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CRIMINOLOGY

CRIMINAL BEHAVIOR AND AGE: A TEST OF THREE PROVOCATIVE HYPOTHESES

CHARLES R. TITTLE* & HAROLD G. GRASMICK**

I. INTRODUCTION

Issues about age and crime are among the most important in criminology. This is due largely to Hirschi and Gottfredson,¹ who contend that the familiar inverted J-curve association between age and crime is invariant, inexplicable with social science variables, and involves no interaction between age and any variable that explains or correlates with crime.

These three hypotheses bear on several trends and issues. First, they challenge the criminal careers perspective that life cycle patterns of offending take many forms, each requiring specific explanations and longitudinal research for testing.² If all people, including frequent offenders, commit more crime in the late teen years than later, then career offending is different only in amount, and the necessity of explaining different trajectories with special theories is vitiated. Moreover, if the causes of

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¹ MICHAEL GOTTFREDSON & TRAVIS HIRSCHI, A GENERAL THEORY OF CRIME (1990); Travis Hirschi & Michael Gottfredson, *Age and the Explanation of Crime*, 89 AM. J. SOC. 552 (1983).

² See David F. Greenberg, *Modeling Criminal Careers*, 29 CRIMINOLOGY 17 (1991); Alfred Blumstein et al., *Longitudinal and Criminal Career Research: Further Clarification*, 26 CRIMINOLOGY 57 (1988); Alfred Blumstein et al., *Criminal Career Research: Its Value for Criminology*, 26 CRIMINOLOGY 1 (1988).

crime are the same at all ages, the call for longitudinal research inherent in the career criminal perspective is irrelevant.³

Second, the Hirschi-Gottfredson position casts doubt on developmental perspectives that portray the determinants of crime as age-graded and variable over the life course.⁴ If the causes of crime do not interact with age and the age-crime relationship is inherent, invariant, and inexplicable, then criminologists need only identify the general causes of crime and apply them to explain constant differences among individuals and categories in likelihood of criminal behavior, without reference to age patterned increases and decreases in the probability and volume of criminal behavior.

Third, these hypotheses challenge practices of organizing criminological work around age differentiations such as juvenile, adult, and aged, or alternatively, of seeking age comprehensive samples in testing theories about crime.⁵ If the causes of crime are the same at all ages, and if age patterns are inexplicable, then dividing labor to study crime within specific age categories and seeking age-comprehensive samples for research makes no sense.

Finally, if age and crime are related in constant ways across all conditions, and inexplicable except by the biology of aging itself,⁶ then the adequacy of numerous general social theories that imply an ability to account for age variations is in doubt

³ See, e.g., Michael Gottfredson & Travis Hirschi, *Science, Public Policy, and the Career Paradigm*, 26 *CRIMINOLOGY* 37 (1988); Michael Gottfredson & Travis Hirschi, *The True Value of Lambda Would Appear to Be Zero: An Essay on Career Criminals, Criminal Careers, Selective Incapacitation, Cohort Studies, and Related Topics*, 24 *CRIMINOLOGY* 213 (1986).

⁴ See ROBERT J. SAMPSON & JOHN H. LAUB, *CRIME IN THE MAKING: PATHWAYS AND TURNING POINTS THROUGH LIFE* (1993); Rolf Loeber & Michael LeBlanc, *Toward a Developmental Criminology*, in 12 *CRIME AND JUSTICE: A REVIEW OF RESEARCH* 375 (Michael Tonry & Norval Morris eds., 1990); David P. Farrington, *Stepping Stones to Adult Criminal Careers*, in *DEVELOPMENT OF ANTISOCIAL AND PROSOCIAL BEHAVIOR* 359 (Dan Olweus et al. eds., 1986); John H. Laub & Robert J. Sampson, *Turning Points in the Life Cycle: Why Change Matters to the Study of Crime*, 31 *CRIMINOLOGY* 301 (1993); Terrie E. Moffitt, *Adolescence-Limited and Life-Course Persistent Anti-Social Behavior: A Developmental Taxonomy*, 100 *PSYCHOL. REV.* 674 (1993).

⁵ Charles R. Tittle & David A. Ward, *The Interaction of Age with the Correlates and Causes of Crime*, 9 J. *QUANTITATIVE CRIMINOLOGY* 3 (1993).

⁶ See Walter R. Gove, *The Effect of Age and Gender on Deviant Behavior: A Bio-Psychosocial Perspective*, in *GENDER AND THE LIFE COURSE* 115 (Alice S. Rossi ed., 1985).

and the import of social, relative to biological, influences is potentially diminished.

II. THE EVIDENCE

A. INVARIANCE

Evidence concerning "invariance" is difficult to judge because Hirschi and Gottfredson were not entirely clear about their definition. Three types of invariance have been investigated—parametric, mathematical form, and individualistic. Parametric concerns details of the relationship between population characteristics and crime rates, including means, standard deviations, and skewness of the distribution, as well as ages of onset and peaks for different crimes and populations.⁷ Steffensmeier et al.,⁸ Greenberg,⁹ and others¹⁰ have reported such work. Results show that the relationship between age and crime is not exactly the same in all details for all crimes and all populations. Thus, if Hirschi and Gottfredson meant to assert parametric invariance, they are clearly wrong. However, it is doubtful they meant such particularism, since they acknowledge variation in details, emphasizing their concern with a "remarkably robust age effect" and not with "statistical noise" indicating "trivial variations"¹¹ or with "an occasional factoid apparently contrary to the thesis."¹²

A second type of invariance, and the one that Hirschi and Gottfredson seem to propose, concerns the shape of the curve describing the relationship between age and crime in any population. The evidence they review,¹³ as well as subsequent re-

⁷ Chester L. Britt, *Constancy and Change in the U.S. Age Distribution of Crime: A Test of the "Invariance Hypothesis,"* 8 J. QUANTITATIVE CRIMINOLOGY 175 (1992).

⁸ Darrell J. Steffensmeier et al., *Age and the Distribution of Crime*, 94 AM. J. SOC. 803 (1989); see also Darrell J. Steffensmeier, *On the Causes of "White-Collar" Crime: An Assessment of Hirschi and Gottfredson's Claims*, 27 CRIMINOLOGY 345 (1989).

⁹ David F. Greenberg, *Age, Crime, and Social Explanation*, 91 AM. J. SOC. 1 (1985).

¹⁰ See, e.g., Britt, *supra* note 7.

¹¹ See Hirschi & Gottfredson, *supra* note 1, at 14.

¹² Travis Hirschi & Michael R. Gottfredson, *The Generality of Deviance*, in THE GENERALITY OF DEVIANCE 14 (Travis Hirschi & Michael R. Gottfredson eds., 1994).

¹³ See GOTTFREDSON & HIRSCHI, *supra* note 1, at 124-30; see also Hirschi & Gottfredson, *supra* note 1.

search,¹⁴ and even the data examined by Steffensmeier and his associates,¹⁵ is consistent with the contention that relationships between age and many kinds of crime for various populations follow a similar pattern characterized by a single peak occurring fairly early in the life cycle (usually in the late teens for most offenses) with steady declines thereafter.

Individualistic invariance concerns differences among categories of individuals in trajectories of prevalence and incidence of crime over the life cycle. Much research based on criminal careers and developmental paradigms shows categorical deviations from modal patterns, as well as differences among categories of people in starting ages, rates of offending at various ages, age at which cessation occurs, and different trajectories of offending.¹⁶

Thus, the empirical standing of the invariance hypothesis depends partly on Hirschi and Gottfredson's definition. If invariance is similarity in the shape of the curves representing the relationship between age and various kinds of crime for different populations, current evidence is consistent with the hypothesis. But, if invariance means that the particular details of the relationships between age and crime for all offenses, social groups, points in history, and for all aspects of offending are similar, then the evidence contradicts it. We believe that the argument pertains to the shape, or form, of the age-crime relationship for various populations.

