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Verbal Ability and Persistent Offending: A Race-Specific Test of Moffitt's Theory

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Abstract

Theoretical questions linger over the applicability of the verbal ability model to African Americans and the social control theory hypothesis that educational failure mediates the effect of verbal ability on offending patterns. Accordingly, this paper investigates whether verbal ability distinguishes between offending groups within the context of Moffitt's developmental taxonomy. Questions are addressed with longitudinal data spanning childhood through young-adulthood from an ongoing national panel, and multinomial and hierarchical Poisson models (over-dispersed). In multinomial models, low verbal ability predicts membership in a life-course-persistent-oriented group relative to an adolescent-limited-oriented group. Hierarchical models indicate that verbal ability is associated with arrest outcomes among White and African American subjects, with effects consistently operating through educational attainment (high school dropout). The results support Moffitt's hypothesis that verbal deficits distinguish adolescent-limited- and life-course-persistent-oriented groups within race as well as the social control model of verbal ability.

Scholarly treatment of the cognitive ability-delinquency relationship has shifted into the criminological mainstream. Hirschi and Hindelang's (1977) review of research conducted between 1950 and the early 1970s combined with their own analysis led them to conclusions that changed the landscape of intelligence and crime research. They argued that the relationship was as substantively important as the associations between delinquency, social class, and race. Moreover, they concluded that the intelligence-delinquency relationship was mediated by educational failure, a finding that is consistent with Hirschi's (1969) social control approach. Numerous studies since Hirschi and Hindelang's (1977) seminal paper confirm that cognitive skill and delinquency are intertwined. It is, therefore, not difficult to understand why cognitive ability increasingly plays a role in respected developmental models of delinquency.

The contemporary IQ-delinquency literature has taken large strides towards transcending historical criticisms that led many criminologists to dismiss or at least seriously question its centrality. It reveals, for instance, that the effect of verbal ability is independent of socioeconomic status (Moffitt et al., 1981) and the level of test motivation expended by subjects during testing (Lynam, Moffitt, and Stouthamer-Loeber, 1993). The relationship also does not appear to be attributable to the differential detection of low intelligence subjects (Moffitt and Silva, 1988). Recent scholarship (reviewed below) has redirected the study of intelligence and delinquency by guiding attention to the verbal ability subcomponent of the overall IQ score and by re-conceptualizing verbal ability as a broad indicator of neuropsychological function (Moffitt, 1990). Critically, Moffitt and her colleagues find that the effect of IQ on delinquency is most fundamentally a consequence of its verbal ability subcomponent (Moffitt, Lynum, and Silva, 1994; Bartusch et al., 1997).

Of course, it is difficult to conceive of testing the verbal ability-delinquency model outside the context of Moffitt's theory of adolescent-limited (AL) and life-course-persistent (LCP) offending because verbal ability plays a foundational role in her model. Moffitt's well known developmental taxonomy of antisocial behavior envisions that the age-crime curve conceals two very different populations of offenders. The offending of the AL group is constrained to the developmental period of adolescence and is largely the result of a maturity gap and resulting peer pressure with relatively normal neuropsychological development among group members. The AL group is numerically much larger and their offending is sporadic, non-violent, and indicative of adult-like behaviors. Desistance is the norm for the majority of these offenders, except for a select few who become ensnared as a result of the consequences of their offending. On the other hand, the LCP offender initiates offending during childhood and continues offending through the adolescent period and into adulthood. For this group, offending results from neuropsychological and socioeconomic deficits in early childhood reflected by diminished verbal ability and impulsivity, poor mental health, low family income, and negative environments. Because these deficits and compromised circumstances go either undetected or un-addressed, the LCP offender encounters instability or failure in a variety of life domains, such as in education, employment, and relationships, and in turn, evinces continued antisocial behavior throughout the life course (see Piquero et al., 2010). Unlike their AL counterparts, the prospect for change among the majority of LCP offenders is slight due to contemporary and cumulative continuity.

The foregoing discussion of Moffitt's theory illustrates that it envelops a wide variety of predictions. For our purposes, it is important in the context of empirical testing to distinguish the hypothesis specifying the number of offending groups (Moffitt's original theory predicts three: non-offenders, adolescent-limited, and life-course-persistent) from the prediction that verbal deficits pattern membership in the life-course-persistent relative to adolescent-limited or non-offender groups. Previous research suggests there are more offending groups that can be empirically distinguished than are specified in the dual taxonomy (Moffitt, 2006; Piquero, 2008; Thornberry et al., 2012). Yet, that does not detract from the important theoretical and policy implications of investigating the role that verbal deficits may play in producing offending among the group that is most problematic for the criminal justice system and society more generally (i.e., life-course-persistent). The analysis presented here is focused on the role of low verbal ability in patterning membership in the life-course-persistent group.

Other questions remain to be resolved as well. One is whether the verbal ability-delinquency relationship generalizes to African American subjects. Theoretically, the question contrasts Moffitt's taxonomy, which proposes that the aforementioned processes are racially invariant, with approaches positing that the expression of genetic influences or psychological traits is most likely in advantaged social contexts (such as contexts experienced by Whites) and least likely in disadvantaged contexts where the influence of verbal ability is constrained by the imperatives of an adverse social environment (more typical of the contexts experienced by African Americans). The latter approach is expressed theoretically as the “social push” hypothesis (Raine, 2002).

The current analysis goes beyond prior research by integrating a test of Moffitt's predictions regarding the distinction between AL and LCP offenders with a race-specific analysis of the verbal ability model. In so doing, we take advantage of a national, longitudinal data set that documents arrests from childhood through early adulthood to operationalize the groups that are central to her theory and assess fundamental predictions of the model. Data limitations constrain much previous research to the child and adolescent developmental periods and focus it on hypotheses dealing with the emergence of offending. While these aspects of Moffitt's model are clearly central, researchers less commonly possess survey data that spans each of the developmental periods that are central to the theory. As a result, measures of offending in adulthood, critical to forming the LCP measure, are often absent and thus preclude more expansive theory testing. In the next sections, we review relevant literature that informs our test of the model.

