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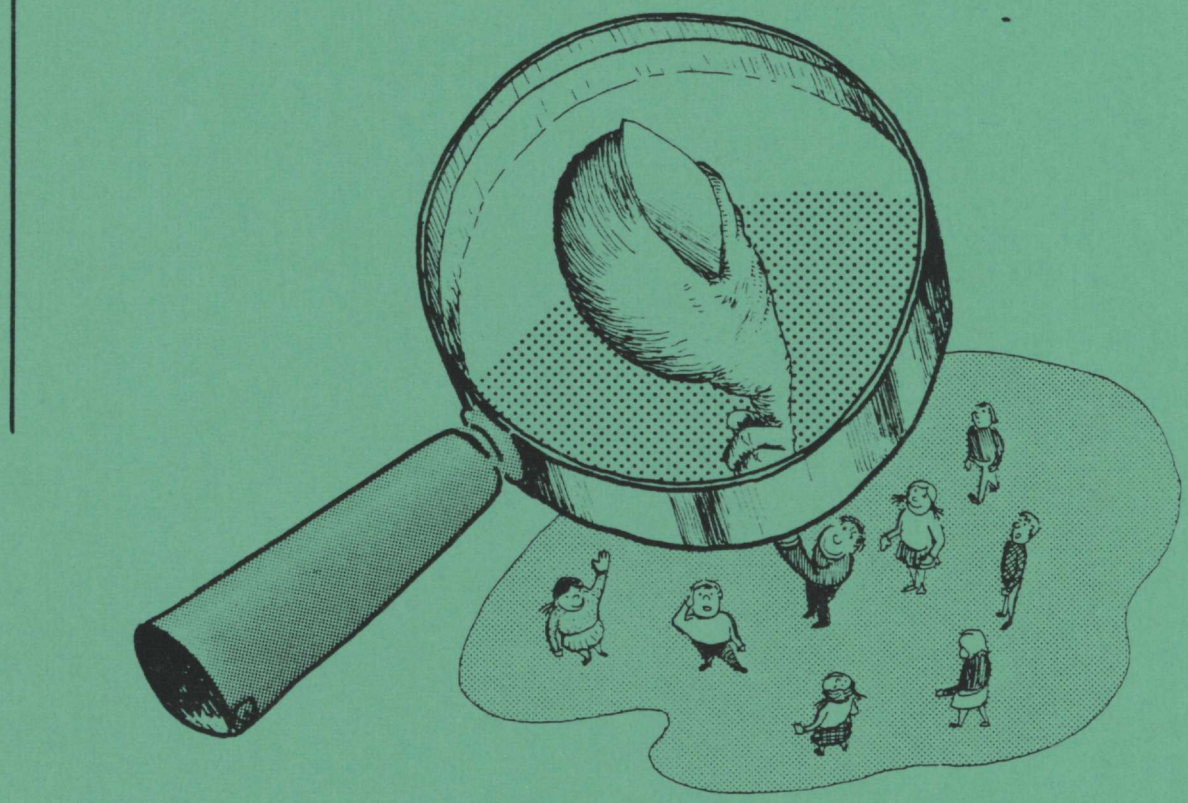

The Individual Statistics Project 44

A Swedish data bank for studies of educational development

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The project that will be described here started in 1961 with the collection of information on all pupils in Sweden born on the 5th, 15th and 25th of any month in 1948. This information, for about one-tenth of the age cohort, has been supplemented by data each year, and the supplementation will continue as long as the individuals are attending an educational institution. In 1966 a new sample, of all pupils born on the 5th, 15th and 25th of any month in 1953, was collected and the follow-up of this sample started in 1967. The number of pupils in the first sample was about 12.000 and in the second about 10.000. In both samples, about 90 per cent of the pupils at the first collection were in the sixth grade of the compulsory school system. Before a more detailed account is given of the design and purpose of the project, a brief description of the compulsory school system in Sweden in 1961 and 1966 will be given.

The compulsory school during the 1960's

In 1961 the compulsory school in Sweden was divided into two systems, as, during the 1950's, some school districts had begun to introduce a nine-year experimental comprehensive school (enhetsskola), while others still had the old system, with a seven- or eight-year elementary school (folkskola). In 1966 compulsory education was divided into the elementary school and the comprehensive school (grundskola), since in 1962 the experimental comprehensive school had been turned into a more definitive nine-year "basic school", which now (1972) is introduced into all school districts. As early as the middle of the 1960's most school districts had introduced the nine-year school, and the number of pupils attending such schools increased from barely 40 per cent in the 1961 sample to more than 80 per cent in the 1966 sample.