¹⁴ See, e.g., JAMES Q. WILSON & RICHARD HERRNSTEIN, *CRIME AND HUMAN NATURE* (1985); David P. Farrington, *Age and Crime*, in 7 *CRIMINAL JUSTICE: AN ANNUAL REVIEW OF RESEARCH* 189 (Michael Tonry & Norval Morris eds., 1986); Britt, *supra* note 7; Daniel S. Nagin & Kenneth C. Land, *Age, Criminal Career, and Population Heterogeneity: Specification and Estimation of a Nonparametric Mixed Poisson Model*, 31 *CRIMINOLOGY* 327 (1993).

¹⁵ See Darrell Steffensmeier & Emilie A. Allan, *Age-Inequality and Property Crime: The Effects of Age-Linked Stratification and Status-Attainment Processes on Patterns of Criminality Across the Life Course*, in *CRIME AND INEQUALITY* 95 (John Hagan & Ruth D. Peterson eds., 1995); Steffensmeier, *supra* note 8; Steffensmeier et al., *supra* note 8.

¹⁶ See Blumstein et al., *supra* note 2; Nagin & Land, *supra* note 14; Daniel S. Nagin et al., *Life-Course Trajectories of Different Types of Offenders*, 33 *CRIMINOLOGY* 111 (1995). But see Rolf Loeber & Howard N. Snyder, *Rates of Offending in Juvenile Careers: Findings of Constancy and Change in Lambda*, 28 *CRIMINOLOGY* 97 (1990) (providing contrary evidence).

However, even though research results have supported this kind of invariance, it has not been unambiguously established because most studies use official data, which may be differentially valid for various age groups and crimes. Self-reports can potentially overcome this weakness by tapping criminal behavior regardless of whether the offender is apprehended by the police or observed by a victim. But only a few such studies include randomly selected respondents across a wide age range.¹⁷

B. INEXPLICABILITY

Whether relationships between age and various kinds of criminal behavior, whatever their form, can be explained with social scientific variables remains an open question. Few attempts to explain empirically the associations between age and crime, particularly based on a wide range of ages, have been undertaken, and data used in those few instances have not included enough key variables to permit strong conclusions. Some studies have partially succeeded in accounting for age-crime relationships,¹⁸ but no attempt has been fully satisfactory.¹⁹ This may be because many potential explanations for the age-crime relationships have not been tested.²⁰

Indeed, Gottfredson and Hirschi propose a theory that could account for age-crime relationships, despite contending that such relationships cannot be explained.²¹ Their theory says that crime results from the interaction of low self-control and opportunity. Given the opportunity, those with low self-control commit crime without considering long range consequences because it gratifies their immediate needs. Low self-control, said to be largely, though not entirely, fixed in early child-

¹⁷ See, e.g., Tittle & Ward, *supra* note 5, at 3.

¹⁸ See generally Greenberg, *supra* note 9; Mark Warr, *Age, Peers, and Delinquency*, 31 *CRIMINOLOGY* 17 (1993).

¹⁹ See Alan R. Rowe & Charles R. Tittle, *Life Cycle Changes and Criminal Propensity*, 18 *SOC. Q.* 223 (1977); see also Kyle Kercher, *Explaining the Relationship Between Age and Crime: The Biological vs. Sociological Model* (presented at the annual meeting of the American Soc'y of Criminology (Nov. 1987)).

²⁰ See, e.g., David F. Greenberg, *Delinquency and the Age Structure of Society*, in *CRIME AND CAPITALISM* 118 (David F. Greenberg ed., 1981); Steffensmeier & Allan, *supra* note 15.

²¹ GOTTFREDSON & HIRSCHI, *supra* note 1.

hood,²² presumably permits natural motivations toward crime to be expressed in actual criminal behavior throughout life, thereby explaining differences among individuals in criminal behavior at all ages. However, Gottfredson and Hirschi contend that differences in self-control cannot explain age-crime associations because everyone experiences an age effect. Variations in criminal behavior between those with different degrees of self-control at any age will be similar to such differences at any other age even though the absolute amount of crime by everybody changes over the life cycle in conformity with the inverted-J curve.

Yet, levels of self-control may not be fixed early in life as Gottfredson and Hirschi suggest. Their own arguments seem to imply that low self-control may change with experience. Crime is said to be attractive because it pays in the short run, but it is committed mainly by those with weak self-control because they do not contemplate the inevitable long term consequences. Over time, however, as the costly consequences of criminal behavior unfold, those who begin with low self-control may gradually learn to defer gratification. Thus with age, many people may increase their self-control.

Some improvement in self-control with maturation is acknowledged by Gottfredson and Hirschi²³ and the possibility of large change is consistent with the image of rationality among humans that they endorse. Experiential learning can occur without external socialization and without changes in major life course events. If self-control increases with age and low self-control largely accounts for criminal behavior, then at some point in the age cycle crime will begin to go down, producing the single peaked, inverted J-curve distribution of crime by age.²⁴ And this process could occur without influence of any of the variables that Gottfredson and Hirschi have rejected as causes of crime.

²² See *id.* at 106.

²³ *Id.* at 108 ("Put another way, the low self-control group continues over time to exhibit low self-control. Its size, however, declines.").

²⁴ *Id.*; cf. David F. Greenberg, *Review of the Generality of Deviance*, 246 CONTEMP. SOC. 24 (1995).

Further, even if self-control is constant throughout the life course, since low self-control interacts with opportunity in producing crime, age variations in opportunity could affect the distribution of criminal behavior. Aging implies modifications in life styles, so criminal opportunities present for youth may decline as they grow older. Hence, the age effect could be explained by a variable from Gottfredson and Hirschi's own theory.

C. NON-INTERACTION

Of the three Hirschi-Gottfredson age-related hypotheses, the one concerning non-interaction has received the most attention. Several lines of work provide relevant evidence, some of it indirect and suggestive and some direct. Consider first, the indirect, suggestive evidence.

Since, according to this hypothesis the causes and correlates of crime are the same at all ages, it follows that they must appear early (because crime, as Gottfredson and Hirschi define it, can be manifest even by children²⁵) and operate throughout life. Therefore, research evaluating whether conditions present or established in childhood have long range stable effects on criminal behavior bears on the non-interaction hypothesis, particularly when it contrasts stable effects with influences that might intervene during the life cycle. Similarly, research evaluating whether crime or deviance are the products of a single underlying tendency indirectly bears on the non-interaction hypothesis because a single cause presumably does not vary with stage of the life cycle. Finally, since different aspects of offending, such as beginning, frequency, and cessation may be age linked, research concerning similarity of explanations for various aspects of crime have indirect relevance for the non-interaction hypothesis.

The results of indirect research are problematic. Much evidence supports the idea that some childhood characteristics continue to influence behavior throughout life,²⁶ but some stud-

²⁵ GOTTFREDSON & HIRSCHI, *supra* note 1, at 15, 129.

²⁶ See, e.g., Daniel S. Nagin & Raymond Paternoster, *Personal Capital and Social Control: The Deterrence Implications of a Theory of Individual Differences in Criminal*

ies report contrary²⁷ or mixed evidence.²⁸ Similarly, while some research suggests that crime and deviance, and various aspects of it, are products of one underlying trait or tendency,²⁹ other studies suggest that different aspects of crime require different explanations,³⁰ and some report mixed evidence.³¹

Offending, 32 CRIMINOLOGY 581 (1994); Nagin & Land, *supra* note 14; Daniel S. Nagin & David P. Farrington, *The Onset and Persistence of Offending*, 30 CRIMINOLOGY 501 (1992); Daniel S. Nagin & David P. Farrington, *The Stability of Criminal Potential from Childhood to Adulthood*, 30 CRIMINOLOGY 235 (1992); Rolf Loeber et al., *Initiation, Escalation and Desistance in Juvenile Offending and Their Correlates*, 82 J. CRIM. L. & CRIMINOLOGY 36 (1991).

²⁷ See Daniel S. Nagin & Raymond Paternoster, *On the Relationship of Past to Future Participation in Delinquency*, 29 CRIMINOLOGY 163 (1991).