The Verbal Ability Model

In a series of papers beginning in the early 1980's, prominent psychologists addressed critical issues in the IQ-delinquency debate. For instance, Moffitt et al. (1981) examined whether the IQ-delinquency relationship is spurious once socioeconomic status is controlled using two prospective longitudinal studies collected in Denmark and found that the expected negative correlation between IQ and delinquency remains net of socioeconomic status (also see Reiss and Rhodes, 1961; Wolfgang et al., 1972). Studies now routinely control the level of test motivation expended by subjects during administration of testing and, when they do,

report that the effect of cognitive ability is robust. Further, Moffitt and Silva (1988) addressed a longstanding critique of the IQ-delinquency literature that subjects with low IQ are more likely to be arrested by the police while smarter but equally delinquent subjects are able to avoid sanctions. In their study, subjects with high levels of self-reported delinquency and an official arrest record were compared to subjects with comparably high self-reported delinquency and no official record. Results indicated no significant differences in IQ between the two groups (also see Hindelang, Hirschi, and Weiss, 1981). Finally, several studies report that educational attainment, impulsivity, and peer context mediate at least some of the effect of intelligence on delinquency (McGloin, Pratt, and Maahs, 2004).

In the late 1980's, scholars began to focus more attention on neuropsychological deficits in relation to delinquency. Moffitt and Silva (1988), for instance, report that "a pattern of verbal, visuospatial-motor integration, and memory deficits contributed variance to delinquency" (p. 233). In a major review of literature on the neuropsychology of delinquency in which many studies were criticized for methodological weakness, Moffitt (1990) concluded that "consistent findings of delinquency-related deficits, particularly in verbal and executive (self-control) functions, have nonetheless been reported in many studies including those with the strongest designs" (p. 99). As well, it has been noted that research comparing the effects of low verbal ability and executive functions indicates that verbal ability is more often consequential among early onset offenders (also see Manninen 2013). [1] In subsequent work, Moffitt, Lynam, and Silva (1994) further clarify that that "poor verbal ability is the "active ingredient" for delinquency in the omnibus IQ" (p. 293), particularly among early-onset delinquents. Beyond the shift from IQ to verbal ability is a sharpened conceptual image of the latent trait it measures – verbal ability comprises "a broad index of neuropsychological health … deficits in the neuropsychological abilities referred to as "executive functions" interfere with a person's ability to monitor and control his or her own behavior" (Lynam, Moffitt, and Stouthamer-Loeber, 1993:188; see also Raine, Moffitt, Caspi, et al., 2005). Both of the latter studies report that verbal deficits are associated with delinquency. A subsequent review likewise concludes that "verbal deficits have been frequently displayed across the literature" (Teichner and Golden, 2000:525).

Prior Research on Moffitt's Developmental Taxonomy of Antisocial Behavior

As a way of unpacking potential heterogeneity underlying the age-crime curve, Moffitt's (1993) developmental taxonomy anticipates that the aggregate age-crime curve is a mixture of at least two distinct offender typologies, each with its own longitudinal patterning of antisocial behavior and each subject to a unique causal process. Life-course-persistent (LCP) offenders are hypothesized to represent a very small portion of the population of offenders (∼5-8%). They begin exhibiting antisocial behavior very early in the life course and continue into adolescence and throughout adulthood. [2] Naturally, the form of their antisocial

[1]Some IQ-delinquency scholars posit that, within offender populations, the effect of verbal ability may shift when outcome variables distinguish overt (violent) from covert (property) offenses. For instance, Walsh (1987) reports the familiar relationship between low verbal ability and violence in his study of male probationers. In contrast, probationers with the highest verbal abilities engaged in more serious property offending (also see Barker et al., 2011).

behavior repertoire is such that the behaviors are age-appropriate but more serious aggressive/violent and property delinquency (pushing as a child, theft and substance use as an adolescent, and violence as an adult). As well, LCP's antisocial tendencies permeate other life domains, such that LCP's encounter failure in education, employment, relationships, and health (Piquero et al., 2010). For Moffitt, the origins of LCP offending lie primarily in neuropsychological (especially verbal) deficits that interact with disadvantaged familial and economic environments. Because of this injurious interaction, the likelihood of altering their life course trajectory is very slim.

The second group of offenders in Moffitt's taxonomy is the adolescence-limited (AL) typology. Unlike their LCP counterparts, AL offenders do not evince deficits in verbal abilities and/or personality structures; instead, their involvement in antisocial behavior begins during adolescence and (for the most part) terminates at the conclusion of adolescence with the emergence of early adulthood. For these offenders, antisocial behavior is normative and involves adolescent age-appropriate behaviors that symbolize adult social status, such as substance use, sexual activity, theft (in order to obtain money), and defiant acts against authority. The underlying cause of their misbehavior lies in what Moffitt refers to as the ‘maturity gap,’ or the disjunction between biological status and social status; that is, AL offenders look and feel like adults, but because of their age they are denied access to adult roles and privileges. When recognition of the maturity gap is met with similarly situated peers who also find themselves in this same maturity gap, the likelihood of delinquency—but not personal violence—is heightened. Importantly, as adulthood approaches, AL offenders are granted access to the things they once coveted and generally desist from their antisocial experimentation, except for a handful of persons who are ensnared into subsequent misbehavior due to an arrest, a drug habit, pregnancy, or other negative life event that was caused by their misbehavior.[3]

Given its hypotheses and the extent to which it cuts at the core of key theoretical debates in criminology over general and typological theories of crime (Paternoster et al., 1997), it is not surprising that the taxonomy has been subject to a significant amount of theoretical debate, criticism, and empirical research assessing key aspects of the two-group typology. Critiques have focused on whether only two groups of offenders characterize the population of offenders, whether the typologies engage in antisocial behavior as a result of the theoretically-anticipated correlates, and the extent to which LCP offenders do in fact offend over the life course (see reviews in Moffitt, 2006; Piquero and Moffitt, 2005; Piquero et al., 2013). Aided by the development of methodologies that are able to detect heterogeneous trajectories of offending (Nagin and Land, 1993), empirical research has shown that although there tends to be age-crime typologies that resemble Moffitt's two-group offender model, results also reveal other trajectories, such as low-level chronic offenders who offend at generally low but relatively stable rates over at least two to three decades of the life

[2]Later onset delinquency is more typically associated with deception/property offending (i.e., covert) than would be the case for early onset delinquency, with the latter reflecting a more general pattern of serious offending that includes covert and overt (i.e., violent) behavior. For a more detailed discussion of these issues see LeBlanc and Loeber (1993), Loeber and Hay (1994), Moffitt (2006), and Patterson et al. (1989).