The elementary and the experimental comprehensive schools differed in several ways, particularly in respect of the pupils' possibilities of choosing an academically inclined education. The elementary school pupils could, after grade 6, apply to enter a lower secondary school, where, however, the number of places was limited, and the pupils were therefore selected on the basis of marks awarded in the elementary school. In both types of comprehensive school, no selection takes place, instead, pupils and their parents decide whether an academic stream is to be chosen. This means, among other things, that pupils in grades 7 and 8 take another foreign language in addition to English, but for most subjects these pupils have the same instruction as other pupils. It is not until grade 9 that the pupils are divided into different streams, of which one is academic, in the meaning that from this stream - as from the lower secondary school - pupils may apply to attend senior secondary schools (gymnasium), which may later lead to university level studies. The experimental comprehensive school differed from the comprehensive school in that there were three instead of nine streams in grade 9, and that, from and including grade 7, pupils choosing academic streams usually formed separate classes. An attempt is made in Figure 1 to illustrate the greatest organizational differences between the three systems. For a more detailed account the reader is referred to Husén & Boalt (1967).

The design of the project

The design of the project is shown in Figure 2, where the various types of information are indicated by different symbols. A brief account of the data is given below. A more detailed description of the data used in this report will be found later on.

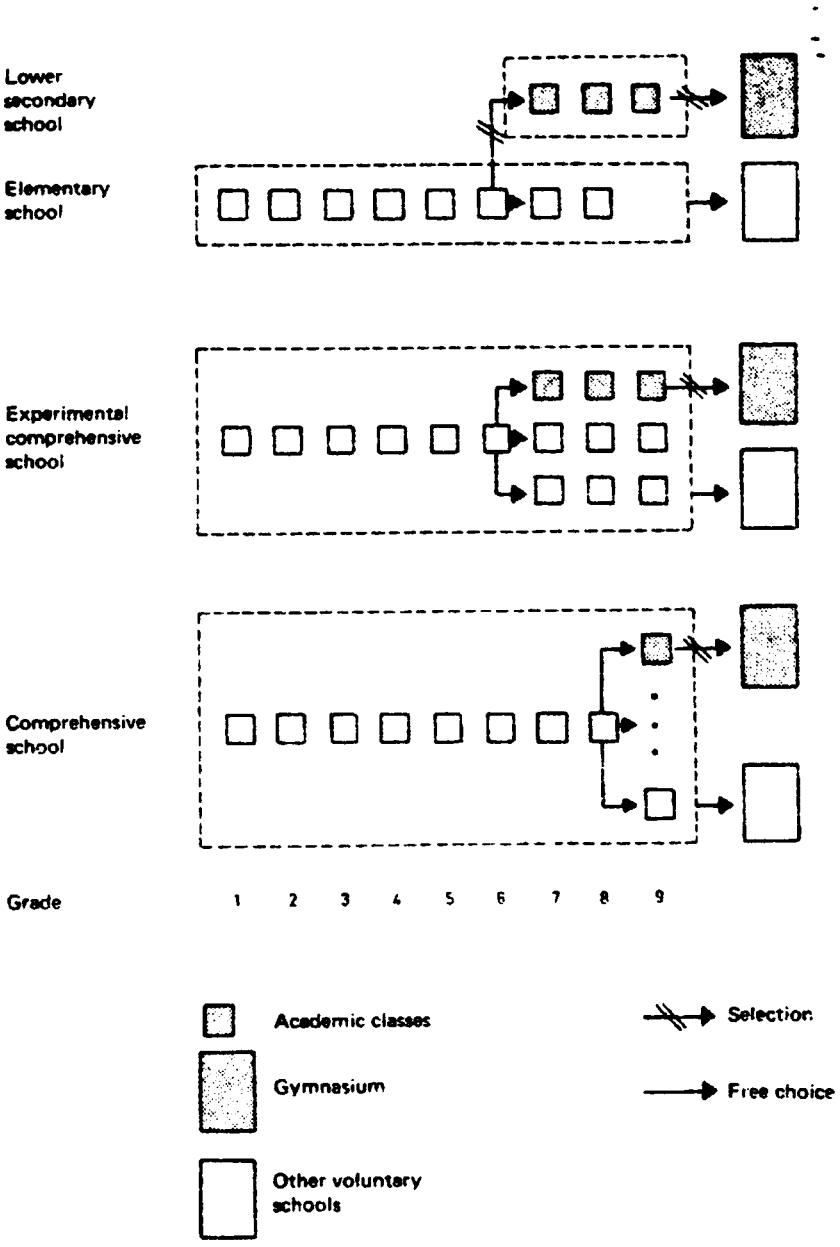

Fig. 1. The Swedish educational systems during the 1960's.

