Social Background, School Performance, Adjustment & Juvenile Offending: A Path Analytic Model

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SOCIAL BACKGROUND, SCHOOL PERFORMANCE, ADJUSTMENT AND JUVENILE OFFENDING: A PATH ANALYTIC MODEL

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Section 1 Introduction

A previous paper (Fergusson et al 1976) presented an analysis of the extent to which it was possible to predict juvenile offending by age 17 years from data collected on a sample of 5,472 ten year old boys. The results of this analysis indicated that maximum prediction could be obtained by combining three sources of information: (a) the boy's "delinquency proneness" at age ten years, measured by a sum of 37 items selected from the Bristol Social Adjustment Guide (Stott 1963); (b) the boy's socio-economic status (SES) measured by the occupation of his parent or guardian; (c) the boy's race. A combination of these variables yielded multiple correlations of about 0.30 with measures of offending behaviour by age 17 years.

The emphasis of the analysis was on combining a series of predictor variables to produce optimal prediction of offending by age 17 years, and consequently little comment on the theoretical implications of the results was provided. This paper extends the earlier analysis by developing a block recursive path model of the relationships of a number of predictor variables to each other and to future offending.

Section 2 The Sample and Variable Definitions

The data used in the analysis presented here were collected on a sample of 5,472 ten year old New Zealand boys: details of the characteristics of this sample and the method of data collection have been published elsewhere (see Fergusson et al 1975b). The analysis is based on the matrix of intercorrelations of five predictor variables (race, SES, school performance at age ten years, teacher ratings of stability at age ten years and delinquency proneness at age ten years) and a single criterion of juvenile offending: the number of appearances before the Children's Court by age 17. The predictor variables were selected from previous analyses which showed them to be associated with juvenile offending (see Fergusson et al 1976). The variables in the analysis are described more fully below; most of these variables have been discussed in greater detail in previous papers and references to these discussions are given in parentheses.

(1) The child's race:- this was recorded as a dichotomous variable: European/Non-European (see Fergusson et al 1975a, p. 3).

(2) The child's SES:- this measure was based on the occupation of the child's parent or guardian and was coded into the six socio-economic categories devised for New Zealand by Elley and Irving (1972) (Fergusson et al 1975a, p. 3).

(3) The child's school performance at age ten years:- this was measured by a sum of normalised teacher ratings of performance in oral language, written language, reading, spelling, writing and arithmetic. The ratings were extracted from 1966 school records and were measured on a five-point scale ranging from 1 "outstanding" to 5 "extremely limited".

(4) The child's behavioural stability at age ten years:- this was measured by a teacher rating of the child's behaviour in the classroom. The rating was extracted from 1966 school records and was measured on a five-point scale ranging from 1 "extremely high" to 5 "extremely low".

(5) The child's delinquency proneness at age ten years:- this was measured by an unweighted sum of 37 items from the Bristol Social Adjustment Guide. This sum has the property that the larger the sum the greater the child's delinquency proneness (Fergusson et al 1976, p. 54).

(6) The child's offending behaviour by age 17 years:- this was measured by the number of appearances before the Children's Court for offending or misbehaviour by the end of 1973. By this time, all the children in the sample would have been in their 17th year,

i.e. over 16 years but under 17 years old.

(Fergusson et al 1975a, p.5)

Table 2.1 shows the matrix of intercorrelations of the six variables. These correlations are calculated for the sample of boys for whom complete data on all variables were available: a total of 4,503 subjects. The deletion of cases having data missing was necessary as the analysis methods used in this paper assume the presence of complete data for all subjects.[1]

Table 2.1 INTERCORRELATION MATRIX OF THE SIX VARIABLES IN THE ANALYSIS

	Race	SES	School Perf.	Stability	Delinquency Proneness	Offending by Age 17
Race	X	.312	.177	.075	.118	.185
SES		X	.217	.142	.180	.178
School Perf.			X	.491	.546	.157
Stability				X	.465	.141
Delinquency Proneness					X	.242
Offending by Age 17						X

1. This deletion altered the structure of the data only slightly: the correlations reported in Table 2.1 differ little from the corresponding correlations for the whole sample.