[3]In the original statement of the theory, Moffitt anticipated a third typology comprised of abstainers who refrained from delinquency altogether because of their social exclusion. As this typology is not part of the offending population, we do not elaborate on them further.

course (Jennings and Reingle, 2012; Moffitt, 2006; Piquero, 2008). Empirical research has also shown that many of the variables anticipated by Moffitt to be distinguishing features of the two trajectories operate as they should, with social process variables being most relevant for AL offenders while individual difference and disadvantage variables being most relevant for LCP offenders (Bartusch et al., 1997; Moffitt et al., 2001). Studies have started to examine (non-crime) life outcomes across the two main offending typologies, the results of which find that the most extreme (e.g., LCP) offending groups also have the worst life outcomes—experiencing disarray and strife in various areas of health and overall functioning (see Odgers et al., 2007; Piquero et al., 2007, 2010). Finally, empirical research tends to show that many LCP offenders desist criminal offending by middle adulthood (Laub and Sampson, 2003) while some LCP's appear to recover from their criminal offending in early adulthood (Moffitt et al., 2002).

Although a sizable literature has critically examined Moffitt's theory, a variety of limitations have prevented empirical investigation of some of the taxonomy's most central hypotheses. For example, only a handful of studies have been able to examine the extent to which verbal ability successfully classifies subjects into offending groups, and among several of these studies researchers have not considered alternative (age-based) cutoffs for membership in the various offending typologies, which, as our work will show, is not a trivial concern. Other studies are limited because their follow-up only extends to late adolescence or early adulthood. Furthermore, very little research has explored race differences across the offender typologies (for exceptions see, Piquero et al., 2005; Haynie et al., 2008). Given the centrality of race differences in criminological discourse, Moffitt (1994:39) addresses how the taxonomy may help shed light on race differences in antisocial behavior:

> “In the United States, the crime rate for black Americans is higher than the crime rate for whites. The race differences may be accounted for by a relatively higher prevalence of both life-course persistent and adolescence-limited subtypes among contemporary African-Americans. Life-course persistent anti-socials might be anticipated at elevated rates among black Americans because the putative root causes of this type are elevated by institutionalized prejudice and by poverty. Among poor black families, prenatal care is less available, infant nutrition is poorer, and the incidence of exposure to toxic and infectious agents is greater, placing infants at risk for the nervous system problems that research has shown to interfere with prosocial child development. To the extent that family bonds have been loosened and poor black parents are under stress,…and to the extent that poor black children attend disadvantaged schools…, for poor black children the snowball of cumulative continuity may begin rolling earlier, and it may roll faster downhill…”

For Moffitt, then, African Americans are at greater risk for offending due to the confluence of risk factors that lead to both AL and LCP antisocial behavior, but the same processes are expected to produce similar outcomes irrespective of race.

Verbal Ability and Offending Among African Americans

The extent to which verbal ability predicts offending across race is not a universally shared theoretical expectation despite consensus about the problematic contexts in which many African American children are reared. For example, the “social push” hypothesis posits that social outcomes typically associated with superior verbal ability are most likely when the social environment is nurturing and least likely when the environment is harsh and/or less welcoming. There is substantial evidence that the social environment in the U.S. is less hospitable to African Americans (Wilson, 2009). Feagin's (1991) research on middle class African Americans finds that they too routinely experience avoidance, verbal epithets, and police harassment on the streets. He concludes that findings support the continuing significance of race beyond that which others acknowledge when referencing the underclass (also see Gabbidon, 2010; Unnever and Gabbidon, 2011). Indeed, race differences, net of individual or family SES, are evident in a variety of realms including education (Hallinan, 2001), employment and labor markets (Wilson, 1996), marriage (Qian, 1997), health (Hayward et al., 2000), and criminal justice (Hawkins, 1995). To the extent that the social environment of African Americans is less opportunistic and nurturing, African American adolescents may be less likely to perceive that the social returns to acquisition of verbal ability will yield the same advantages evident among Whites. This leads to the expectation, consistent with the social push hypothesis, that exposure to non-nurturing environments could result in quite different behavioral choices among higher ability African American adolescents relative to Whites. For instance, although African American subjects are as likely as Whites to perceive the adverse consequences of an arrest, they may nevertheless choose risky behavior in the presence of situational inducements or if their social experiences convey that the potential for social mobility is low (see Anderson 1999).

Whether the verbal ability model generalizes to African Americans has been infrequently addressed because most studies are comprised of White subjects. Donnellan et al. (2000) examine the issue in their longitudinal study of juvenile prisoners committed to a California Youth Authority (CYA) facility in the mid-1960s. Offending data characterizing each of the youth's criminal careers were then collected roughly twenty years later. Neuropsychological deficits were assessed using twelve subtests derived from three general cognitive ability instruments. The authors divided their sample based on the extent to which subjects approximated the AL or LCP category. Consistent with Moffitt's (1993) model, the results indicate lower cognitive scores among the LCP White offenders. However, among African Americans there were no significant differences in cognitive abilities between the AL and LCP offenders. Donnellen et al. (2000) conclude that “a possible and plausible explanation for these results is that the protective effects of cognitive ability are not as influential in the contexts in which African Americans lead their lives” (p. 399). Although differing in terms of research design and sampling frames, Donnellen et al.'s (2000) findings are theoretically consistent with the social push hypothesis.

Support for the social push hypothesis is challenged by two studies that support Moffitt's position. Lynam, Moffitt, and Stouthamer-Loeber (1993) estimate the relationship between verbal ability and delinquency separately among Whites and African Americans and find that verbal ability is inversely associated with delinquency among both African American

and White male subjects after controlling for socioeconomic status, test motivation, and impulsivity. Further, the effect of verbal ability appears to be mediated by school achievement among African Americans, whereas among Whites the effect of verbal ability is more direct.

Using data from the Philadelphia cohort of the National Collaborative Perinatal Project (NCPP), Piquero and White (2003) address the longitudinal relationship between cognitive abilities measured in childhood and adolescence and offending patterns from adolescence and into early adulthood. After considering two different measures of cognitive abilities and three different measures of LCP-style offending, their analyses revealed that higher scores on tests of cognitive abilities protected against LCP patterns of offending—even after controlling for several other important correlates of offending.

