburst of offending in this period is inevitable for late starters and they would mix with early starters. This may be why the time-averaged variables do not prove to be as powerful discriminators as are early variables for early and late starters.

We should note that here we just present the mean level of these time-averaged variables. There are drawbacks to present mean level comparison. First, we can only capture the pooled relationships at variable level, but not at individual level. By using time-averaged variables, we overlook the rich information of the multiple-wave design of current study. Besides, we can only observe the relationships in univariate level. PROC TRAJ provides options for analyzing the relationships among variables dynamically and in multivariate context. Therefore, we move to the time-varying covariate analysis.

Time-varying covariate analysis

The purpose of time-varying covariates is to investigate change in the dependent variable as a function of change in its covariates over time. Therefore, researchers can understand the dynamic relationships among covariates from the longitudinal perspectives. There are many ways to do time-varying analysis. They include cross-lagged panel analysis, time-varying covariates in latent growth models and growth curve models, a multiple group approach in

SEM, autoregressive latent trajectory (ALT) models, or a parallel process of latent growth models (Curran et al., 1997; Muthen & Muthen, 2003; Wickrama et al., 2002; Wills and Stoolmiller, 2002; Bollen and Curran, 2004). Each approach has its own conceptualization of the covariates over time. The current analysis utilizes a group-based model in which the time-varying covariates are modeled as predictors along with the time variable in a time-specific equation. Since our goal is to investigate the relationships between parenting and delinquency, we included two parenting measures in the time-varying covariates as x in the equation (3). Besides, we also included affiliation with deviant peers as a third covariate for controlling purpose. PROC TRAJ provides an option for putting time-varying covariates in the model. It also provides an option that is used to observe change of trajectories based on hypothetical values of the time-varying covariates. The analysis provides a dynamic picture of how these time-varying covariates alter the developmental trajectory within a group over time. The results provide rich information about how change of parenting over time relates to change of delinquent trajectories.

Table 6 presents the results. We ran four models in this analysis. First, we ran three models with only one covariate at a time. Then, we ran the fourth model with three covariates in the same model. Since there is no use in predicting the trajectory of the never group, we only present early and late starters in the models. Model 1 through 3 show that all the covariates significantly predict the developmental trajectories of delinquency. We can observe in model 2 after adding time-varying involved vigilant parenting, that the time effects become non-significant. This shows that positive parenting has a significantly strong effect in predicting the developmental trajectory for early starters over the time effect. This means the trajectory cannot be attributed only to time. In model 4 after adding all the

covariates, we still see that each covariate has significant effect on predicting the developmental trajectory and they operate in the predicted direction. That is, the positive coefficients would increase the predicted mean of delinquency, while the negative coefficients decrease it.

The meaning of the time-varying covariates is not so clear if we just see the coefficients in the tables. PROC TRAJ provides an option that researchers can use to plot the predicted mean trajectory of the outcome variable under different hypothetical levels of covariates. For doing so, we took three levels for each covariate: one standard deviation below mean, mean, and one standard deviation above mean. We then ran model 4 with various settings of levels of covariates as presented in table 7 and 8. We presented two sets of the analyses. The univariate analyses show the effects of single covariate on the trajectory after controlling for other covariates. The settings shown in table 7 are to see the timing of the exposure to the high level of the covariate.

The bivariate analyses present the effects of two parenting measures on the trajectory after controlling for affiliation with deviant peers. This is important, since we can see the change of the trajectory when kids move in-and-out of the high level of the two parenting measures. The bivariate analysis has many possible settings for the change of the covariates. We did not present all the possibilities, since it would be overwhelming. Instead, we presented some theoretically interesting patterns of change as presented in table 8.