Section 3 A Block Recursive Path Model

The matrix of intercorrelations of the variables in Table 2.1 has two main features:

(1) The predictor variables fall into two clusters of correlated variables: social background variables (race and SES) and school performance and adjustment measures at age ten years. Within these clusters the variables are quite highly correlated, whereas the between cluster correlations are small.

(2) All predictor variables show some positive association with offending behaviour by age 17 years.

These properties suggest that the general structure of the inter-correlation matrix can be represented by the theoretical schema shown in Figure 3.1

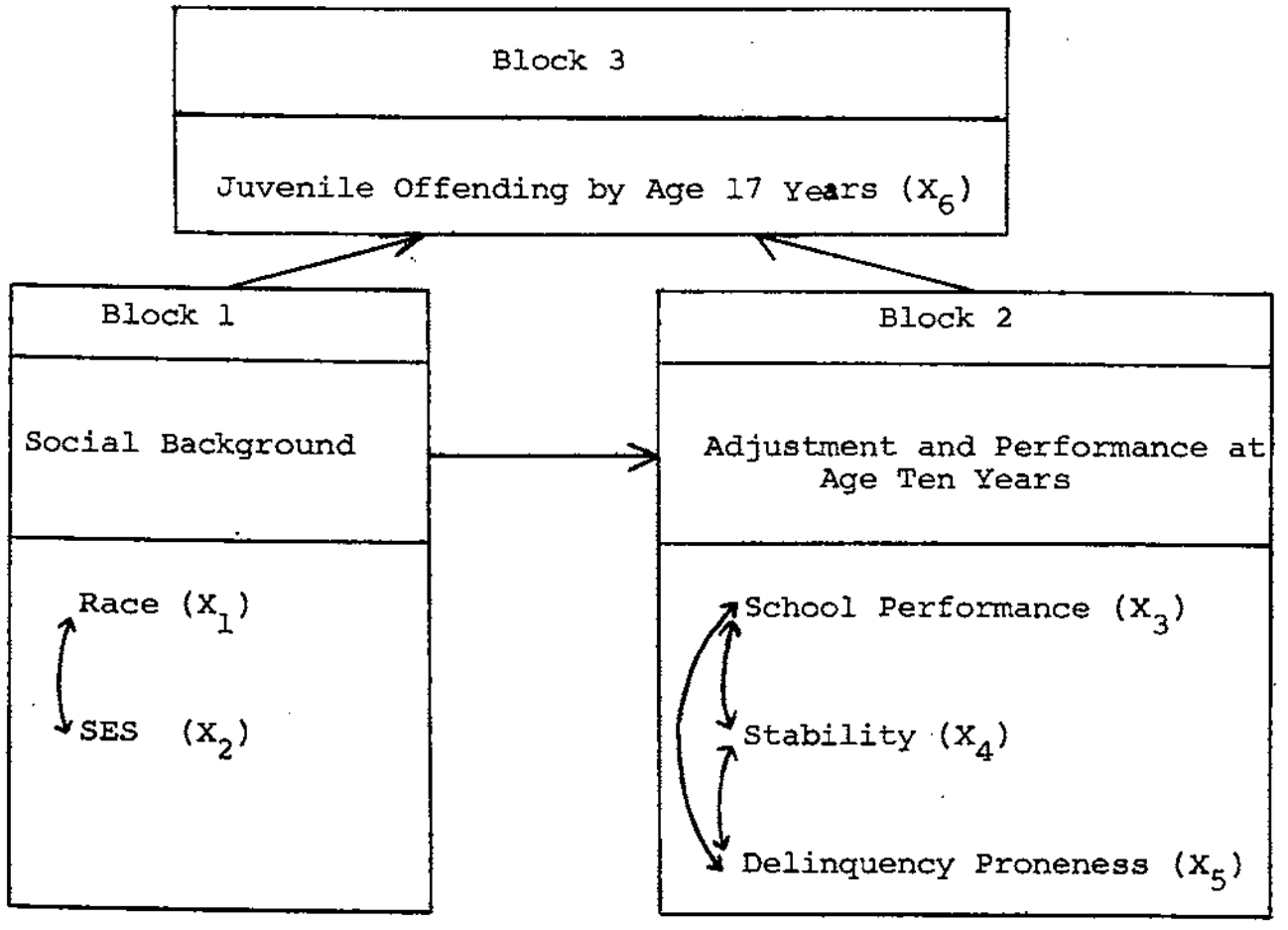

Figure 3.1 THEORETICAL SCHEMA

The diagram can be interpreted as follows. Variables are grouped into three classes or blocks: social background variables, school performance and adjustment variables and juvenile offending by age 17 years. Within blocks, the variables are assumed to be mutually interacting as indicated by the double-head arrows linking the variables; between blocks, the variables influence each other in the directions indicated by the arrows linking the blocks. In this model, the social background variables are assumed to exert an influence on both the child's school performance and adjustment and his offending; school performance and adjustment influence future offending only.

This schema can be represented quantitatively by a block recursive path model (see Blalock 1971, p.248-250). The general features of such models are as follows:

(1) Variables are organised into a series of blocks B_1, B_2..... B_k. Within these blocks the variables are assumed to be mutually interacting; between blocks, variables in any block B_i may only influence variables in blocks B_{i+1}, B_{i+2}, etc.

(2) The between blocks influences are represented by a series of structural equations, with the property that within blocks the error terms of these equations may be correlated; between blocks the error terms are uncorrelated: i.e. the matrix of path coefficients is block-triangular.

The theoretical schema depicted in Figure 3.1. can be expressed in this form in the following way:

(1) The structural equations describing the between blocks influences are:

$$X_3 = p_{13}X_1 + p_{23}X_2 + p_{e3}E_3 \quad \text{Eq. 1}$$

$$X_4 = p_{14}X_1 + p_{24}X_2 + p_{e4}E_4 \quad \text{Eq. 2}$$

$$X_5 = p_{15}X_1 + p_{25}X_2 + p_{e5}E_5 \quad \text{Eq. 3}$$

$$X_6 = p_{16}X_1 + p_{26}X_2 + p_{36}X_3 + p_{46}X_4 + p_{56}X_5 + p_{e6}E_6 \quad \text{Eq. 4;}$$

where X_1 = race, X_2 = SES, X_3 = school performance, X_4 = stability, X_5 = delinquency proneness, X_6 = offending by age 17 years, and all variables are in normalised form. The terms E_3, E_4, E_5, E_6 represent sources of error not accounted for by the variables in the system, and the coeffients p_{13}, p_{23} ..... p_{56}, p_{e6} are the weights or path coefficients attached to the normalised variables. These structural equations can be solved by ordinary least squares methods.

(2) The mutual interaction of the variables within blocks can be represented by a series of correlations as follows:

(a) The within block interaction of the variables in Block 1 (race and SES) can be represented by the bivariate correlation of these variables.

(b) The within block influences of the variables in Block 2 (school performance, stability and delinquency proneness) can be represented by the correlations between the error terms E_3, E_4 and E_5.

It can be shown that these correlations are, in fact, the second-order partial correlations of X_3, X_4 and X_5 with X_1, X_2 held constant.[1]

Thus, the model specifies the between blocks influence of the variables by a series of structural linear equations. Within blocks, the mutual influence of the variables is accounted for by a series of correlations which remain unexplained within the model.

The solutions to the structural equations are presented in Table 3.1. The table shows the path coefficients, the error terms and the multiple correlation coefficient for each of the equations. The path diagram for the model is presented in Figure 3.2.

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1. The use of partial correlations to represent the within blocks influence of the variables was suggested by an example discussed by Duncan 1966 (see Blalock 1971, p. 127). The same conclusion may be reached by expressing the correlations between the error terms E_3, E_4 and E_5 in terms of the structural equations and solving the resulting equations.