In sum, the longitudinal effect of verbal ability on offending among a general population of African Americans remains unresolved, as does the extent to which any such relationship varies between African Americans and Whites. Taking stock of the larger neuropsychology of delinquency literature, Nigg and Huang-Pollack (2003) echo this conclusion, arguing that "the best specification of the effect of intelligence on offending may be that it applies to early-onset problems in boys…and that the effect is most pronounced for verbal skills… Applicability to various racial-ethnic groups requires continuous scrutiny across development" (pp. 235-236). With this backdrop in hand, we test two hypotheses in the current paper: (1) low verbal is positively associated with membership in the life-course-persistent- oriented versus adolescent-limited-oriented offending group, and (2) low verbal ability is positively associated with arrest outcomes among African American and White subjects.

Data and Method

Sample

We examine the longitudinal relationship between verbal ability and delinquency with a sample of African American and non-Hispanic White males drawn from fourteen waves of the 1997 National Longitudinal Survey of Youth (NLSY97) – a large and nationally representative household sample of the U.S. that captures the emergence of delinquency in later childhood and follows subjects through the transition into young adulthood. The sample comprises subjects who were between the ages of 12 and 16 when they were selected for inclusion and who have been interviewed yearly since 1997, with an over-sample of African Americans. By the fourteenth wave, the sample ranged in age from 26 to 30 years old. In the first stage, 100 primary sampling units (PSU) contained in the National Opinion Research Center's (NORC) 1990 national sampling frame were randomly selected proportionate to size. Segments of adjoining blocks with at least 75 housing units were selected from each PSU, and households were randomly selected from a list of housing units in each segment. Screening interviews resulted in 9,806 eligible subjects, 8,984 of whom participated, yielding a 91.6% response rate. By round 14, 7,479 respondents completed interviews, yielding an 83.2% retention rate that does not vary significantly by race.

Lynam et al.'s (1993) analysis was restricted to males, which is common in delinquency research given substantially higher rates of serious delinquency among males. We mirror their decision so that the analysis is comparable. Approximately 51% of the sample, or 3,814 subjects, are male, of which 1,655 are non-Hispanic White and 848 are African American resulting in a final sample of 2,503. The sample is statistically indistinguishable in arrest history from non-Hispanic White and African American male subjects present in the first wave but who had attrited by the fourteenth wave of data collection.[4] Race is self-reported, and is measured with a dummy variable contrasting African American with non-Hispanic White subjects. Regression imputation with random error components was used to replace missing values on explanatory measures (Jinn and Sedransk, 1989). To ensure that the reported results are not sensitive to imputation, we replicated our models using list wise deletion of cases with missing values and also mean substitution. There were no substantive differences between these alternative specifications and the results contained in the text.

Level-1 Measures (Time-Varying)

Arrest—The NLSY97 is designed to document human capital and the transition from school to work, but illegal behavior and other topical areas are assessed. Data availability plays a role in structuring the analysis. Some items such as arrest outcomes are available in each survey round. Verbal ability, test motivation, family income, and peer drug use are measured in the first or second wave when subjects are earlier in their development. High school completion is assessed in each wave throughout the study (each measure is described in more detail below).

Measurement of the arrest outcome distinguishes whether subjects were ever arrested and their frequency of arrest because verbal ability could exert differing effects depending on measurement. Ever arrest is dummy coded 0 if there was no arrest and 1 if there was an arrest in the previous year. The second measure, for subjects that did get arrested at least once during one of the fourteen waves, reflects the frequency of arrest in each wave with a range of zero to nineteen. Arrest prior to age 12, which is needed to classify subjects into offending groups (reviewed below), is assessed with a variable created by NLSY staff (i.e., earliest arrest date) based on survey responses specifying the date (month and year) of the first arrest. Descriptive statistics for the arrest outcomes and other variables included in the analyses are presented in Table 1. Consistent with previously reported research (McNulty and Bellair, 2003), race differences in arrest history are evident: African Americans exhibit a significantly higher likelihood of ever arrest and, among subjects with one arrest or more, a greater frequency of arrest relative to Whites.[5]

[4]The subsample analyzed in this study is not unusual or unrepresentative in ways that bias the analysis in favor of Moffitt's theory. Comparison of study variables in wave 1 between the sample analyzed here (analysis sample) and the White and African American males that left the sample by wave 14 due to attrition (attrition sample) reveals no differences ($p<.05$) in ever or frequency of arrest, family income, test motivation, and high school completion. Small but significant differences were found in peer drug use (attrition sample slightly greater) and verbal ability (attrition sample slightly lower). All else equal, the analysis may therefore slightly underestimate the size of verbal ability effects due to those differences. Relative to the entire NLSY97 sample minus White and African American males (exclusion sample), the analysis sample, as expected, is almost twice as likely to be arrested with over twice the frequency of arrest. The exclusion sample is also slightly less affluent and exhibits slightly lower verbal ability, but greater peer drug use and high school dropout with no difference in test motivation.

Level-2 Measures (Between-Person)

Low Verbal Ability—The U.S. Department of Defense funded administration of the *CAT-ASVAB* to NLSY97 respondents during the first wave for the purpose of establishing national norms.[6] The CAT-ASVAB comprises 12 separate tests that measure knowledge and skill in wide ranging competencies and is designed to determine which job specialties recruits are qualified for. Verbal ability is measured by combining final ability estimates of the word knowledge and paragraph comprehension subtests (r = .78) into a principle components factor scale with each item weighted by its factor loading (Cronbach's alpha = .88).[7] Measurement of key variables follows Moffitt's hypothesis that LCP offenders suffer from extreme neuropsychological and socioeconomic deficits. Thus, we measure verbal ability (and other individual characteristics where possible) using a dummy variable coded one (zero otherwise) if a subject is in the bottom quartile of the verbal ability distribution[8], yielding a mean of .25 (see Table 1). Consistent with previous research (Jencks and Phillips, 1998; Lynam et al., 1993), Table 1 indicates substantial and significant differences in verbal ability by race. There is ongoing debate over the differential validity of the ASVAB test by race. In a detailed study, Wise et al. (1992: 25) note that “small but significant differences indicating greater sensitivity [in the ASVAB] for whites than for blacks do suggest the need for further investigation and possible refinements” but concluded more generally “that the ASVAB technical composites are highly sensitive predictors of training and job performance for all applicant groups.”