Table 6 Time-varying Analyses for Boys' Delinquency Trajectories (Standard Errors in Parenthesis)

	Model 1		Model 2		Model 3		Model 4	
	Early Starters	Late Starters	Early Starters	Late Starter	Early Starters	Late Starters	Early Starters	Late Starters
Intercept	-28.15* (13.32)	37.36** (11.85)	-28.87* (12.75)	22.24* (10.76)	-19.15 (12.07)	32.97** (12.43)	-17.30 (14.06)	43.57** (12.79)
Slope	36.34* (17.48)*	-58.45** (15.74)	36.69* (16.67)	-38.44** (14.20)	25.01 (15.70)	-49.27** (16.37)	21.99 (18.38)	-65.51** (16.97)
Quadratic	-11.33* (15.68)	21.24** (5.16)	-11.30* (5.41)	14.71** (4.64)	-7.37 (5.10)	18.21** (5.35)	-6.53 (5.99)	23.66** (5.57)
Affiliation with Deviant Peers	0.04* (0.02)	0.06** (0.01)					0.05* (0.02)	0.06** (0.01)
Involved Vigilant Parenting			-0.12** (0.05)	-0.32** (0.06)			-0.17** (0.06)	-0.26** (0.05)
Harsh Parenting					0.11* (0.05)	0.14** (0.39)	0.18** (0.07)	0.14** (0.03)

* p<0.05
** p<0.01

Table 7 The Settings of Time-Varying Variables for Predicting Developmental Trajectories: Univariate Analysis

	Affiliation with Deviant Peers				Involved Vigilant Parenting				Harsh Parenting			
	Age 13	Age 14	Age15	Age 17	Age 13	Age 14	Age15	Age 17	Age 13	Age 14	Age15	Age 17
Baseline	M	M	M	M	M	M	M	M	M	M	M	M
Effect of Involved Vigilant Parenting												
Model 1	M	M	M	M	-1 SD	-1 SD	-1 SD	-1 SD	M	M	M	M
Model 2	M	M	M	M	-1 SD	-1 SD	-1 SD	+1 SD	M	M	M	M
Model 3	M	M	M	M	-1 SD	-1 SD	+1 SD	+1 SD	M	M	M	M
Model 4	M	M	M	M	-1 SD	+1 SD	+1 SD	+1 SD	M	M	M	M
Model 5	M	M	M	M	+1 SD	+1 SD	+1 SD	+1 SD	M	M	M	M
Effect of Harsh Parenting												
Model 1	M	M	M	M	M	M	M	M	-1 SD	-1 SD	-1 SD	-1 SD
Model 2	M	M	M	M	M	M	M	M	-1 SD	-1 SD	-1 SD	+1 SD
Model 3	M	M	M	M	M	M	M	M	-1 SD	-1 SD	+1 SD	+1 SD
Model 4	M	M	M	M	M	M	M	M	-1 SD	+1 SD	+1 SD	+1 SD
Model 5	M	M	M	M	M	M	M	M	+1 SD	+1 SD	+1 SD	+1 SD

M: The covariate at mean level

- 1 SD: The covariate at one standard deviation below the mean

+ 1 SD: The covariate at one standard deviation above the mean

Table 8 The Settings of Time-Varying Variables for Predicting Developmental Trajectories: Bivariate Analysis

	Affiliation with Deviant Peers				Involved Vigilant Parenting				Harsh Parenting			
	Age 13	Age 14	Age15	Age 17	Age 13	Age 14	Age15	Age 17	Age 13	Age 14	Age15	Age 17
Baseline	M	M	M	M	M	M	M	M	M	M	M	M
Effect of Involved Vigilant Parenting and Harsh Parenting												
Model 1	M	M	M	M	-1 SD	-1 SD	-1 SD	-1 SD	-1 SD	-1 SD	-1 SD	-1 SD
Model 2	M	M	M	M	-1 SD	-1 SD	-1 SD	-1 SD	+1 SD	+1 SD	+1 SD	+1 SD
Model 3	M	M	M	M	+1 SD	+1 SD	+1 SD	+1 SD	+1 SD	+1 SD	+1 SD	+1 SD
Model 4	M	M	M	M	+1 SD	+1 SD	-1 SD	-1 SD	+1 SD	+1 SD	+1 SD	+1 SD
Model 5	M	M	M	M	+1 SD	+1 SD	+1 SD	+1 SD	+1 SD	+1 SD	-1 SD	-1 SD
Model 6	M	M	M	M	-1 SD	-1 SD	+1 SD	+1 SD	+1 SD	+1 SD	+1 SD	+1 SD
Model 7	M	M	M	M	+1 SD	+1 SD	+1 SD	+1 SD	-1 SD	-1 SD	+1 SD	+1 SD

M: The covariate at mean level

- 1 SD: The covariate at one standard deviation below the mean

+ 1 SD: The covariate at one standard deviation above the mean

To investigate the effect of two parenting measures over time, we focused upon the moving in-and-out of positive and negative parenting. Model 1 through 3 show the effect of the two parenting measures when both are at the same level over time. Model 4 and 5 test to what extent the delinquency would change if parents exert one of the parenting less at later stage. Model 6 and 7 investigate to what extent the delinquency would change if parents exert one of the parenting less at early stage.