Table 3.1 SOLUTIONS OF STRUCTURAL EQUATIONS

Equation	Path Coefficients	Error Correlations	Multiple R
$X_3 = p_{13}X_1 + p_{23}X_2 + p_{e3}E_3$	$p_{13} = .121$, $p_{23} = .179$, $p_{e3} = .970$	-	.245
$X_4 = p_{14}X_1 + p_{24}X_2 + p_{e4}E_4$	$p_{14} = .034$, $p_{24} = .132$, $p_{e4} = .989$	$r_{E3E4} = .476$	.146
$X_5 = p_{15}X_1 + p_{25}X_2 + p_{e5}E_5$	$p_{15} = .068$, $p_{25} = .158$, $p_{e5} = .982$	$r_{E3E5} = .525$, $r_{E4E5} = .450$	.191
$X_6 = p_{16}X_1 + p_{26}X_2 + p_{36}X_3 + p_{46}X_4 + p_{56}X_5 + p_{e6}E_6$	$p_{16} = .130$, $p_{26} = .100$, $p_{36} = -.012^*$, $p_{46} = .029^*$, $p_{56} = .202$, $p_{e6} = .952$	r_{E3E6}, r_{E4E6}, $r_{E5E6} = 0$	.305

*denotes path coefficient not significantly different from zero at the 5% level.

The results presented in Table 3.1. make it possible to examine the ways in which the variables in the model influence each other. This may be done simply by inspecting the path diagram and the path coefficients. The same result may be obtained more formally by decomposition of the bivariate correlations in Table 2.1. It can be shown that any bivariate correlation can be decomposed into a series of additive components of path coefficients (see Blalock 1971, p. 121). These components have the following general form:

r_{ij} = Direct correlation + indirect correlation + common correlation

The direct correlation of r_{ij} represents that component of the correlation between the variables which is independent of the other