Historically, scholars criticize ability testing because, if it is true that delinquents do poorly in school, they would not be expected to exert themselves during administration of standardized testing. This sentiment is captured by Simons (1978:269-70), who notes “the delinquent is often described as an unmotivated student who does little school work and receives failing grades. … But, if these students are not motivated to do academic work on any other day of the school year, why should they be motivated to perform to the best of their ability on the day the IQ tests are administered?” To address this issue, we control for the self-reported *test motivation* each subject reported during the ASVAB test. *Test motivation* was assessed at the conclusion of the ASVAB administration and is coded such that high values reflect greater effort. African American subjects exerted less effort than Whites but in practical terms the difference is quite small.

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[5]Differential validity of delinquency data by race is an unresolved issue (Piquero et al., 2014). Previous research on the validity of self-reports examines criterion validity by examining the association between self-reported delinquency and either official or self-reported official delinquency. Two prominent studies are illustrative. Hindelang et al. (1981) report that Black male self-reports exhibit lower validity relative to White males. Twenty-five years later, Farrington et al. (1996) examined the issue with data drawn from the Pittsburgh Youth Study. In contrast to Hindelang et al.'s findings, Farrington et al. report that black adolescents with police records for criminal delinquency and property and violent index offenses are more likely to report being picked up by the police than similarly charged whites. They conclude “ethnic differences in official delinquency … were not attributable to differential … ethnic validity of measures of delinquent behavior” (p. 511).

[6]For a detailed description of the ASVAB administration in NLSY97 see Appendix 10 of the NLSY97 codebook supplement.

[7]Final ability estimates of the word knowledge and paragraph comprehension subtests are used to calculate the verbal ability measure rather than raw scores because computer-adaptive testing was used. The method entails tailoring the difficulty of questions based on each respondent's correct or incorrect responses to previous questions. Thus, respondents did not answer the same number of questions and the questions asked of each were of varying difficulty, both of which confound use of raw scores. The final ability estimates, created by the Department of Defense (DOD) using item response theory, are appropriate for comparing verbal ability across respondents.

[8]Use of the bottom quartile to indicate risk is common in the developmental/ life-course criminology literature as well as more general research on the risk factors associated with antisocial behavior (see Farrington and Loeber 2000).

Low Family Income—Socioeconomic status is measured by *low family income* reported by each subject's primary caregiver during the first wave, and is included given Moffitt's (1993) argument that exposure to disadvantage during early development influences membership in the LCP group. It is also included due to historical criticism that the relationship between verbal ability and delinquency is confounded with socioeconomic disadvantage. A dummy variable is computed equal to one if a subject's family income lies in the bottom quartile (below $24,878). Low family income is substantially more prevalent among the families of African American subjects.

High Peer Drug Use—High peer drug use is a facet of delinquency generally as well as Moffitt's taxonomy in particular. Specifically, Moffitt anticipates that associations with (delinquent) peers is an important correlate of AL delinquency, and further that the offending behavior of LCP offenders (whether it is offending or drug use) serves as a model for AL offenders to mimic. It is measured during the first wave with a categorical response set reflecting the percentage of each subject's peers in their grade at school (or when they were in school) that use drugs. The response set ranges from one to five, with one indicating that almost none use drugs and five indicating that almost all (over 90%) use drugs. *High peer drug use* is measured with a dummy variable coded one if, according to the subject, over 50% of peers use drugs. African American subjects are more likely to experience peer drug using contexts.

GED / High School (HS) Degree—A prominent indirect effect model (Hirschi and Hindelang, 1977) posits that cognitive ability exerts its influence on delinquency by affecting educational attainment. From a classic social control perspective, educational attainment reflects attachment, commitment, involvement, and belief in school. The social control model of verbal ability predicts that educational attainment mediates the effect of verbal ability on delinquency. Educational attainment is measured as a set of dummy variables to depict whether subjects have earned a high school degree (HS Degree), a GED, or no degree (omitted category) and is derived from an item created by NLSY staff to characterize each subject's highest earned degree by wave 14. We distinguish GED from HS Degree because the GED is more common among criminal justice populations, and may not reflect the same level of commitment as traditional completion of high school. *GED* is coded 1 if the subject earned a GED, and *HS Degree* is coded 1 if the subject earned a high school diploma. Approximately 14% of the sample completed a GED and about 76% earned a high school diploma (roughly 10% earned neither). Educational attainment varies significantly by race. African Americans are almost twice as likely to have earned a GED and are significantly less likely to have earned a high school diploma.

Offending Groups—A central goal of the analysis is to contrast the verbal ability of AL and LCP offenders. Accomplishing this goal requires decision rules for dividing the sample into offending groups. Arrest outcomes at three different developmental stages (childhood, adolescence, adulthood) are used to classify the sample, with a maximum of eight distinct offending groups possible. Given that there are eight potential offending categories and Moffitt's taxonomy specifies three groups (e.g., non-offenders, AL's, and LCP's), there are residual groups presented that are of less interest. It is not our goal to advocate a particular

typology of offender groups or to make claims about the specific number of distinct groups that exist in the population. As we noted above, prior research indicates that more groups can be empirically distinguished than were specified in Moffitt's taxonomy. Instead, our focus lies squarely on how verbal abilities distinguish between offending classifications that equate with the essence of Moffitt's taxonomy that low verbal abilities are subsequently related to the most chronic forms of antisocial behavior.

Moffitt (1993) does not stipulate a specific age to define early onset but does make frequent reference to “preteen arrests” as a defining characteristic of stable offending, with stable offending a hallmark of LCP offenders. This suggests a 12 and under age criterion for defining early onset, as does some although not all of the DSM-IV criteria for establishing conduct disorder. For instance, staying away from home without parental permission before age 13 and/or truancy before age 13 are criteria used along with other information for diagnostic purposes. Some research examining early onset offending adopts a similar strategy (van Damburgh et al., 2009). Other scholars have used age 14 and under as a criterion for defining early onset, typically because age 14 marks entrance into high school and also effectively divides the age range of a sample for analytic purposes (see Patterson et al., 1992; Tibbetts and Piquero, 1999; Simons et al., 1994). Consistent with Moffitt's (1993) approach, when the 12 and under criterion is employed the verbal deficits of the LCP group are most pronounced. A related issue is the age cutoff to distinguish adolescent and adult offending, with implications for the size of all groups. The late bloomer category is typically defined as onset of offending after age 18 (see e.g., Eggleston and Laub, 2002; Gomez-Smith and Piquero, 2005), but some scholars use age 21 (see Zara and Farrington, 2009). Using the age 18 criterion, in combination with 12 and under to reflect early onset, produces the smallest AL and LCP groups.