The effect of involved vigilant parenting on trajectory change

Figure 2 presents the impact of involved vigilant parenting on delinquent trajectory for late and early starters. When parents exert low involved vigilant parenting over time, late starters end up with the highest delinquency. We also observe that the level of delinquency does not have much difference across models at the first three waves. Model 2 through 5 show that as long as parents exert a high level of involved vigilant parenting in the last wave, their boys have a low level of delinquency. As we have seen in affiliation with deviant peers for late starters, the effect of this parenting measure is the strongest at the last wave.

The results for early starter boys show that the three covariates alter the delinquent trajectory. We can see in model 2 through 5 once parents exert high involved vigilant parenting, the level of delinquency drops. The effect of this parenting measure is similar at each wave. This indicates that the intervention of positive parenting for early starter boys works at any time throughout late childhood and mid-adolescence.

The results provide substantial support for the importance of parenting. Involved vigilant parenting decreases delinquency for both late and early starter boys. The results also show a dynamic relationship between involved vigilant parenting and delinquency for different trajectory groups. The impact of this parenting measure is found more for late starters at age 17, while it has similar influences for early starters

across time. This is not addressed in the types of delinquency approach and merits exploration.

The effect of harsh parenting on trajectory change

Figure 3 show the impact of harsh parenting on delinquent trajectories for late and early starter boys. For late starter boys, although harsh parenting has a positive effect on the delinquent trajectory, the effect is not large. The difference between model 1 (low level of harsh parenting over time) and model 5 (high level of harsh parenting over time) is small. The largest difference is in the last wave, although the difference is still small. Other than that, we do not see much difference between models. The impact of harsh parenting is trivial for this group of boys, under the social context in which harsh (corporal) parenting is acceptable and common.

The situation for early starter boys shows a similar trend as presented in involved vigilant parenting models. Different from late starters, harsh parenting has some impact on the delinquent trajectory. Model 1 has a low level of delinquency trajectory, while model 5 shows the highest. The rise of harsh parenting at each wave corresponds to the increase of the delinquent trajectory.