²⁸ See SAMPSON & LAUB, *supra* note 4.

²⁹ See Chester L. Britt, III, *Participation and Frequency*, in THE GENERALITY OF DEVIANCE 193 (Travis Hirschi & Michael R. Gottfredson eds., 1994); Terrie M. Moffitt et al., *Neuropsychological Tests Predicting Persistent Male Delinquency*, 32 CRIMINOLOGY 277 (1994); Nagin & Farrington, *supra* note 26; David C. Rowe et al., *A Latent Trait Approach to Unifying Criminal Careers*, 28 CRIMINOLOGY 237 (1990); D. Wayne Osgood et al., *The Generality of Deviance in Late Adolescence and Early Adulthood*, 53 AM. SOC. REV. 81 (1988).

³⁰ See Gerald R. Patterson & Karen Yoerger, *Developmental Models for Delinquent Behavior*, in MENTAL DISORDER & CRIME 140-72 (S. Hodgins ed., 1993); Dawn R. Jeglum Bartusch et al., *Is Age Important?: Testing a General Versus a Developmental Theory of Antisocial Behavior*, 35 CRIMINOLOGY 13 (1997); Nagin et al., *supra* note 16; Avshalom Caspi et al., *Are Some People Crime-Prone?: Replications of the Personality-Crime Relationship Across Countries, Genders, Races, and Methods*, 32 CRIMINOLOGY 163 (1994); Delbert S. Elliott, *Serious Violent Offenders: Onset, Developmental Course, and Termination*, 32 CRIMINOLOGY 1 (1994); Ruth A. Triplett & G. Roger Jarjoura, *Theoretical and Empirical Specification of a Model of Informal Labeling*, 10 J. QUANTITATIVE CRIMINOLOGY 241 (1994); Ronald L. Simons et al., *Two Routes to Delinquency: Differences Between Early and Late Starters in the Impact of Parenting and Deviant Peers*, 32 CRIMINOLOGY 257 (1994); David P. Farrington & J. David Hawkins, *Predicting Participation, Early Onset, and Later Persistence in Officially Recorded Offending*, 1 CRIM. BEHAV. & MENTAL HEALTH 33 (1991); David Huizinga et al., *Are There Multiple Paths to Delinquency?*, 82 J. CRIM. L. & CRIMINOLOGY 83 (1991); Douglas A. Smith et al., *Dimensions of Delinquency: Exploring the Correlates of Participation, Frequency and Persistence of Delinquent Behavior*, 28 J. RES. CRIME & DELINQ. 6 (1991); Loeber et al., *supra* note 26; Terrie E. Moffitt, *Juvenile Delinquency and Attention Deficit Disorder: Boys' Developmental Trajectories from Age 3 to Age 15*, 61 CHILD DEV. 893 (1990); Daniel S. Nagin & Douglas A. Smith, *Participation In and Frequency of Delinquent Behavior: A Test for Structural Differences*, 6 J. QUANTITATIVE CRIMINOLOGY 335 (1990); Raymond Paternoster & Ruth Triplett, *Disaggregating Self-Reported Delinquency and Its Implications for Theory*, 26 CRIMINOLOGY 591 (1988).

³¹ Raymond Paternoster & Robert Brame, *Multiple Routes to Delinquency?: A Test of Developmental and General Theories of Crime*, 35 CRIMINOLOGY 49 (1997); Nagin & Farrington, *supra* note 26; Douglas A. Smith & Robert Brame, *On the Initiation and Continuation of Delinquency*, 32 CRIMINOLOGY 607 (1994).

Six studies bear directly on the non-interaction hypothesis. Three³² support it and three³³ contradict it. Moreover, none is ideal. Five use limited age samples and the Tittle-Ward study, which uses subjects ages 15 to 89, employs cross-sectional rather than more desirable longitudinal data. In addition, all of the studies suffer a non-inclusive array of correlative and/or explanatory variables. Even the most comprehensive³⁴ incorporates no variables from prominent stress³⁵ or self theories,³⁶ and most important, it does not employ variables from Gottfredson and Hirschi's general theory.³⁷

Gottfredson and Hirschi assume that crime is universally attractive—that it requires no special motivation. Therefore, they theorize that criminal behavior reflects absence of internal (low self-control) and external (opportunity) constraints. However, if crime is not equally attractive at all ages, then variables from their theory will not operate the same at all ages. Perhaps criminal behavior has more appeal to younger people because of greater payoff. Since youth are usually more economically deprived than adults, have stronger sex drives with fewer routine outlets through marriage, and depend more heavily on the reaction of peers for their social standing, crime may have more value for them. Force and fraud can relieve economic deprivation, lead to sexual gratification, and win peer approval, all of which would appear to be especially useful for youth. Similarly, since desire to use crime for gratification may be less among

³² MARVIN E. WOLFGANG ET AL., FROM BOY TO MAN, FROM DELINQUENCY TO CRIME (1987); Yossi Shavit & Arye Rattner, *Age, Crime and the Early Life Course*, 93 AM. J. SOC. 1457 (1988); Tittle & Ward, *supra* note 5.

³³ Brent B. Benda, *Testing Competing Theoretical Concepts: Adolescent Alcohol Consumption*, 15 DEVIAN'T BEHAV. 375 (1994); Jennifer Friedman & Dennis P. Rosenbaum, *Social Control Theory: The Salience of Components by Age, Gender, and Type of Crime*, 4 J. QUANTITATIVE CRIMINOLOGY 363 (1988); Randy L. LaGrange & Helene Raskin White, *Age Differences in Delinquency: A Test of Theory*, 23 CRIMINOLOGY 19 (1985).

³⁴ Tittle & Ward, *supra* note 5.

³⁵ See Robert Agnew, *Foundation for a General Strain Theory of Crime and Delinquency*, 30 CRIMINOLOGY 47 (1992).

³⁶ See HOWARD B. KAPLAN, DEVIAN'T BEHAVIOR IN DEFENSE OF THE SELF (1980); Ross Matsueda, *Reflected Appraisals, Parental Labeling, and Delinquency: Specifying a Symbolic Interactionist Theory*, 97 AM. J. SOC. 1577 (1992).

³⁷ GOTTFREDSON & HIRSCHI, *supra* note 1.

adults because their needs are less intense, low self-control should produce less adult crime.

Crime might also appeal more to youth than adults with low self-control because adults have more access to non-criminal gratifications—legal gambling, risky financial investments, thrill-seeking recreational activities, etc. Thus, self-control and crime should be more strongly linked among youth than adults. Logically, then, Gottfredson and Hirschi's non-interaction hypothesis, like their inexplicability hypothesis, might be challenged by their own self-control theory. Yet, research testing age hypotheses has never employed variables from it.

In summary, while studies directly dealing with the non-interaction hypothesis are generally supportive, they are not strong enough to produce definitive conclusions, and studies with indirect evidence show about an equal amount of support as contradiction.

D. RATIONALE FOR THE PRESENT STUDY

Hirschi and Gottfredson's contentions that the relationship between age and crime is invariant and inexplicable and that the correlates and causes of crime do not interact with age are central to the criminological enterprise, but the evidence concerning these contentions is weak and contradictory. Our study contributes additional information, and in particular, examines the inexplicability and non-interaction contentions using variables from Gottfredson and Hirschi's own general theory of crime. We offer three advances: (1) the subjects are of widely varying ages (18-90); (2) the data contain several indicators of crime, including two based specifically on definitions stipulated by Gottfredson and Hirschi; and (3) we employ some theoretical variables not previously used, including those central to Gottfredson and Hirschi's general theory.

III. THE STUDY

A. SAMPLE

Data are from the Thirteenth Annual Oklahoma City Survey. In the spring of 1991, the Sociology Department of the

University of Oklahoma interviewed a simple random sample of 394 adults aged eighteen or older listed in the *R.L. Polk Directory*. Respondents were initially notified by mail that they would be contacted. Trained personnel later conducted face-to-face interviews, but respondents reported their crimes on separate answer sheets unseen by the interviewers. Random substitutes replaced refusers and those who could not be located. By comparison with the 1990 census, the sample is representative in percentage white (82% vs. 84%) and male (46% vs. 47%), but males and non-whites are more prevalent in the later age categories than in the census.