The scheme adopted for the present analysis is presented in Table 2, characterizing early offending as an arrest at or before age 12, adolescent offending between the ages of 13 and 18, and adult offending occurring at age 19 and beyond. The AL offender in Moffitt's (1993) scheme does not exhibit early onset, has one or more arrests during adolescence, and no adult offending. We follow this definition. The definition of the LCP offender group is more nuanced. The initial strategy was to use a stringent classification of LCP offenders so that a clear comparison could be made. We began by classifying subjects with an early, adolescent, and adult arrest as LCP. However, and as would be expected in a household survey of the population, application of the strict definition resulted in a very small number of subjects (n=49) meeting the criteria and hence low power to detect significant differences. After further analysis, subjects with an early and adult arrest but no adolescent arrest (10 subjects met this criteria) were included in the LCP group producing a final LCP group of 59 subjects. This small increase in power does not change the pattern of findings but does improve the power to detect a significant and substantively meaningful difference. When there are differences in findings between the strict and more expansive definition of the LCP group they are noted when relevant. Beyond these details, and consistent with Moffitt's (1993) approach, there is clearly a progression in the percentage of subjects in each group in the lowest quartile of verbal ability (i.e., low verbal ability) from non-offenders to LCP offenders.

Results

Table 3 presents a multinomial logistic regression distinguishing offender groups on key developmental measures, with the AL group serving as the base or reference category. Of particular relevance for Moffitt's (1993) theory is the contrast in verbal ability between AL and LCP offenders. Consistent with Moffitt's theory, low verbal ability significantly increases the log odds of membership in the LCP relative to AL group, and the odds ratio (in parenthesis) indicates that the odds of LCP group membership are more than doubled by low verbal ability.[9] Evidence also reveals that low family income and high peer drug use increase the likelihood of a LCP versus AL offending pattern. The findings presented were also compared with results obtained from group-based trajectory modeling (not shown). The patterns are very similar. Consistent with Moffitt's conceptualization, we began by imposing a three group model (non-, AL, and LCP offender) and then estimated multinomial regression models following the specification in Table 3. A three group solution resulted in a small LCP group comprising 1% of the sample (about 25 subjects) and an AL group comprising 19.4% of the sample (about 485 subjects) with the remainder classified as non-offenders. Consistent with Moffitt's theory, low verbal ability was positively associated with LCP vs. AL group membership ($p < .05$, two-tailed test). Using the BIC criterion, a four and five group model fit the data better, but produced substantially smaller LCP groups than the three group solution. Multinomial regression indicated a similar pattern as the three group solution, but, as a consequence of small sample size and consistent with the outcome of the grouping procedure presented above, the significance level of the low verbal ability coefficient dropped ($p < .10$).

With respect to the other offending groups, low verbal ability, low family income, and high peer drug use increase the probability of membership in the adolescent onset late bloomer group relative to the AL group. The non-offender group is also distinguished from AL offenders due to their greater verbal ability and family income, and diminished exposure to peer drug using contexts. The remaining groups (late bloomer and early onset desister) do not display a clear pattern of effects distinguishing them from the AL offenders, although high peer drug use predicts membership in the early onset desister group. Overall, these findings are generally consistent with Moffitt's theory, with sharp distinctions occurring between AL offenders and their LCP (and non-offender) counterparts, but with some room for potential modification because the substantive findings that compare the adolescent onset late bloomer to the adolescent-limited group were similar to those obtained in the comparison between the life course persistent and adolescent-limited groups.

The relationship between verbal ability and delinquency by race is addressed in Table 4 with a series of 2-level hierarchical models with repeated measures of arrest nested within persons (for an overview of the statistical procedures see Luke, 2004:59-62 or Raudenbush and Bryk, 2002:231-232). The binary measures, reflecting ever involvement in the prior year, are analyzed using logistic regression while frequency counts are treated as over-

[9]When the strict definition of the LCP group is used (i.e., n = 49) the pattern of results is nearly identical. The key difference is that the coefficient for low verbal ability reduces with a slight increase in standard error, which changes statistical significance from $p<.05$ to $p<.10$. Other coefficients are virtually identical.

dispersed Poisson sampling distributions with constant exposure.[10] The level 1 model is expressed as follows: (1) $\eta_{ij} = \pi_{0j} + e_{ij}$ where η_{ij} reflects either the logit or log delinquency event rate per unit of time *i* for person *j;* π_{0j} is the intercept for person *j*; and e_{ij} is a level-1 random effect that represents prediction error.

The key analytic question in this portion of our analysis is whether arrest is a function of verbal ability within each racial group. Thus, the level-1 intercept π_{0j} is modeled as an outcome of person-level characteristics and random error: (2) $\pi_{0j} = \beta_{00} + \beta_{01}X_{1j} + \Gamma_{0j}$ where β_{00} is the intercept; X_j are person-level characteristics including low verbal ability, low family income, and high peer drug use used as predictors; β_{01} are the corresponding regression coefficients; and Γ_{0j} is a level-2 random effect that represents the deviation of person *j*'s level-1 intercept (π_{0j}) from its predicted value based on the person-level model. All models were examined for signs of multicollinearity by examining item inter-correlations, variance inflation factors (VIFs), and whether standard errors increase across equations. None of the VIFs came close to exceeding the critical value of 4.0 (Fisher and Mason, 1981:108). The other tests also indicate that multicollinearity is not confounding the analysis.

Table 4 presents results (logged odds) addressing whether low verbal ability increases arrest outcomes among non-Hispanic Whites but not among non-Hispanic African Americans (e.g., Donnellen et al., 2000), or whether comparable results are evident for both groups (e.g., Lynam et al., 1993; Moffitt, 1994).[11] The table further assesses whether the low verbal ability effect on arrest (ever and frequency) is mediated by educational attainment, consistent with a social control model of verbal ability, and whether that mediation is evident for both White and African American subjects.