Figure 2 Univariate Analysis in Time-Varying Model: Involved Vigilant Parenting

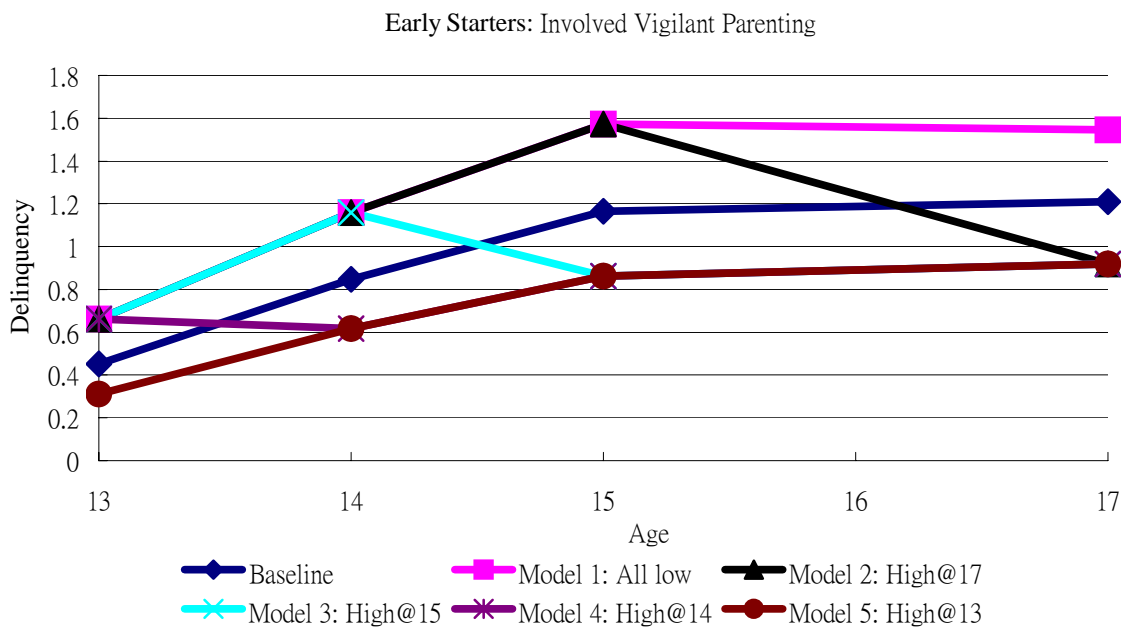
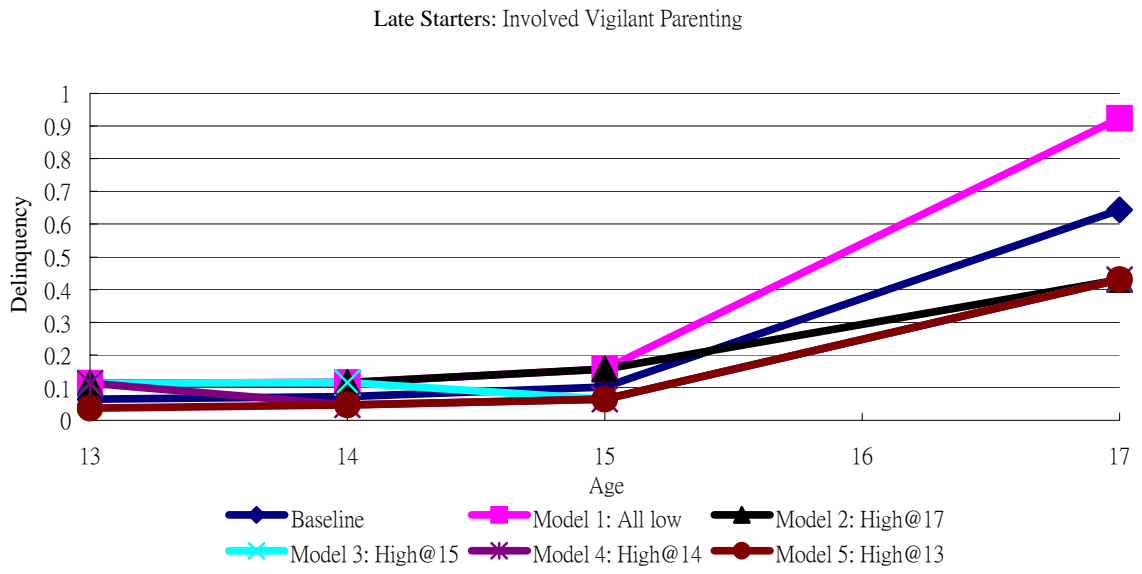
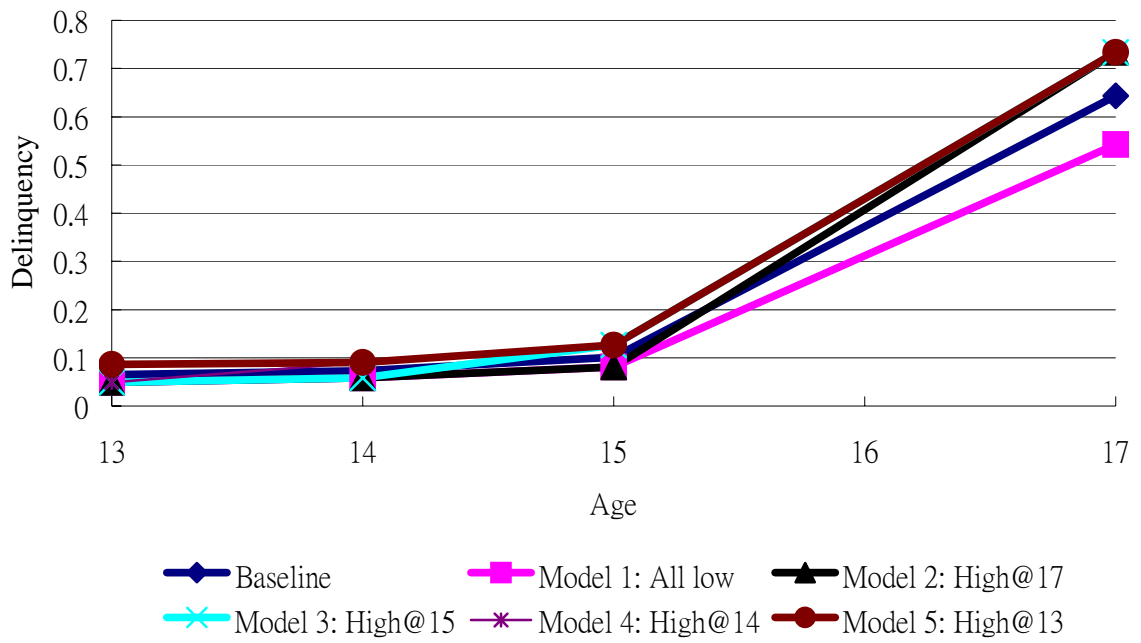
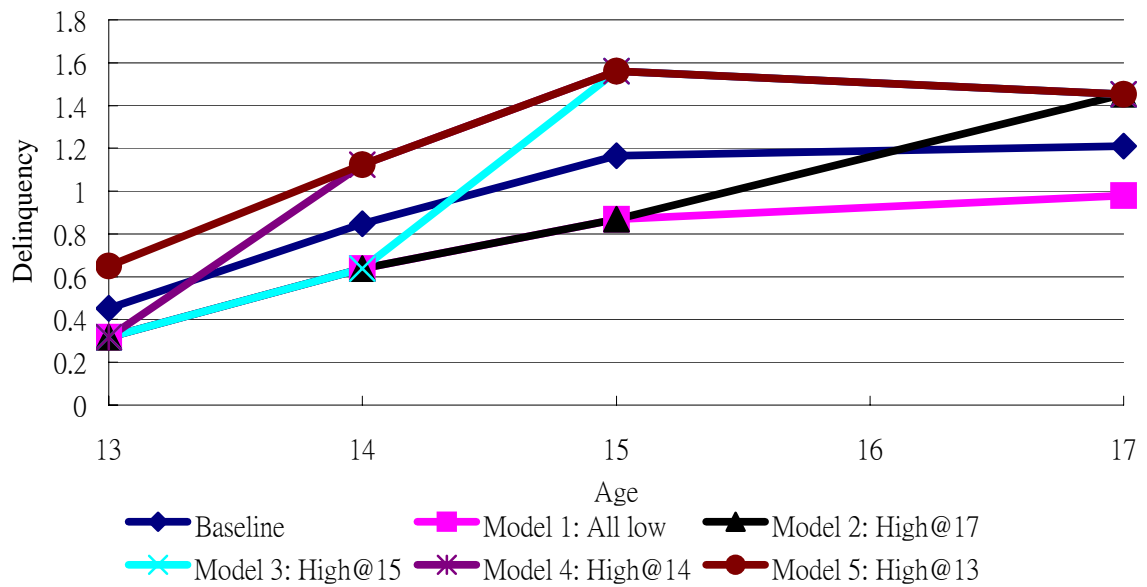