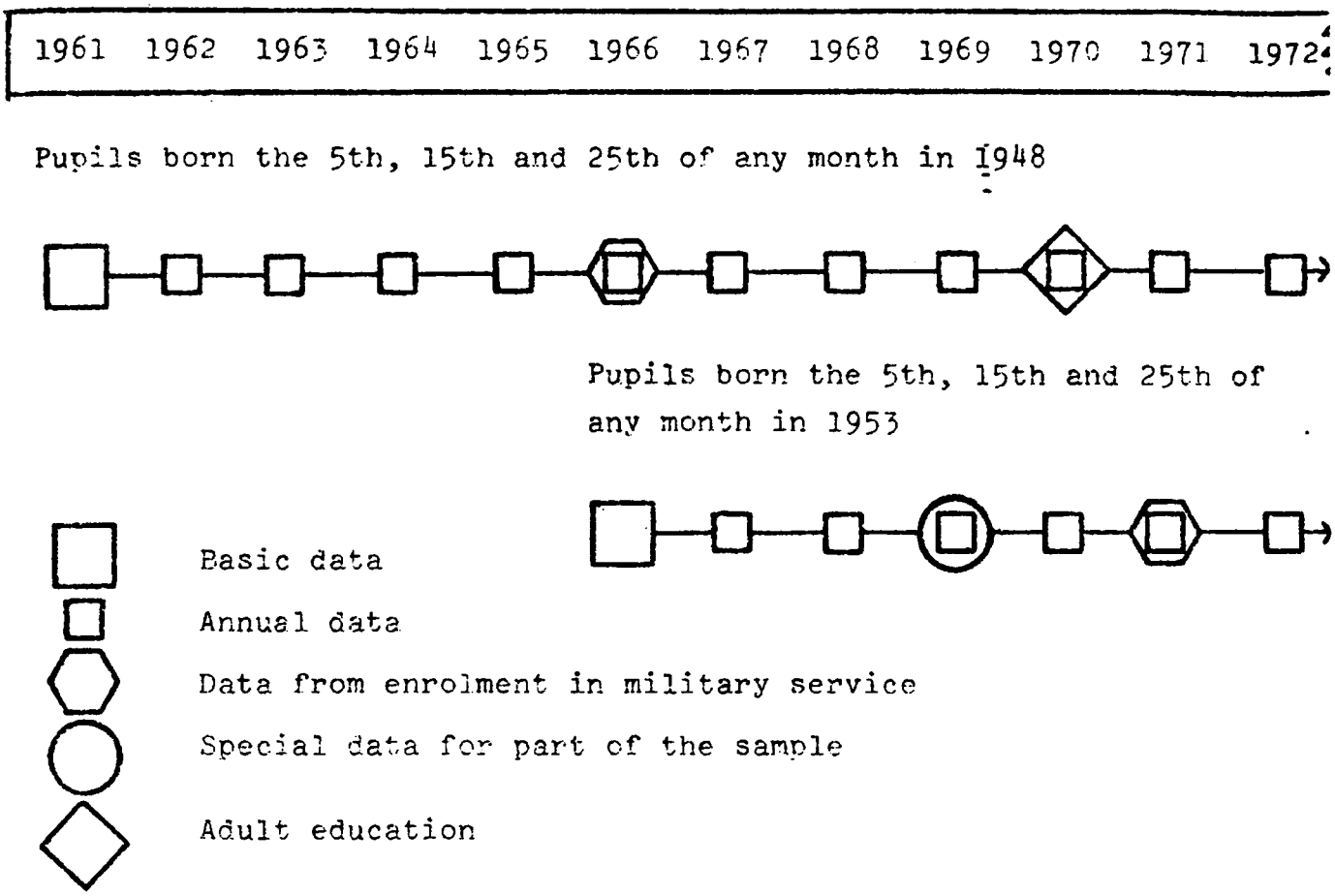

Fig. 2. Plan of the project.

I. BASIC DATA

a) Information from the school records, e.g. class, type of class and school marks.

b) Information on personal background, such as parents' occupations and education.

c) Scores on three intelligence tests; verbal, spatial and reasoning.

d) Scores on standardized achievement tests in Swedish, Mathematics and English from grade six.

e) Replies to questionnaires on the pupils' attitudes to school, their spare time interests, and plans for study and work.

II. ANNUAL DATA

Information from the school records of the type listed under Ia above. The information is collected as long as the pupils are at school.

III. MILITARY ENROLMENT DATA

This information consists of, among other things, data on level of education, the scores on four intelligence tests, and the replies to certain questions concerning adjustment to home, school and work. These data are available for males only.