The data suffer two weaknesses: no respondents under age eighteen and cross sectionality. The invariance hypothesis in particular concerns all ages, but we cannot directly investigate a supposed upward trend in crime from early adolescence to the late teens or early twenties. However, we can document crime for those at the presumed high point of offending, relative to later years. Moreover, since our crime measures cover five years, we can examine the shape of the age-crime curves, which Hirschi and Gottfredson regard as invariant, even without younger respondents. However, age-crime relationships in the data could reflect generational rather than life-cycle variations. Definitive descriptions require large samples to provide information about criminal behavior, and theoretical variables to explain it, at multiple intervals through life, but such data will not exist for at least forty years (the best longitudinal sets now include cases only up to about age thirty).³⁸ Until then, we must learn as much as possible from cohorts, and there are reasons to think the cohort data do show life-cycle variations.

B. THE INVARIANCE HYPOTHESIS

The age-crime curve presumably is invariant by historical period, location, social category, and type of crime. Since our data were collected at one point in time and in one location, and since the number of cases is limited, we can examine invariance only across different types of crime.

³⁸ See WOLFGANG ET AL., *supra* note 32; see also Nagin et al., *supra* note 16.

1. Variables for Testing Invariance

Age. Respondents' ages are from their last birthday, but since a relatively small sample inevitably contains substantial random variation in behavior and since allowance also must be made for random error in measurement, the indicators of criminal behavior are aggregated in ten-year intervals. Distributions of crime reports are graphed using seven age points: less than 25, 25-34, 35-44, 45-54, 55-64, 65-74, and 75 plus.

Criminal Behavior. Respondents reported how many times they had committed each of five criminal acts in the past five years. Their reports are dichotomized as some or none to avoid problems with skewness and with exceptional sensitivity to extreme scores when we graph distributions of age category averages. Three offenses use a conventional legal definition: tax cheating ("failed to report certain income or claimed an undeserved deduction on your income tax return"); minor theft ("taken something worth less than \$20 that did not belong to you"); and major theft ("taken something worth at least \$100 that did not belong to you"). The other two are measures of crime independent of the law, as Gottfredson and Hirschi prescribe: fraud ("distorted the truth or falsely represented something to get something you couldn't otherwise obtain"); and force ("used or threatened to use force against an adult to accomplish your goals").

It is inconvenient that these reports cover five years. Statements about amount or probability of crime by those of various ages should be based on crime occurring in specific age years rather than on that aggregated for a five year period. Nevertheless, since aggregation reflects annual ups and downs, it should not distort the *shape* of the hypothesized age-crime curve. Figures for 18-year-olds represent crime for ages 13-18 rather than that occurring only during the 18th year, while the figures for 24-year-olds represent that which occurred from ages 20-24. Our first age category includes those younger than 25 (18-24), so it actually encompasses crimes admitted by those 13-24. Thus, if Gottfredson and Hirschi are right about invariance, all of our crime measures should show a single peak in the earliest

age category, declining thereafter through the oldest age category.

To check reliability, we repeated all analyses using respondent projections of future crime. Since the results were substantively the same for both types of data, we report only those for self-reported past crime. In addition, we formed a number of composite indexes combining the different measures of past crime and future projections in various ways. Our results with these indexes showed little difference from analyses with single item indicators, so again only the results for specific past offenses are reported.

2. Approach for Testing Invariance

We visually inspect the age-crime curves. Since the hypothesis of invariance seems to refer to the shape of the curves rather than to minute details about precise ages at which crime begins to rise or fall or about the steepness of peaks or lengths of tails, and because the size of the sample allows considerable random error, we make no attempt to describe the various curves mathematically or to measure precisely their differences. If the hypothesis is correct, all of them should show a single peak that emerges in the early part of the age range, with a downward trajectory thereafter.

3. Results Concerning Invariance

Figure 1 shows the shape of the age-crime relationship using percent reporting crime, aggregated in ten year intervals. For visual comparison the figures representing the percent reporting theft of \$100 or more and force during the past five years are multiplied by five, the figures representing the percent having committed fraud and tax cheating are multiplied by three.

Note that the patterns for fraud, force, and major and minor theft correspond roughly to the shape that Hirschi and Gottfredson contend is invariant. For each the peak is at the earliest age with a noticeable decline thereafter. Although the age decline for these four offenses does not appear visually to be completely linear or even monotonic, deviations from linearity are small enough that they could be attributable to chance

according to non-linearity tests we performed. However, there is one apparent departure from the "invariant" pattern—that for tax cheating: the earliest age group shows a relatively low level of tax cheating, while the next three age groupings show considerably higher levels that again decline in the fifth age category to about the level of the youngest category. After that it declines only slightly for each of the remaining age categories.

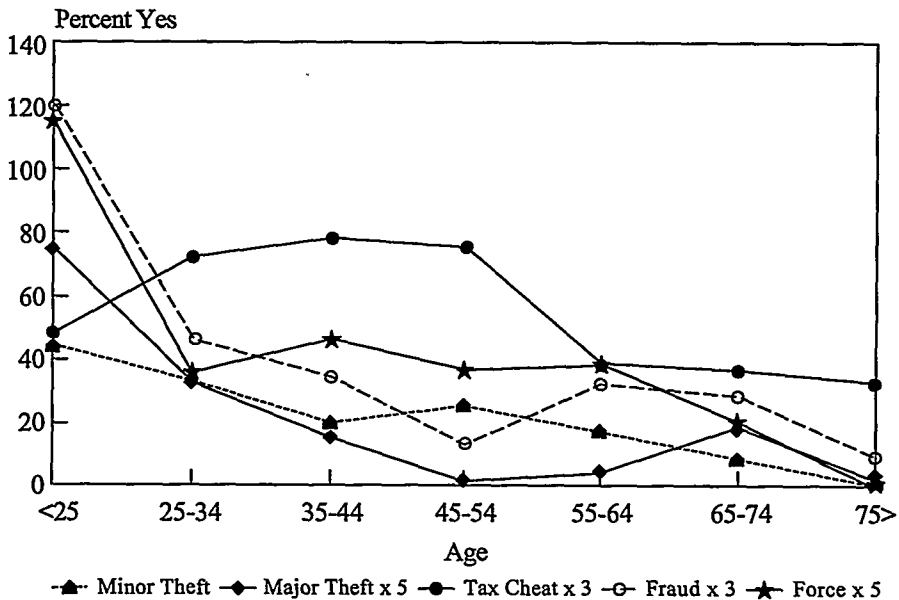
These data, then, only slightly challenge the hypothesis that the relationship between age and crime is always single peaked early, trending downward thereafter. Visually, tax cheating, a form of white-collar crime,³⁹ seems different from the other offenses, although it does not deviate significantly from linearity according to formal tests. It increases through middle age and declines thereafter, forming an upside-down U-shaped curve. If aberrations for specific offenses are "noise" or minor deviation from a dominant trend, then this pattern does not challenge the invariance hypothesis. However, since Gottfredson and Hirschi argue that white-collar crime is like any other crime⁴⁰ our findings take on added significance. Thus, while there may be a dominant, typical relationship between age and crime, it does not appear to be completely invariant.⁴¹

³⁹ See generally Travis Hirschi & Michael R. Gottfredson, *The Significance of White-Collar Crime for a General Theory of Crime*, 27 CRIMINOLOGY 359 (1989).

⁴⁰ GOTTFREDSON & HIRSCHI, *supra* note 1, at 184-201; see also Hirschi & Gottfredson, *supra* note 39.

⁴¹ Cf. Steffensmeier & Allan, *supra* note 15.