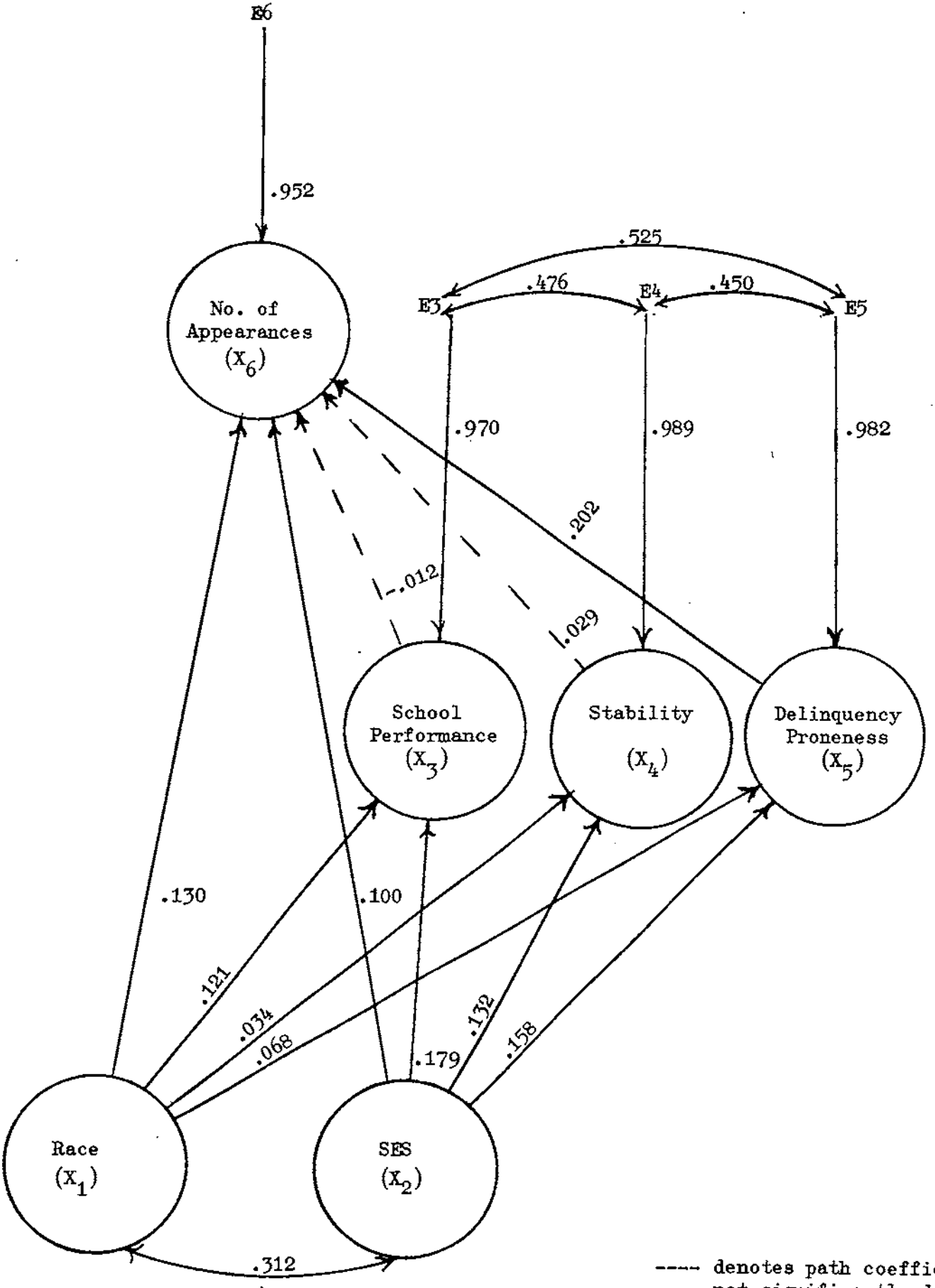


Figure 3.2 PATH DIAGRAM

variables in the model; the indirect correlation represents that component of correlation which is mediated by causally intervening variables; and the common correlation represents that component of correlation which arises from the influence of one or more common or prior causal variables. It can be shown that these components of correlation can be obtained by a series of sums of products of path coefficients and/or within blocks correlations. Appendix 1 to this paper describes the theory of the decompositions of the bivariate correlations and illustrates the method by which they are obtained.

Table 3.2. shows the decomposition of the between blocks bivariate correlations and the amount of correlation that can be attributed to: (a) the direct correlation of the variables; (b) the indirect correlation of the variables; (c) the common correlation with the Block 1 variables; (d) the common correlation with the Block 2 variables.

Table 3.2 DECOMPOSITION OF BIVARIATE CORRELATIONS

Correlation	Direct	Indirect	Common	Total
r13	.121	-	with Block 1 .056	.177
r23	.179	-	with Block 1 .038	.217
r14	.034	-	with Block 1 .041	.075
r24	.132	-	with Block 1 .010	.142
r15	.068	-	with Block 1 .050	.118
r25	.158	-	with Block 1 .022	.180
r16	.130	via Block 2 .013	with Block 1 .042	.185
r26	.100	via Block 2 .034	with Block 1 .044	.178
r36	-.012	-	with Block 1 .055)) with Block 2 .114)	.157
r46	.029	-	with Block 1 .029)) with Block 2 .083)	.141
r56	.202	-	with Block 1 .033)) with Block 2 .007)	.242

Inspection of the path diagram and of the results presented in Table 3.2. leads to the following conclusions:

(1) The impact of the social background variables on offending behaviour is mainly direct: very little of the association between race, SES and offending can be explained by the intervening variables of school performance, stability or delinquency proneness.

(2) The school performance and adjustment measures are not well predicted by the social background variables. Further, it will be observed that

school performance and stability have negligible direct effects on offending behaviour. In fact, it will be seen from inspection of the path diagram that the direct path coefficients linking these two variables to offending are not significantly different from zero at the 5% level. Most of the effect of these variables on offending behaviour reflects their association with the variable of delinquency proneness. This result suggests that both school performance and stability are related to offending behaviour only in so far as they are associated with maladjusted or anti-social behaviour at age ten years.

In the next section of the paper we examine the general implications of these results.