IV. SPECIAL DATA

In connection with another project, questionnaire data on the pupils' adjustment and attitudes to further education and occupational choice have been collected for about a third of the 1966 sample.

V. ADULT EDUCATION

In 1970 questionnaire data were collected for about 2 000 men of the 1961 sample. The data give information on interest in adult education among persons with only compulsory education.

Information under Ia, Ib and II is collected by the National Bureau of Statistics, and under Ic - e, IV and V by the Institute for Educational Research, University of Göteborg, with financial support from the Ministry of Education, the Swedish Council for Social Science Research and the National Board of Education. Data under III are obtained from the Institute of Military Psychology in Stockholm.

The purpose of the project

The purpose of the Individual Statistics Project and the "data-bank" the project has established may be said to be threefold:

1. To make possible follow-up studies of large and representative samples of pupils, and to ascertain how geographic, social and psychological factors affect the choice of education and occupation, and to discover what changes the switch-over to the nine-year comprehensive school has caused in these respects.
2. To provide a basis for studies concerned with the importance of various environmental factors for changes in intelligence, both within a sample of pupils tested at different ages,

and between different samples of pupils tested at the same age level but at different points of time.

3. To supply data to investigations made to elucidate how different types of demographic and personality factors are associated with success in and adjustment to school.

An account will now be given of some studies from each of the fields mentioned above.

Follow-up studies of educational choices

The basic data (cf. Figure 2) have been used as background variables in a number of follow-up studies of educational choices. Some of the major ones will be referred to here.

Reuterberg (1968) compared the frequency of academic vs. non-academic choices at the lower and upper secondary levels in the traditional school system and the experimental comprehensive school. The data were taken from the 1948 cohort. His main objective was to find out if the influence of socioeconomic and geographical background differed between the two school systems.

Because of great differences in intelligence and achievement between sub-groups already at the initial testing Reuterberg tried to hold such initial differences under control by means of various methods, i.a. a kind of standardization of initial status (cf. Härnqvist 1966). The influence of background and school system was studied through indices between observed and expected choice frequencies for various sub-groups when intelligence respectively school marks in grade 6 were kept constant. As an example we report the indices for the choice of academic lines at upper secondary level (gymnasium) among pupils from the traditional and the comprehensive system when intelligence at age 13 was kept under control (Table 1).

Table 1. Indices for choice of gymnasium in different socioeconomic groups and school systems. Intelligence controlled.

Socioeconomic group	Traditional	Comprehensive
A	181	181
B	161	167
C	117	118
D	60	68
E	69	66
F	61	73
Total	96	104

Group A represents professional and managerial level, B and C intermediate levels differing in respect of father's education, D farmers, E working class and F unknown. As compared to an average index of 100 (observed = expected) there are great differences between socioeconomic groups in both school systems with a very slight tendency for the comprehensive school to have above average indices and less variation between groups. These trends were somewhat stronger when school marks in grade 6 were used as control variable.

Bengtsson (1971) followed-up the 1953 cohort in grade 9 and investigated their plans and motives for further education. By using the basic data from grade 6 he was able to show that much of their choices were done already at the earlier age and could be traced back to background variables and early achievement.

By comparing Reuterberg's data from the 1948 cohort and Bengtsson's for the 1953 cohort with a retrospective study of the 1934 cohort by Härnqvist (1958), Härnqvist and Bengtsson (1972) were able to show how the increase over the years in frequency of academic choices at secondary level was related to initial achievement and socioeconomic background. Figure 3 shows the transition to the gymnasium for different school mark levels.

In all cohorts the frequency increases steadily with increasing level of initial school marks. For the later cohorts it almost reaches 100 per cent at top level.