Figure 1. Age and Past Crime



Based on Group Data

C. THE INEXPLICABILITY HYPOTHESIS

For this hypothesis to be meaningful, measurable relationships between the age of respondents and the various crime measures must exist. The graphs presented above, of aggregate figures, imply that in most cases, age and crime are related in discernable patterns. However, their irregularity, which is even greater with smaller age categories, suggests that significant relationships between age and crime for *individuals* might not emerge. Moreover, since the relationship between age and tax cheating is not visually linear, normal statistics may not show the presumed inexplicable relationship. To estimate the age-crime association for each of our measures, we use logistic regression. Since the sample taps into the age cycle about the time when crime is generally assumed to be most prevalent (the self-reports of crime cover the previous five years and the youngest respondent is eighteen), if Hirschi and Gottfredson are correct, non-chance linear relationships between age and crime should emerge for each crime index. Row 1 of Table 1, showing bi-

variate logistic regression coefficients reflecting associations between age and the measures of crime, confirms this expectation.

1. Variables for Explaining Age and Crime

Our data permit measurement of ten variables for explaining the age-crime relationships, including the ones in Gottfredson and Hirschi's theory—low self-control and criminal opportunity. The list of potential explanatory variables contains some from theories oriented around motivation, some from theories emphasizing absence of control, some from theories that combine both motivation and absence of control, and some linked to demographic characteristics that imply varied effects.

a. Variables From Control Theories

Low Self-Control. Gottfredson and Hirschi's general theory, like that of Wilson and Herrnstein⁴² and many psychologists,⁴³ features an early established tendency/ability to defer gratification. If, as they contend, this self-control is relatively stable through life, it cannot account for age-crime relationships⁴⁴ because crime reflects opportunities, which they think vary only slightly with age, or some inherent, aging process. But, as previously noted, self-control may improve with age.⁴⁵ Such a possibility is allowed by Gottfredson and Hirschi, although their argument seems to imply too little potential change to account for age-crime relationships.

Our measure was developed by Grasmick et al.,⁴⁶ who derived it from indicators of six dimensions suggested by Gottfredson and Hirschi as composing self-control. Grasmick et al. show it has acceptable psychometric qualities with high reliability ($\alpha = .81$). The scale (mean of zero and a standard deviation of 10.2 with higher score showing lower self-control) is a linear

⁴² WILSON & HERRNSTEIN, *supra* note 14.

⁴³ See, e.g., Caspi et al., *supra* note 30.

⁴⁴ Hirschi & Gottfredson, *supra* note 1, at 14.

⁴⁵ See *supra* note 24 and accompanying text.

⁴⁶ See Harold G. Grasmick et al., *Testing the Core Empirical Implications of Gottfredson and Hirschi's General Theory of Crime*, 30 J. RES. CRIME & DELINQ. 5 (1993).

TABLE 1
PERCENTAGE REDUCTION IN ASSOCIATION BETWEEN INDIVIDUALS' AGES
AND VARIOUS MEASURES OF SELF-REPORTED CRIME PRODUCED BY
CONTROLLING POTENTIAL EXPLANATORY VARIABLES

	Measures of Crime				
	Traditional			Gottfredson/Hirschi	
	Tax Cheat	Minor Theft	Major Theft	Fraud	Force
Bi-Variate Association	-.00970*	-.02619*	-.02964*	-.02563*	-.01432*
<u>Explanatory Variables</u>					
General:					
Com integ	13%	3%	16%	8%	11%
Int integ	1%	+	+	+	1%
Relig	11%	1%	0%	4%	7%
Stress	+	7%	10%	8%	+
Dissat	11%	3%	8%	6%	15%
Esteem	8%	4%	11%	6%	2%
Sex	1%	+	3%	+	+
Race	+	+	1%	+	+
Gottfredson/Hirschi:					
Low SC	8%	4%	13%	8%	11%
Opport	+	1%	0%	+	+
All	8%**†	13%	31%**	21%	5%**

† = unreliable estimate

+ = association between age and crime increases when the explanatory variable is controlled

** = association between age and crime is reduced to insignificance when the explanatory variable(s) is controlled

* = statistically significant, $p < .05$, logistic regression

composite of the z-score transformations of twenty-three items concerning impulsivity, preference for simple tasks, risk seeking, and physical activities, as well as a tendency toward self-centeredness and tempestuousness.

Opportunity. Several recent or elaborated theories, including Gottfredson and Hirschi's, recognize opportunities for crime as important,⁴⁷ and they may vary by age and thereby account for age-crime associations. Respondents were asked: "How many opportunities have you had in the *past five years* to . . ." (Opportunity was defined for them as situations where it would have been possible, gratifying at the moment, easy, and unlikely to be quickly detected.) They answered separately for each of the five offenses.

Community Integration. This variable reflects how bonded respondents were with their communities or their institutions. Theories of social control⁴⁸ suggest that involvement with, commitment to, and investment in conventional social institutions and activities constrains inclination toward behavior disapproved by those institutions. Such integration may vary with age because maturity usually implies greater stakes in the life of the community as well as greater concern and responsibility for it. Thus, crime may decline because more integration comes with age.

Our measure of community integration is a factor weighted composite of nine variables that loaded heavily on one factor in a factor analysis that included numerous items about community and interpersonal relationships. The first three are: (1) current employment status, registered in five ordered categories from full-time employment to unemployed (the more fully em-

⁴⁷ See, e.g., GOTTFREDSON & HIRSCHI, *supra* note 1; Derek B. Cornish & Ronald V. Clarke, *Introduction to THE REASONING CRIMINAL: CHOICE PERSPECTIVES ON OFFENDING 1* (Derek B. Cornish & Ronald V. Clarke eds., 1986); Lawrence E. Cohen & Marcus Felson, *Social Change and Crime Rate Trends: A Routine Activity Approach*, 44 AM. SOC. REV. 588 (1979).

⁴⁸ See, e.g., JOHN BRAITHWAITE, *CRIME, SHAME, AND REINTEGRATION* (1989); TRAVIS HIRSCHI, *THE CAUSES OF DELINQUENCY* (1969); WALTER C. RECKLESS, *THE CRIME PROBLEM* (1967); EMILE DURKHEIM, *SUICIDE* (1897); Albert J. Reiss, Jr., *Delinquency As the Failure of Personal and Social Controls*, 16 AM. SOC. REV. 196 (1951).

ployed the respondent, the more integrated into the community he or she is assumed to be); (2) the number of groups or organizations other than church-affiliated ones, to which the person belonged; and (3) the number of meetings or activities of those organizations attended in the last year. The greater the number of affiliations, and the greater the number of their activities participated in, the more a person's community integration is assumed to be.

The fourth variable in the community integration scale is a three-value index representing the extent to which the respondent was involved in a binding familial type relationship. Married individuals received the highest score, those living with a partner received a middle score, and those who were neither married nor living with a partner were scored lowest. We contend that the greater the involvement in these types of relationships, the more the person is likely to control his/her criminal impulses because of more extensive consequences from misbehavior. And since this item loaded with the other "community" variables rather than with the "interpersonal" variables, we assume that most of the constraint of such bonds stems from concern about community expectations for one to honor familial type relationships, rather than from concern with the potential direct reactions of significant others.

The other five items concern activities oriented around community problems and were recorded as dichotomous responses about participation in each of the activities within the last three or four years. They are: (1) "worked with others in the community to try to solve some community problem;" (2) "[took] part in forming a new group or new organization to try to solve some community problem;" (3) "personally [went] to see, or spoken to, or written to, some representative or governmental official outside of the local community;" (4) "personally [went] to see, or spoke[] to, or [wrote] to, some member of the local community about some need or problem;" and (5) "joined with other members of your community to demonstrate or rally to protest or support some action, event, or policy by the local, state, or federal government or business enterprise."

These nine components were combined,⁴⁹ so that each contributes to the overall composite score in proportion to its factor score coefficient, which is multiplied by the standardized value of the item. The reliability coefficient for this index is .69 and it has a mean of -.01 (deviation from zero due to rounding error) with a standard deviation of 2.6.