Section 4 The Implications of the Results

The results have a number of important implications for the explanation and treatment of juvenile offending. First, the analysis shows that the association between race, SES and juvenile offending cannot be explained by intervening psychological variables relating to the child's social adjustment. This result rules out any suggestion that the association between social background and offending behaviour reflects a tendency for children in different social groups to vary in their level of social adjustment. This conclusion can be illustrated quite dramatically by the results of our prediction research: the most well-adjusted Non-European child had a greater chance of appearing before the Children's Court than the most maladjusted European child of white-collar parentage (Fergusson et al 1976, p.80). In view of this, it seems likely that the association between social background and offending behaviour reflects the effects of social rather than psychological variables. In a previous paper, we have discussed some of the social factors which could account for this association: differences in cultural and sub-cultural attitudes; the effects of relative social deprivation on offending behaviour; variations in the reactions of official agencies to offending by children in different social groups; the effects of urbanisation and migration (see Fergusson et al 1975a, p.19). At present, these explanations are not tested, but the results of the path analysis suggest that the association between social background and offending is likely to be explained by these or similar social factors.

At the same time, the results make it clear that juvenile crime is not a purely sociological phenomenon: the child's level

of social adjustment is related to his offending behaviour almost independently of his social background. The general structure of the results suggests that the variation in juvenile offending between groups is explained by social factors, while the within groups variability in offending reflects psychological factors.

These findings are consistent with the views of various authors (for example, Reiss 1952, Johnson 1959, Kvaraceus and Miller 1959, West 1967) who have suggested that offending behaviour involves both sociological and psychological components. For example, Johnson (1959) suggests that delinquents may be classified into two types: "sociologic" delinquents and "individual" delinquents. She sees sociologic delinquency as arising from social conditions which sanction or reinforce behaviour which is in opposition to the prevailing legal system. Individual delinquency, on the other hand, arises from individual pathology which is generated by disturbed parent/child relationships. While our findings do not permit detailed analysis of this theory, it is clear that they support the distinction between sociologic and individual delinquency: offending behaviour is influenced both by social background and by individual pathology and these two factors appear to operate independently.

This conclusion has important implications for policies designed to reduce the incidence of juvenile offending:

(1) The differences in offending rates for various social groups can only be influenced by ameliorating the social conditions which give rise to these differences. The results make it clear that attempts to reduce differences in juvenile offending rates for various social groups by using programmes designed to improve individual psychological factors (such as social adjustment) are unlikely to be effective.

(2) At the same time, the results suggest that the within groups offending rates can be reduced by treating those factors which tend to give rise to maladjusted or disturbed behaviour.

However, it must be noted at this point that the precision of the model is low: the entire model accounts for less than 10% of the total variation in offending behaviour. There are two reasons for this lack of precision. First, the criterion variable is extremely skewed - approximately 90% of the sample committed no offences. This property of the criterion variable makes it extremely difficult to locate effective predictor variables (see Simon 1971; Fergusson et al 1976). However, granting the limitations imposed by the distribution of the offending criterion, it is apparent that the major deficiency of the model is the absence of sufficient effective predictor variables: this is indicated by the large error term associated with the criterion variable. In this respect, the model is instructive since it indicates the

general properties of further effective predictor variables: these variables should be correlated with offending but should have low correlations with the variables already included in the model. This property of the model has several implications:

(1) It rules out the suggestion that more refined measures of the variables in the model would improve prediction greatly: such variables would necessarily be highly correlated with the variables already analysed.

(2) It renders implausible the suggestion that measures of the same variables taken at earlier or later ages would lead to a marked increase in predictive power, since it would be expected that there would be substantial correlations between such variables when measured at different points in time.

(3) It suggests the type of variable which might profitably be added into the model; for example, variables relating to the child's home situation, his and his parents' attitudes to the law, peer group influences, child-rearing methods, the characteristics of the child's risk-taking behaviour, etc.