Figure 3 Univariate Analysis in Time-Varying Model: Harsh Parenting

Late Starters: Harsh Parenting



Early Starters: Harsh Parenting



The effect of involved vigilant and harsh parenting on trajectory change

Table 4 shows the bivariate results for boy late and early starters. Late starter boys show a different level of delinquency at age 17 across models, while there is little difference across models at the first three waves. We can see at age 17 model 2 and 4 have the highest delinquency, since parents have low positive parenting and high harsh parenting either across time or at later waves. Model 1 reaches the second high at age 17 as we can see parents exert low level of both positive and harsh parenting. On the other hand, model 5 has the lowest delinquency, since parents exert positive parenting across time and decrease harsh parenting at later waves. As we have seen in the previous, two parenting measures do not alter the trajectory at the first three time points, but they do make a change at the last time point. For the data here, this seems the consistent finding across models.

The models for early starter boys show a lot of change under different settings for the two parenting measures. In the first three models, we can see model 1 and 3 have similar trajectories, while model 2 has a trajectory with the highest level of delinquency over time. The parenting style presented in model 1 is like the ignorant parenting style. It has similar effect on the trajectory while parents exert low positive parenting and high harsh parenting. This indicates that in the current data, positive and harsh parenting has a similar effect on delinquency. They cancel the effect of each other in model 3.