Interpersonal Integration. This measure combines various dimensions of interpersonal bonding. The rationale is also rooted in theories of social control, which contend that social bonds, particularly with conventional others, serve as constraints against expressing deviant impulses. Since maturity may produce more extensive and stable interpersonal relationships, crime may vary with age due to enhanced social bonds.

The scale is a factor composite of six items that loaded heavily on a single factor, differentiated from the previously described community integration items, that emerged from a general factor analysis which included items about community and interpersonal relationships. Using derived items and weights, the Kim method described above was used to score individuals.

The six items include: (1) respondents' reports of the number of times in a typical month they engaged in social activities with people other than those they live with, particularly friends, neighbors, or relatives; (2) ratings on a four point agree-disagree continuum of the closeness of the relationships with the people named in response to the question above; and (3) ratings of the frequency with which the person shared "innermost thoughts and feelings" with those individuals. In addition, the respondents noted on a four point continuum of agreement-disagreement the closeness of their social bonds in response to the questions: (4) "there are people in my life with whom I could discuss almost any personal problems;" (5) "there are people in my life who will stand behind me no matter what;" and (6) "I have as many or more close friends than most people I know." Reliability is .68 and the mean is -.01 (deviation from zero due to rounding error) with a standard deviation of 2.3.

⁴⁹ See Jae-On Kim, *Factor Analysis*, in *STATISTICAL PACKAGE FOR SOCIAL SCIENCE* 487 (Norman H. Nie et al. eds., 2d ed. 1975).

Religiosity. Despite some early disconfirming data,⁵⁰ most research shows religiosity negatively related to criminal behavior,⁵¹ and there is good theoretical reason to imagine a causal connection between religious feeling and practice and misbehavior. This is largely because moral precepts as well as involvement in morally oriented communities constrains deviant impulses.⁵² Furthermore, since religiosity may vary directly with age, it could explain associations between age and crime.

Religiosity is measured with a factor weighted composite of responses to sixteen questions that all loaded heavily with a forced single factor solution. Five were reports of numbers of times within the past month that the respondents had: (1) attended worship services; (2) watched a church service on television or listened to one on the radio; (3) prayed or meditated; (4) read the Bible or other sacred texts; and (5) participated in church-related activities other than worship. One question (6) evoked reports of the number of church groups to which the respondent belonged. In addition, responses to ten questions were given on a four point agree-disagree continuum: (7) "religion is a very important part of my life;" (8) "I would describe myself as very religious;" (9) "religion should influence how I live my life;" (10) "when I have decisions to make in my everyday life, I usually try to find out what God wants me to do;" (11) "I have experienced a feeling that I was in a very close relationship with God;" (12) "I have experienced a feeling that God was trying to make me aware of Him;" (13) "I feel that I have had a religious born-again experience;" (14) "I have a very close relationship with some people in a church or other religious group I belong to;" (15) "I often share my inner-most thoughts and feelings with people in a church or other religious group I belong to;" and (16) "When I need help, I can turn to people in a

⁵⁰ See Travis Hirschi & Rodney Stark, *Hellfire and Delinquency*, 17 SOC. PROBS. 202 (1969).

⁵¹ See T. David Evans et al., *Religion and Crime Reexamined: The Impact of Religion, Secular Controls, and Social Ecology on Adult Criminality*, 33 CRIMINOLOGY 195 (1995).

⁵² See Harold G. Grasmick et al., "Render Unto Caesar What Is Caesar's": *Religiosity and Taxpayers' Inclinations to Cheat*, 32 SOC. Q. 251 (1992); Charles R. Tittle & Michael R. Welch, *Religiosity and Deviance: Toward a Contingency Theory of Constraining Effects*, 61 SOC. FORCES 653 (1983).

church or other religious group I belong to." Reliability is .92 and the mean is .02 (due to rounding error) with a standard deviation of 7.8.

b. Variables From Motivational Theories

Stress. Several theories emphasize how stress or strain can motivate criminal behavior so strongly that possible constraints are ignored.⁵³ Therefore age and crime may be related because many potential stresses or strains are age-linked. Yes-no answers were elicited to the questions: (1) "Have you entered school after not attending school for at least four months;" (2) "Have you left school;" (3) "Have you started a new job;" (4) "Have you left a job voluntarily;" (5) "Have you left a job due to being laid off or fired;" (6) "Have you gotten married;" (7) "Have you become separated or divorced;" (8) "Have you moved to a new neighborhood or community;" (9) "Has anyone moved into your household who needs to be cared for by you;" (10) "Has anyone moved into your household who does not need to be cared for by you;" (11) "Has anyone who had been living with you moved away;" (12) "Has anyone who had been living with you died;" (13) "Has anyone who was not a member of your household but who was in your immediate family or someone you considered to be a very close friend died;" (14) "Have you or anyone else in your household become so seriously ill as to require hospitalization or long-term medical care;" and (15) "Have you been the victim of a serious crime such as a personal attack, having your home broken into, or your car stolen." The index of stress is the number of stressful events, from these fifteen, that the respondent had experienced in the past six months and has a mean of 1.4 and a standard deviation of 1.5.

Dissatisfaction. Various theories imply that dissatisfaction with one's life or circumstances may motivate people to try to alter their situations using criminal means.⁵⁴ Since perceived dep-

⁵³ See Agnew, *supra* note 35.

⁵⁴ See, e.g., WILHELM A. BONGER, CRIMINALITY AND ECONOMIC CONDITIONS (1916); Robert K. Merton, *Social Structure and Anomie*, in SOCIAL THEORY AND SOCIAL STRUCTURE (1968).

riuation probably changes with age, perhaps in response to objective conditions or to changes in expectations by others, it may account for the age-crime relationship. We use a reverse-scored additive index of dissatisfaction based on response (on a four point agree-disagree continuum) to four questions: (1) "In most ways my life is close to ideal;" (2) "The conditions of my life are excellent;" (3) "I am satisfied with my life;" and (4) "So far I have gotten the important things I want in life." The mean is 13; the standard deviation is 2.7; and alpha is .82.

c. Variables From Theories Merging Motivation and Control

Self-Esteem. Theories in the symbolic interaction tradition emphasize self concepts and imply that low self-esteem may lead to crime. One type of such theory contends this is because self concepts come from evaluations by others. When the reflected appraisals of others have ceased to matter, as indicated by low self-esteem, processes of informal control lose their power to restrain deviance.⁵⁵ Another self theory portrays crime as a maneuver to avoid loss of self-esteem or to regain it once lost.⁵⁶ Since evaluations from others presumably vary situationally, they may also vary with age, which suggests that self-esteem may account for age-crime relationships.

Our measure is a composite, factor weighted scale derived from seven items that loaded heavily together. Using the Kim method, we scored individuals from their agree-disagree responses (on a four point continuum) to the following questions: (1) "I take a positive attitude toward myself;" (2) "I am reliable;" (3) "I feel I do not have much to be proud of;" (4) "I am trustworthy;" (5) "On the whole, I am satisfied with myself;" (6) "When I do a job, I do it well;" and (7) "I wish I could have more respect for myself." In this scale, with reliability of .67, mean of .01, and standard deviation of 2.34, the items are scored so that a higher score reflects higher self-esteem.

⁵⁵ Matsueda, *supra* note 36.

⁵⁶ KAPLAN, *supra* note 36.

d. Variables Reflecting Demographically Linked Effects

Gender. Age may be related to criminal behavior because of life span changes in gender roles and social expectations, sex differentiated changes in hormonal stimuli, or because the age-crime curve for a total population may reflect the longer life expectancy of women, which reduces the relative proportion of people in the later age cohorts who are highly prone to crime. These potential effects are especially likely if the propensity for criminal behavior is most marked among males, especially early in the life cycle, and if maturity has its greatest effect in modulating this tendency. Like most researchers, we have no direct measures of gender although we have the usual indicator of sex. Hence, we use self-reported sex distinction as male or female to proxy for gender and for sex linked biological characteristics.