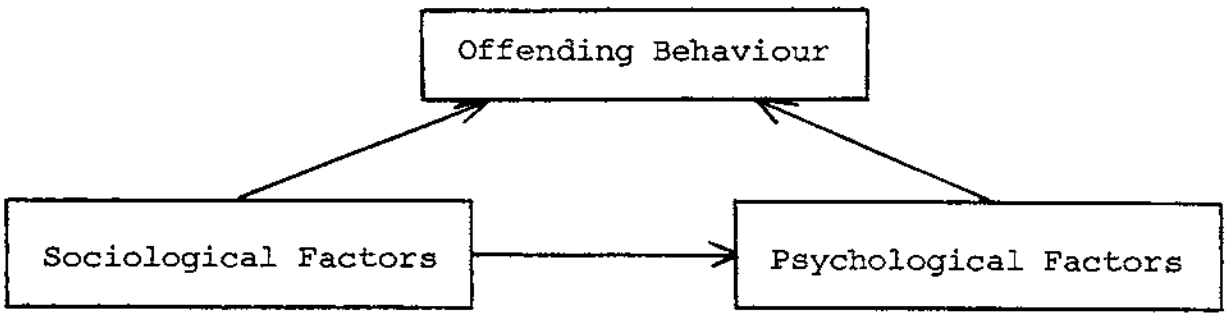
Thus, despite the obvious imprecision of the model, it has several useful features: it provides a means of interpreting the

prediction results in our earlier paper; it shows the relative contributions of sociological and psychological factors to offending behaviour; it indicates the types of policy which should be initiated to reduce various aspects of offending behaviour and, finally, it shows the general features of further effective explanatory variables. In these respects, the model is an invaluable aid for assessing and interpreting the data. Further, it is shown in the next section, that the present model is a special case of a more general model which provides a basis for integrating sociological and psychological theories of the etiology of young offending.

Section 5 Towards a General Theory of Juvenile Crime

West (1967) in a review of theories of juvenile offending has suggested that most explanations of juvenile crime can be classified into two groups: sociological theories and psychological theories. Sociological theories explain offending behaviour by describing the way in which social conditions influence offending; psychological theories explain juvenile crime by specifying the psychological factors which predispose individuals to offend. In the past, there has been a tendency for theorists to argue that crime is either a purely sociological or a purely psychological phenomenon (see Stott(1960) for a discussion and critique of this debate). However, most criminologists would now agree that offending behaviour involves both sociological and psychological components.

The relationship between sociological and psychological factors in offending, indicated by the present analysis, can be best expressed by the following block diagram:



This diagram can be interpreted as follows:

(1) Sociological factors are assumed to influence offending in two ways:

(a) A direct influence which represents the contribution of social factors independently of individual psychological factors. The thesis that social conditions can influence the incidence of deviant behaviour independently of individual pathology is not new: it was first advanced by Durkheim in his study of suicide (Durkheim 1952). In this study, Durkheim proposed that suicide is influenced by sociological factors which are completely independent of psychological states or variables. As was suggested in the previous section, this argument has also been applied to juvenile offending.

(b) An indirect influence which represents the effect of sociological variables on individual behaviour and adjustment. The idea that social background exerts an influence on behaviour is so widely held as to require no further comment.

(2) Psychological factors are assumed to be influenced by social conditions and in turn they exert an influence on offending behaviour.

It can readily be seen that this generalised schema of the relationships between sociological factors, psychological factors and offending is identical to the schema on which the block

recursive model developed in this paper is based. This similarity immediately implies that it is possible to integrate psychological and sociological theories of offending into a two-stage theory which can be expressed quantitatively by a block recursive path model. In this paper, we have analysed a limited case of this model which considers only a few variables. However, this basic model can be extended considerably by the addition of further sociological or psychological variables. More generally, Block 1 of the model could be any sociological theory of crime and Block 2 could be any psychological theory. The quantitative nature of the model makes it possible to examine the relationships between the theories and their relative contributions to offending. Thus, we would argue that the block recursive path model we have developed in this paper provides a general paradigm for integrating sociological and psychological theories of offending and for assessing the relative contributions of these theories.