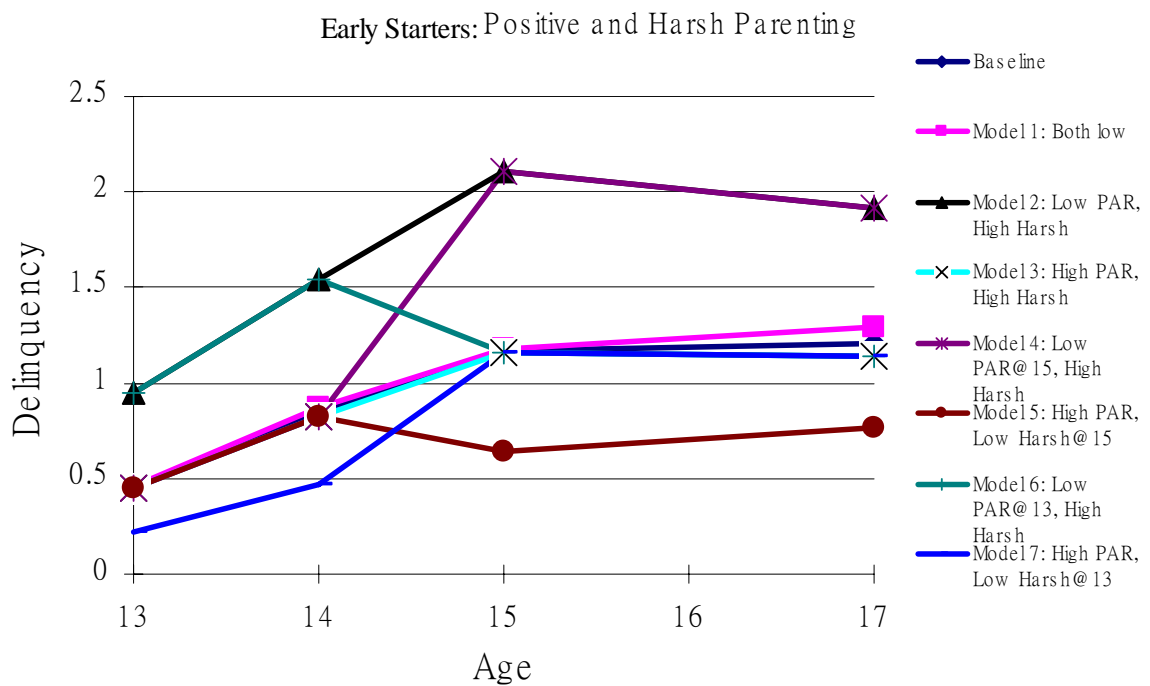
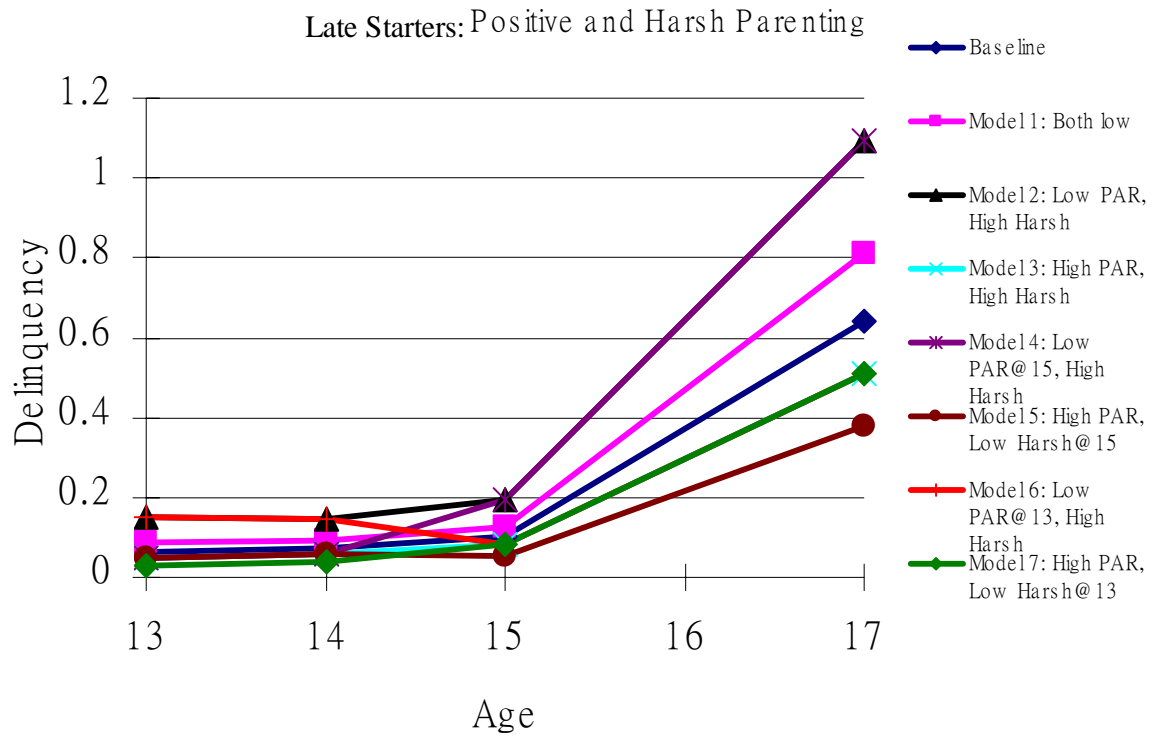
Model 4 and 6 provide an interesting contrast. Model 4 shows the decrease of positive parenting in later waves and a high level of harsh parenting over time. Model 6 has low positive parenting in early waves and a high level of harsh parenting over time. Therefore, we can see there is a jump at age 15 in model 4 and the trajectory ends up with the highest level of delinquency due to the decrease of positive parenting. Model 6 has an early jump in the delinquent trajectory and the trajectory decrease