Race. Like gender, race may have age graded implications that could account for the overall age-crime relationship, and if criminal propensity is greater among blacks, their differential mortality could account for the overall crime decline with age. If one race is more subject to the effects of social integration or to the modulating influences of gender-linked adult roles, which would seem possible since life cycle changes in role expectations are probably influenced by opportunities for responsible adulthood, then general age crime relationships might be explained by their racial reflections. Our measure is a dichotomy: white and non-white.

2. Approach for Explaining Age-Crime Relationships

To ascertain if the theoretical variables explain the age-crime relationships, we examine logistic betas showing the ability of age to predict each crime index in multi-variate equations that include each of the explanatory variables separately, along with age, and all of them simultaneously. We conclude that a given, statistically significant, bi-variate relationship between age and crime is explained when a control variable, or all the control variables together, reduces the association below significance. We also examine the extent (percent reduction) to

which each variable, or all variables in combination, reduces the associations between age and the various crime measures.

3. Results Concerning Inexplicability

Before testing inexplicability, we had to see if the potential explanatory variables actually vary by age in such a way that they could explain the observed associations between age and crime. Table 2 confirms that any one of the ten variables might help account for some of the age-crime associations since they all vary by age, most in statistically significant ways, and several of them vary in ways corresponding to curves for various of our measures of crime. For example, stress and dissatisfaction are high in the early age categories but decline with increasing age; self-esteem and religiosity are low in the early age categories and increase with age.

The most interesting patterns are for opportunity and low self-control, the chief variables in Gottfredson and Hirschi's general theory. Recall that the theorists deny that self-control or opportunity can account for age-crime relationships because neither varies enough by age. This presumed minimal variation in low self-control is because self-control is supposedly due to effective child rearing, and without it the natural state of low self-control continues throughout life. The presumed minimal variation in criminal opportunity is supposedly due to its ubiquity for all people at all ages.

We suggested that substantial life cycle changes in self-control might be expected despite Gottfredson and Hirschi's assumption to the contrary. Figures in Table 2 confirm strong, statistically significant, age variation in low self-control. However, the figures also defy the implication of our thinking by showing a U-shaped relationship with age. The least low self-control is among those 45-54 (standard score = $-.29$) and the greatest low self-control is among those less than age 25 (standard score = $.30$), with a declining level of low self-control for each age category between the youngest and those in middle ages. And those aged 75+ exhibit low self-control substantially

TABLE 2
EXPLANATORY VARIABLES BY AGE CATEGORY, EACH EXPRESSED IN STANDARD DEVIATIONS FROM ITS OVERALL
INDIVIDUAL MEAN

Variables:	Age Category							Sig		
	-25	25-34	35-44	45-54	55-64	65-74	75+			
Gottfredson/Hirschi:										
Low Self-Control	.30	.18	-.14	-.29	-.02	.06	.05	.0	10.2	*
Opportunity:										
Minor Theft	.14	.11	.07	-.12	.01	-.26	-.09	53.9	192.0	
Major Theft	-.10	.10	.04	-.04	-.02	-.17	.05	28.3	142.0	
Tax Cheat	.15	-.10	.09	.16	-.11	-.04	-.21	2.6	9.3	
Fraud	-.05	-.01	.05	.22	-.08	-.05	-.26	4.6	17.9	
Force	.01	.15	-.06	-.06	-.01	-.03	-.08	4.2	51.4	
Other Theories:										
Comm Integ/(high=high)	-.05	.00	.14	.07	-.04	-.27	-.37	-.01	2.6	*
Int Integ/(high=high)	.15	-.15	-.07	.00	.11	-.03	.31	-.01	2.3	
Religiosity/(high=high)	-.17	-.13	-.06	-.29	.22	.28	.48	.02	7.8	*
Stress/(high=high)	.64	.34	-.08	-.03	-.44	-.27	-.34	1.4	1.5	*
Dissatisfact/(high=high)	.17	.14	.26	-.06	-.16	-.35	-.44	12.0	2.7	*
Self-Esteem/(high=high)	-.31	-.20	.07	.36	.08	-.08	-.03	.01	2.3	*
Demographic:										
Gender/(high=female)	-.02	.02	.05	.10	.16	-.08	-.32	1.4	.5	
Race/(high=white)	.14	.27	.01	.01	-.16	-.30	-.31	1.3	.7	*

* = $p < .05$ (F test)

above those in middle age (standard score = .05) with a distinct progression in low self-control from the middle age category to the oldest.

This, of course, does not directly demonstrate life course variation in self-control because our data are for age cohorts rather than for individuals measured annually throughout the life cycle. Thus, our data could reflect generational effects. For example, the 45-54 age cohort may have greater self-control and the younger and older cohorts may have weaker self-control because as groups they experienced some unique events at various points in the life cycle. The depression and the Second World War may have taught middle age people to defer their gratifications, and having grown up in the permissive 1960s could have generated weak self-control among the younger set. Yet, it is hard to believe that the First World War would have led the older cohort to have *weaker* self-control than the middle aged, as the data suggest. Therefore, since the results show no consistency in potential generational effects, we conclude that these cohort data reasonably approximate patterns one might find with longitudinal data for people at every age throughout life.

Age variations in our measures of criminal opportunity are also interesting. While Gottfredson and Hirschi seem to imply that opportunity might vary enough with some conditions to permit low self-control to manifest itself in distinct patterns of crime, they deny age variations sufficient to account for typical age-crime relationships.⁵⁷ Yet our measures do show substantial differences among the age categories, though none are statistically significant, and some of those patterns correspond at least roughly with the patterns of crime revealed in Figure 1. For example, opportunities for minor theft and force are greatest in the early years, and actual reported minor theft and force are also greatest in the early years.

Overall, then, since the predictors do show enough age variation to explain the observed age-crime relationships, we turn back to Table 1, which reports the results of our tests. Ta-

⁵⁷ GOTTFREDSON & HIRSCHI, *supra* note 1, at 128.

ble 1 shows only partial success in explaining the age-crime relationships. None of the specific explanatory variables seems to have much influence on the age-crime relationship since controlling them reduces the original association very little. The maximum reduction for any given variable is only 15%—achieved when dissatisfaction is introduced into the equation predicting force from age. Moreover, simultaneously controlling all ten variables reduces the age-crime associations only minimally, with the maximum reduction of 32% being achieved for the self-reports of major theft.⁵⁸ Nevertheless, three of the age-crime relationships are rendered insignificant when all of the explanatory variables are considered simultaneously. Hence, even though one of those estimates is unreliable, one might conclude that the associations between age and tax cheating, major theft, and force are explicable.⁵⁹

Whether these results contradict the inexplicability hypothesis depends on interpretation. On one hand, we have explained at least 40% and perhaps 60% of the associations, in the sense of reducing them below significance by controlling all of the explanatory variables. On the other hand, in no instance were our variables, even used simultaneously, able to reduce the age-crime association by even as much as 35%. Furthermore, if one assesses success by the number of favorable effects of specific tests, the picture is bleak. Overall, we performed tests using five crime measures with ten trials representing different explanatory variables and one trial using a combination of the variables for each crime measure (a total of fifty-five tests) with only three successes in reducing the original age-crime association below significance. This could easily have occurred by chance ($p = .23$).⁶⁰ In addition, controlling an explanatory vari-

⁵⁸ That the reduction in association between age and crime when all predictors are considered simultaneously is sometimes less than the reduction achieved by some of the specific predictors alone is probably due to the fact that controlling some of the specific predictors actually increased the age-crime association rather than decreasing it.

⁵⁹ Since tax cheating visually does not seem to be related to age in a linear fashion (although that association passes a formal test of linearity), we broke the sample into two age groups, those less than 45 and those 45 and over, and performed the analysis within each subgroup. Even then, none of the variables accounted for the association.

⁶⁰ See Tittle & Ward, *supra* note 5, at 20 (describing David Greenberg's formula).

able actually increased the age-crime associations in fourteen instances, suggesting that in those cases age-crime relationships are somewhat suppressed by the free variation of variables that are supposed to explain them.