Most important, the effect of low verbal ability is significant and consistently positive for both non-Hispanic Whites and African Americans across the baseline equations in Table 4 (Models 1, 3, 5, and 7), net of other variables including test motivation. There are no significant differences in the magnitude of the low verbal ability coefficients across equations disaggregated by race. This supports Moffitt's view and prior research that neuropsychological deficits, such as low verbal ability, are associated with both the incidence and frequency of arrest, and that this effect is racially invariant. Models 2, 4, 6, and 8 in Table 4 incorporates the GED and HS Degree indicators of educational attainment, the latter of which has consistent and inverse effects on arrest across models. We also hypothesized that much of the effect of low verbal ability may operate through educational attainment, consistent with a social control model outlined above. For both non-Hispanic White and African American respondents, the effect of low verbal ability on ever or frequency of arrest is mediated by completion of a high school degree (i.e., it reduces and is not significant).[12]

[10]For example, at level-1 we model: $\eta_{ij} = \log(\lambda_{ij})$, where λ_{ij} is the event rate reflecting the frequency of delinquency and η_{ij} is the log of the event rate. Note that while λ_{ij} is constrained to be non-negative, $\log(\lambda_{ij})$ can take on any value. The predicted log event rate can be converted to an event rate by generating $\lambda_{ij} = \text{exponential}\{\eta_{ij}\}$.

[11]The models in Table 4 are estimated with HLM.

[12]The measures of educational attainment used in the analysis were contrasted with two alternative school measures in the models -- grade point average and educational expectations. The alternative measures are less consistently associated with the arrest outcome and do not mediate the entire effect of verbal ability on arrests.

The effects of the other variables across models in Table 4 are generally consistent with expectations. Test motivation has no bearing on the results. Low family income has direct, positive effects on arrests (both ever and frequency) for both Whites and African Americans (models 1, 3, 5, and 7), and these effects too appear to be at minimum partially mediated by educational attainment in models 2, 4, 6, and 8. Likewise, high peer drug use is associated with an increased likelihood of an arrest and a greater frequency of arrests across each of the equations, although less of that effect is mediated by educational attainment. In sum, the results are consistent with Moffitt's theory that verbal deficits are related to a LCP style of offending, that low verbal ability has theoretically consistent effects for both non-Hispanic Whites and African Americans, and that this effect is mediated by educational attainment for both groups.

Discussion and Conclusion

A large volume of research establishes an inverse relationship between IQ and juvenile delinquency. Aided by advances in psychology, recent criminological work conceptualizes verbal ability as a broad index reflecting neuropsychological executive functions and argues that it is an underlying component of the relationship. In this view, low verbal ability is directly associated with delinquency because it reflects a diminished capacity to monitor and control one's own behavior, and the social control hypothesis posits it as indirectly associated with offending through its effect on educational attainment. While many researchers have investigated the relationship between IQ or verbal ability and delinquency, it is rare to conjecture that the relationship differs by race and to explore this pattern of associations into adulthood.

Using longitudinal data drawn from the NLSY spanning a period of about 13 years, the results provide support for specific aspects of Moffitt's (1993) theory, although, consistent with extant research, the results are not consistent with a dual taxonomy specification of offending groups. However, multinomial logistic regressions distinguishing offender groups on key developmental measures indicate a sharp contrast between the AL group and LCP offenders (and non-offenders). Findings are consistent with Moffitt's theory that LCP offending is directly associated verbal deficits and related disadvantages. Two-level models regressing arrest (ever and frequency) on verbal ability by race show that low verbal ability has theoretically consistent effects for both non-Hispanic Whites and African Americans, and that this effect is mediated by educational attainment for both groups. The latter finding contrasts in part with Lynam et al. (1993), who report that the effect of verbal ability is mediated by school achievement among African American adolescents, whereas among Whites the effect is more direct. The effect of a GED on the trajectory of arrest is generally negative but does not significantly impact arrests, suggesting that a GED may matter more or less depending on the context (i.e., in juvenile detention, in the community, as a condition of probation, or in an adult prison) in which it is earned (for evidence that prison education programs reduce recidivism see Davis et al., 2013).

In total, these results serve as important confirmations of some of the key aspects of Moffitt's theory linking verbal abilities to distinct styles of LCP offending, as well as the extent to which such a relationship is similar across race. Nevertheless, there remain several

important questions and challenges that are in need of further theoretical and empirical research. First, our main focus in the current investigation rested on the role of verbal ability to differentiate unique patterns of offending over the life course. Because there is limited information on family processes and conditions and none reflecting the early childhood period in NLSY97, we did not consider Moffitt's interactional hypothesis that verbal deficits and disadvantaged environments spark an even more distinct and chronic offending style. Assessments of Moffitt's interactional hypothesis are rare—and even rarer are assessments of interactions across race (for an important exception, see Piquero, Moffitt, and Lawton, 2005). Second, as we were focused on comparing our analysis of the NLSY data to the important study by Lynam et al. (1993), we restrained our analysis to males. Thus, future studies should replicate our approach and findings among females as well, recognizing the low number of LCP offenders among females (see Moffitt, 1994). Third, the offending measures used were based on official reports of arrest that do not differentiate violence from property offenses. It is likely that many offenses went undetected and thus future research should consider including self-report measures of offending in an effort to compare results across reporting sources, bearing in mind, of course, that both self-report and official measures have general limitations that potentially vary across race (see Piquero et al., 2014). Fourth, it would be of interest to consider the extent to which poor verbal abilities compromise success across other life domains among subjects in the NLSY, including educational attainment, successful employment, as well as overall general and mental health functioning. Fifth, our analysis of Moffitt's original two-offender typology provided some important confirmation that LCP and AL offenders vary in important ways. At the same time, the results also showed that an adolescent onset late bloomer group differed from the AL group in very similar ways as well, thereby intimating some potential reconsideration of the number of groups and/or the hardline distinctions between theoretically anticipated groups and the correlates that distinguish them. Although Moffitt (2006) has started to move in a direction of further specifying the number of theoretically-anticipated groups, and empirical research uncovers a variety of different age-crime curve profiles (Piquero, 2008), much more theoretical work and empirical replication on these issues is needed. Sixth, we did not have alternative measures of verbal ability available to us, and future research could fruitfully replicate the analysis using another measure. Finally, as Moffitt's hypothesis (and the limited previous research) focuses its race-based hypotheses on African American and White subjects, questions remain regarding the extent to which Moffitt's taxonomy provides a useful framework for understanding the offending patterns of Hispanics. Given that Hispanics are under-researched in criminology (Maldonado-Molina et al., 2009), largely because of data limitations (Piquero, 2008a),[13] there is a pressing need to consider the full reach of aspects of Moffitt's taxonomy across groups defined by race *and* ethnicity.