after age 15.

On the contrary, model 5 and 7 show the opposite settings. Model 5 has a decrease of harsh parenting at the later waves and high positive parenting over time, while model 7 has low harsh parenting at the early waves and high positive parenting over time. Therefore, we can see the trajectory in model 5 decreases after age 15 and ends up with the lowest delinquency. Model 7 has the lowest initial level of delinquency and increase by age 15. After that the trajectory stays constant and has a similar level as model 3.

Time-varying analysis presented here shows how the change of delinquent trajectory associates with the three covariates. The findings display the dynamic impact of the covariates on the trajectories: their abilities to alter the delinquent trajectories. This corresponds to the arguments of developmental theory, but does not support the arguments of self-control theory. Even for early starters who are said to have high temperament problems in childhood, their developmental trajectories still can change after taking the change of the covariates into account.

Figure 5 Bivariate Analysis in Time-Varying Model: Involved Vigilant and Harsh Parenting



A final remark

Current study is a preliminary result of an on-going project for investigating the adolescent delinquency using longitudinal data in Taiwan. Our work provides an empirical test for theories of types of delinquents. Using PROC TRAJ, we achieve two research aims. First, we found two trajectory groups of delinquency for boys over five years period. The two trajectory groups correspond to what Patterson et al. (1992) and Moffitt (1997) argued. We found early starters who start their delinquency at early stage of the life course and persist over five years and late starters who start their delinquency during mid-adolescence. The group size for these two groups also corresponds to theoretical argument.

The analyses of time-varying covariates provide another image for the linked lives argument and the transition perspective in life course perspectives. Three covariates (i.e. positive and harsh parenting) significantly influence (alter) the delinquent trajectories for early and late starter boys. The results support the argument of life course perspectives that developmental trajectories can be altered by personal or environmental factors during the life course (Sampson & Laub, 1993). This result provides meaningful information for the intervention studies of adolescent delinquency. From types of delinquents framework, researchers and specialists of intervention should notice the different patterns and perform relevant intervention at proper timing for each group.

The results also provide a strong support for doing longitudinal studies in Taiwan. Without longitudinal design, researchers cannot trace the life course trajectories for delinquents. Therefore, we make the final remark in this paper. Researchers in Taiwan pursuit and know the latest theoretical perspectives very well. However, in the

empirical investigation, the collection of good quality data corresponding to these theoretical perspectives remains in its preliminary stage. Few years ago, Glen Elder introduced his life course theory to Taiwan's researchers. When amazing the complexity of his theory, we need to note that it is based on the accumulation of several longitudinal studies across thirty years. Facing the trend of developmental and longitudinal research, investing more in longitudinal studies is worthwhile for today and for future.

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