Even though the possible 60% explanation rate, using the theoretical variables simultaneously, might lead some to think that the data contradict Hirschi and Gottfredson's inexplicability hypothesis, it is not impressive in light of the other evidence. Of course, the ten explanatory variables used here may not be well enough measured to produce positive results, and they do not include variables from all theories that might explain age-crime associations. Consequently, it would be premature to either embrace or reject the inexplicability notion. Yet, our results suggest that Hirschi-Gottfredson have identified a relationship that is difficult to explain.

The performance of the Gottfredson and Hirschi variables as well as measures of crime based on their specific definitions are of particular interest. In no instance do opportunity or low self-control seem to enhance explanation of the age-crime associations. Moreover, results for the measures of force and fraud are similar to those using measures of crime as traditionally defined. Thus the conceptual apparatus associated with Gottfredson and Hirschi's general theory of self-control appears to be consistent with their own view that age and crime relationships cannot be explained.

D. THE NON-INTERACTION HYPOTHESIS

Our test of the non-interaction hypothesis makes use of the explanatory variables described above.

1. Approach for Testing Interaction

We assess interaction by including product terms (age * variable) in the equations predicting crime. For example, to determine if variable Y, a possible correlate of crime, interacts with age, we employ an equation with three independent variables—age, Y, and age * Y—to predict the various crime measures. And to determine if variable Y, a presumed cause of crime, interacts with age, we employ an equation with twelve independent vari-

ables—age, Y, age * Y, and the nine other predictive variables to be controlled. Possible multi-collinearity implied by such a procedure makes this a conservative test, but in this instance it does not appear to be a serious problem because the bi-variate correlations between no two of the variables exceeds .43. However, the time ordering of the variables, with some of the predictors possibly following rather than preceding the crime measures, makes inferences about the interaction of “causes” of crime with age problematic. To check, we repeated the analyses using self estimated future crime wherein the explanatory variables exist prior to the projected behavior. Similarity of the results to those for the past crime measures increases our confidence.

2. Results Concerning Non-Interaction

The figures in Table 3 again show a mixed picture. For three (possibly two, since one of the estimates is unreliable) of the five measures, at least one of the potential correlates or causes shows statistically significant interaction with age. Opportunity may interact with age in its association with tax cheating. Since the logistic regression coefficients for the interaction term and for age are negative, while the coefficient for opportunity is positive, the effect of opportunity on tax cheating appears to decline with age. Stress interacts with age in its association with minor theft, and since the interaction term is positive while the coefficients for age and stress are negative; the effect of stress on minor theft also appears to decline with age. Finally, interpersonal integration interacts with age in predicting fraud. Since the coefficients for the interaction term and for age are negative, while the coefficient for integration is positive, the effect of interpersonal integration too appears to decline with age. Hence, the majority of types of crime appear to involve at least one interaction of a correlate or cause with age, and those interactions suggest that the explanatory variables have less effect with increasing age.

Yet, overall, only 5 or possibly 4 of 100 multiplicative terms (5 measures of crime with 10 predictors each alone and with all others in combination) show significance. This could easily

have occurred by chance ($p = .18$).⁶¹ Thus, by one approach, there is interaction between age and various correlates and causes of crime, but by another there is not. The vast majority of causes and correlates in our data, however, do not seem to interact with age.

It is worth noting that the variables drawn from Gottfredson and Hirschi's general theory interact with age in the production of crime no more or less than other variables. Thus, measures from their general theory seem to behave consistently with their contentions about age and crime.

TABLE 3
VARIABLES, REPRESENTING THE CORRELATES AND CAUSES OF CRIME,
FOR WHICH PRODUCT TERMS REFLECTING INTERACTION WITH AGE*
ACHIEVED STATISTICAL SIGNIFICANCE ($P < .05$)

Crime Measures	Correlates**	Causes***
Traditional:		
Tax Cheat	opportunity†	none†
Minor Theft	stress	stress
Major Theft	none	none
Gottfredson/Hirschi:		
Fraud	interp intg	interp intg
Force	none	none

† = unreliable estimates

* In the equations the interaction term is the potential explanatory variable multiplied by age.

** The equations examining the interaction of each correlate of crime with age include the explanatory variable and its interaction term.

*** The equations examining the interaction of each cause of crime with age include all the explanatory variables simultaneously and one interaction term at a time.

⁶¹ *Id.*

IV. CONCLUSION

Examination of three hypotheses from the Hirschi-Gottfredson discussion of age and crime show mixed results. The "invariance" hypothesis, that the relationship between age and crime is of an inverted-J form for all types of crime (which for our data implies a single peak in the earliest age category with a linear decline thereafter), proved a little problematic because tax cheating, a white-collar crime, is visually related to age in a curvilinear manner with the highest level during the middle ages. However, patterns for four of the five crime measures basically conform to the curve suggested by the invariance hypothesis, and all of the relationships pass a formal test for linearity. Thus the "typical" age-crime curve to which Hirschi and Gottfredson refer seems highly likely but perhaps not inevitable. They might counter that deviations for specific crimes are unimportant aberrations from otherwise stable general patterns, just as they contend that variations in peaks and exact features of age-crime curves are insignificant "noise." But this underlines the importance of specifying how stable a pattern must be to qualify as invariant. Until that specification is made, we conclude that the age-crime relationship is not "invariant" though it is highly generalizable.

Our test of the "inexplicability" hypothesis, that the relationship between age and crime cannot be explained with social variables, also produced mixed results. We are able to reduce to insignificance two and maybe three of the relationships with the predictors at our disposal, but the predictors do not account for a very large percent of the age effect. Some of this failure may be due to the absence of a strong relationship between age and some of the measures of crime, to the dearth of measures of key variables from some important theories of criminal behavior (for instance, social learning/differential association theory or theories about age-graded inequalities),⁶² or even from our inability to measure another variable implicit in the Gottfredson-Hirschi self-control theory: the availability of non-criminal *outlets*

⁶² See Steffensmeier & Allan, *supra* note 15.

for gratification among those with low self-control at various ages.

Even though better measures might have produced more success, the results verify how difficult it is to account for age-crime associations. Even with measures of opportunity and low self-control and of dependent variables of crime based on Gottfredson and Hirschi's non-legal definition of crime, which displayed the same patterns as more common measures, we were still unable to explain most of the age effect. Thus, while Hirschi and Gottfredson may have made an extreme assertion, it is nonetheless true that age-crime associations do not easily yield to explanation.

Finally, our tests of the "non-interaction" hypothesis—i.e., that the correlates and causes of crime do not interact with age—also produced ambiguous results. One approach showed more interaction than would have occurred by chance alone, but another did not. Clearly, however, most of the causes and correlates of crime in these data do not interact with age.

It worthy of note, however, that our data contradict Gottfredson and Hirschi's assumption that low self-control varies little with age since it has a marked, significant, U-shaped relationship with age. This calls into question a crucial premise of their general theory, which contends that low self-control is almost exclusively a product of early child rearing.

Conclusions must be tempered because the data could reflect generational instead of life-cycle variations, the self-reports cover five rather than one-year periods, the sample does not include respondents less than eighteen-years-old, and the number of cases is limited. Nevertheless, because the data contain measures of criminal behavior by people across a wide age span, measures of explanatory variables from a range of theories featuring different degrees of motivational and control orientations, and measures of crime based on the special definition of criminal behavior formulated by Gottfredson and Hirschi, as well as measures of variables central to their general theory, the results would seem particularly pertinent.

Thus, despite weaknesses, the data seem to justify the conclusion that Hirschi and Gottfredson have identified some

strong trends concerning age and crime. Typically, relationships between crime and age in our sample do appear to be described by a single relatively early peak with steady declines thereafter, and they do appear resistant to explanation by social variables. Moreover, the causes and correlates of crime do not seem to interact much with age. Nevertheless, because some forms of crime seem to deviate from the typical pattern of relationship with age, because some success in explaining some observed age-crime relationships has been achieved, and because age seems to interact with some correlates and causes of crime, the Hirschi-Gottfredson perspective must be regarded as at least somewhat problematic.