Finally, since we used self-reports of arrests as the principal measure of offending, we are unable to contend with the delinquent acts that are not subject to arrest, unable to discern whether the NLSY respondents were certain that any official contacts were indeed official arrests, and unable to identify a potentially more accurate age-at-onset (because self-

[13]Unlike African American and White subjects, there is substantial missing data on the verbal ability measure among Hispanics in the NLSY97 which, unfortunately, limits our ability to analyze that group.

reported offending tends to occur a few years earlier than official arrest). Although the self-reported arrest in the NLSY has served as a useful resource for many criminological studies, the extent to which our results would replicate with self-reported offending data is an important question for future research. In addition, our arrest measure is general and does not distinguish among differing offense types. These issues notwithstanding, we suspect that our substantive conclusions in general and across race would hold, especially since prior research has shown that conclusions about the correlates of onset tend to yield substantively similar conclusions with the use of either self-reports of delinquency or self-reports of arrest onset (see Moffitt et al., 2001).

These findings also have implications for policy-related discussions. Recall that a key finding of this paper was that verbal abilities not only help to distinguish between chronic and non-chronic styles of offending, but also that these effects operate through educational attainment (vis-à-vis high school completion). In this regard, continued attention should be paid in policy circles to the importance of verbal abilities. Not only are those abilities consequential in the education and employment domains more generally, but their importance and relevance have also been implicated in recent developmentally-based neuroscience research. Several studies for example, have shown that the under-developed or compromised cognitive abilities of young persons may adversely influence their competency and ability to understand key legal matters, proceedings, and decisions (e.g., Grisso et al., 2003). This line of research has also been an important part of three recent U.S. Supreme Court decisions regarding adolescents' developmental maturity generally and criminal culpability in particular (Steinberg, 2013). Continued investigation of the effect of verbal abilities in general and across demographic groups in several life domains remains an important area for theoretical, empirical, and policy-relevant research.

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Table 1

Descriptive statistics, by race (Waves 1-14, NLSY97)

	Full Sample		White		African American	
Level 1 (within-individual)	**Mean**	**SD**	**Mean**	**SD**	**Mean**	**SD**
Arrest						
Ever	.07	.26	.06	.25	.09#	.30
Frequency	.28	1.18	.26	1.15	.31#	1.21
N ever arrest	35,042		23,170		11,872	
N frequency of arrest	15,960		9,436		6,524	
Level 2 (person)						
Low verbal ability	.25	.43	.14	.34	.47#	.50
Test motivation	4.03	1.00	4.11	.95	3.87#	1.07
Low family Income	.25	.43	.14	.35	.46#	.50
High peer drug use	.35	.48	.32	.47	.39#	.49
GED	.14	.35	.11	.31	.21#	.41
HS Degree	.76	.42	.82	.38	.65#	.48
Offending Groups						
Non-offender	.54	.50	.59	.49	.45#	.50
Adolescent-limited	.12	.32	.12	.32	.12	.32
Late bloomer	.15	.35	.13	.33	.19#	.39
Adolescent onset late bloomer	.15	.35	.13	.33	.19#	.39
Early onset desister	.02	.15	.02	.14	.03	.17
Life-course-persistent	.02	.15	.02	.14	.03†	.18

Notes:

#Mean is significantly different from White, p <.05.

†Mean is significantly different from White, p <.053.

Table 2

Coding scheme for offender groups, full sample

Offender category	N (%)[1]	12 & under[2]	13-18[2]	19 & older[2]	Low Verbal Ability
Non-offender	1,358 (54.3)	0	0	0	.19
Adolescent-limited	295 (11.8)	0	1	0	.27
Late bloomer	366 (14.6)	0	0	1	.30
Adolescent onset late bloomer	367 (14.7)	0	1	1	.36
Early onset desister	58 (2.3)	1	0/1	0	.33
Life-course-persistent	59 (2.4)	1	0/1	1	.45

Note:

[1] percent does not sum to 100% due to rounding.

[2] 0 = not arrested; 1 = one arrest or more.

Table 3

Multinomial regression of offender groups on developmental measures relative to the Adolescent-Limited group

	Offender Group				
	Non-offender	**Late bloomer**	**Adolescent onset late bloomer**	**Early onset desister**	**Life course persistent**
Low verbal ability	-.406** (.667)	.058 (1.060)	.353* (1.424)	.218 (1.243)	.722* (2.059)
Low family income	-.328* (.721)	.301† (1.352)	.418* (1.519)	.443 (1.557)	.638* (1.893)
High peer drug use	-.298* (.742)	.038 (1.039)	.411* (1.508)	.682* (1.977)	.763** (2.144)
Constant	1.789**	.098	-.187*	-2.125**	-2.720**
LR Chi-square	170.49**				
Pseudo R-square	.026				

Notes: Odds Ratio in parenthesis.

† p < .10;

* p < .05;

** p < .01.

** N = 2,503.

Table 4

Two-level model of arrest on verbal ability by race (standard error in parenthesis)

	WHITE				AFRICAN-AMERICAN			
		Ever [a]		Frequency [b]		Ever [a]		Frequency [b]
Level-2 (person)	**(1)**	**(2)**	**(3)**	**(4)**	**(5)**	**(6)**	**(7)**	**(8)**
Low verbal ability	.36** (.12)	.07 (.11)	.28** (.11)	.17 (.11)	.32** (.11)	-.10 (.11)	.27** (.10)	.004 (.10)
Test motivation	-.06 (.04)	-.04 (.04)	-.05 (.05)	-.04 (.04)	-.03 (.05)	-.04 (.05)	.04 (.05)	.02 (.05)
Low family income	.52*** (.11)	.23* (.11)	.22* (.09)	.10 (.10)	.32** (.11)	.14 (.10)	.21* (.11)	.11 (.10)
High peer drug use	.45*** (.09)	.32*** (.08)	.18* (.08)	.14† (.08)	.40*** (.11)	.33** (.11)	.38*** (.10)	.34*** (.10)
GED		.05 (.14)		-.002 (.13)		-.15 (.13)		-.10 (.14)
HS Degree		-1.36*** (.13)		-.55** (.12)		-1.12*** (.13)		-.72*** (.13)
Level 1 N	23,170	23,170	9,436	9,436	11,872	11,872	6, 524	6, 524
Level 2 N	1,655	1,655	674	674	848	848	466	466

Notes:

† p < .10,

* p < .05,

** p< .01,

*** p < .001(two-tailed tests).

[a] Logistic regression.

[b] Poisson regression, over dispersed.