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APPENDIX

THE DECOMPOSITION OF THE BIVARIATE CORRELATIONS

The decompositions of the bivariate correlations in Table 3.2 may be obtained from the basic theorem of path analysis:

$$r_{ij} = \sum_q p_{iq} r_{jq}$$ (see Blalock 1971, p. 121);

where i and j denote two variables in the system and the index q runs over all variables from which paths lead directly to X_i. By successive expansion of this formula, it is possible to express the correlation between any two variables in the system as a series of products of path coefficients and correlations. The way in which this method of decomposition can be applied to the present data is illustrated below:

Consider the correlation r_{36} between the variables X_3 and X_6 in the model. Since all variables are in normalised form this correlation may be written as:

$$r_{36} = \sum X_3 X_6 / N \quad \ldots\ldots\ldots\ldots\ldots\ldots \text{ Equation 1}$$

Equation 1 can be re-expressed in terms of the structural equation as:

$$r_{36} = \sum X_3 (p_{16}X_1 + p_{26}X_2 + p_{36}X_3 + p_{46}X_4 + p_{56}X_5 + p_{e6}E_6)/N$$
$$= p_{16}r_{13} + p_{26}r_{23} + p_{36} + p_{46}r_{34} + p_{56}r_{35} + p_{e6}r_{E6X3}$$

But $r_{E6X3} = 0$ since the between blocks error terms are uncorrelated, thus:

$$r_{36} = p_{16}r_{13} + p_{26}r_{23} + p_{36} + p_{46}r_{34} + p_{56}r_{35} \ldots\ldots \text{ Equation 2}$$

Equation 2 may be further expanded by expressing the correlations r_{13} to r_{35} in terms of the structural equations. By successively expanding terms Equation 2 may be finally expressed as:

$$r_{36} = p_{36} + p_{13}p_{16} + p_{23}p_{16}r_{12} + p_{26}p_{13}r_{12} + p_{26}p_{23}$$
$$+ p_{14}p_{13}p_{46} + p_{23}p_{14}p_{46}r_{12} + p_{46}p_{23}p_{24} + p_{46}p_{24}r_{12}p_{13}$$
$$+ p_{46}p_{e3}p_{e4}r_{E3E4} + p_{56}p_{13}p_{15} + p_{23}r_{12}p_{15}p_{56} + p_{25}p_{23}p_{56}$$
$$+ p_{56}p_{25}r_{12}p_{13} + p_{56}p_{e3}p_{e5}r_{E3E5}$$

This expression may be partitioned into a series of additive components as follows:

r_{36} = Direct correlation

p_{36}

+

Common correlation with Block 2 variables

$p_{46}p_{e3}p_{e4}r_{E3E4} + p_{56}p_{e3}p_{e5}r_{E3E5}$

+

Common correlation with Block 1 variables

$p_{13}p_{16} + p_{23}p_{16}r_{12} + p_{26}p_{13}r_{12} + p_{26}p_{23} + p_{14}p_{13}p_{46}$
$+ p_{23}p_{14}p_{46}r_{12} + p_{46}p_{23}p_{24} + p_{46}p_{24}r_{12}p_{13} + p_{56}p_{13}p_{15}$
$+ p_{23}r_{12}p_{15}p_{56} + p_{25}p_{23}p_{56} + p_{56}p_{25}r_{12}p_{13}$

The interpretation of these components is clear:

(a) The direct correlation is the correlation of X_3 with X_6 independent of the other variables in the model.

(b) The common correlation with the Block 2 variables represents the correlation of X_3 with X_6 which is in common with X_4 and X_5 only.

(c) The common correlation with the Block 1 variables represents the correlation of X_3 with X_6 which is in common with the Block 1 variables and the intervening Block 2 variables.

In the same way, the other decompositions in Table 3.2 may be obtained. It should be noted that for the decompositions of r_{16} and r_{26}, the common correlation with Block 2 variables has the interpretation of indirect correlation: that is, the component of correlation which is mediated by the causally intervening variables X_3, X_4 and X_5.

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** Available free of charge on application to the Secretary, Joint Committee on Young Offenders, c/- Department of Social Welfare, Head Office, Private Bag, Wellington, New Zealand.