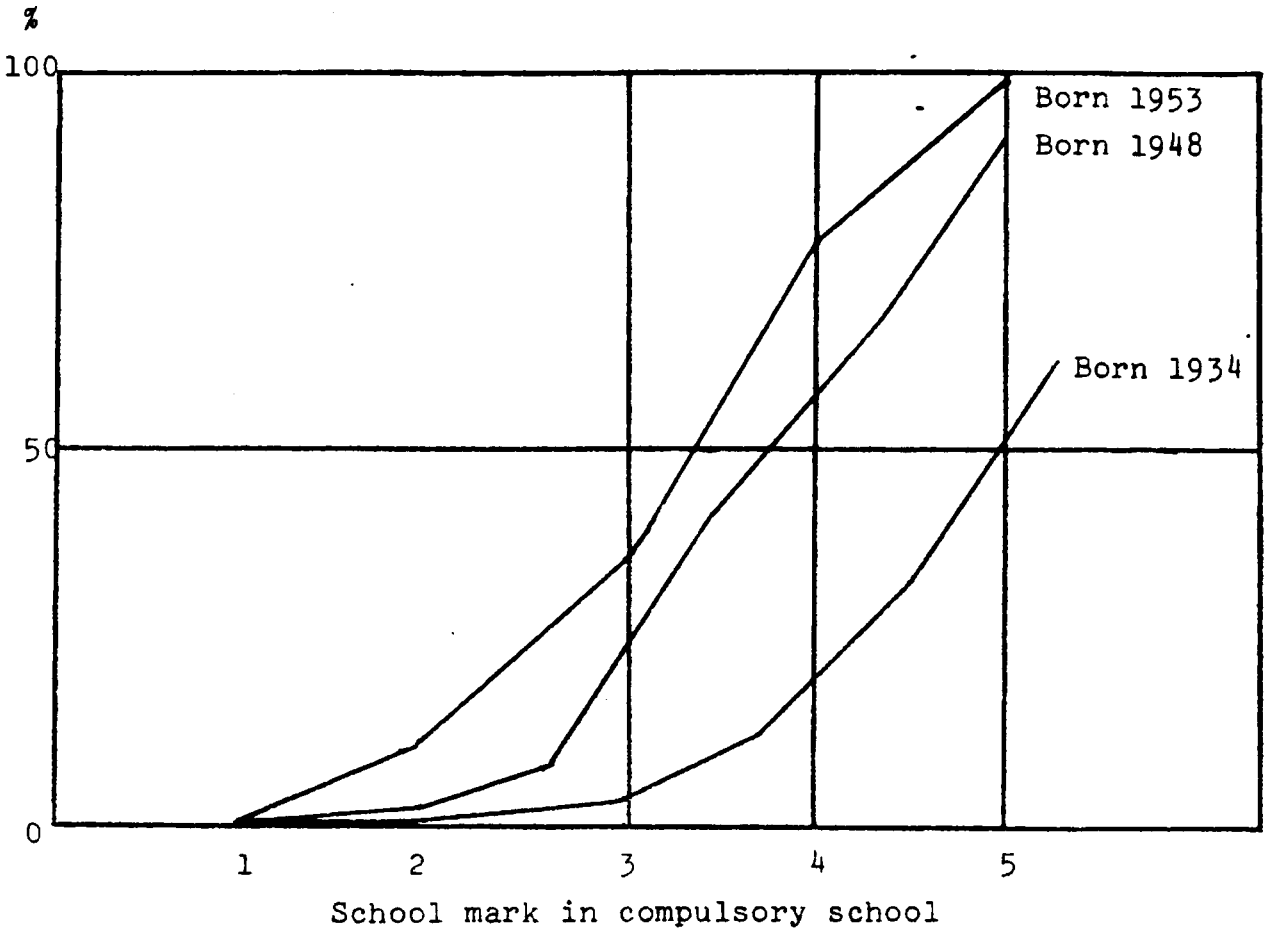

Figure 3. Transition to the "gymnasium" in per cent for different achievement levels (males).

Table 2 shows the average level of school marks where 50 per cent of the group enters the gymnasium.

More than one unit more on the marking scale (which is equal to one unit of the standrad deviation) is required of a pupil with working class background to have the same 50 per cent chance of transition to the "gymnasium" as a pupil with an upper middle class background. Roughly the same average level which for males born in 1934 was "critical" in upper middle class (3,4) applied in age cohort 1948 to lower middle class (3,7) and in age cohort 1953 to working class (3,6).

Table 2. School marks level with 50 per cent transition to the "gymnasium" in different social classes (males).

"Critical" mark level[1] for social class	Age cohorts 1934	1948	1953
I. Upper middle class	3,4	2,9	2,5
II. Lower middle class	50 % never reached	3,7	3,2
III. Working class		4,1	3,6

1) Mark 3 means average level in compulsory school.

These are examples of studies of whole age cohorts made possible by the data bank. Other studies have concentrated on particular sub-groups and as one example we might mention Rubenson's study (1972) of the interest for adult education among young men with short basic education. His sample was selected by means of data for the 1948 cohort from their enrolment in military service 1966. In 1970 he sent a questionnaire to those having just compulsory education at enrolment. He studied their background, interests and motives for additional education at adult level. Occupational needs for further schooling were dominating among the motives, but also background and experiences from their school years were shown to have an influence upon their educational interests.

Studies of intelligence changes

Härnqvist (1968) has reported on an investigation of changes in intelligence from the initial testing at age 13 to the military enrolment tests at age 18 as related to background and intermediate education. Since the two intelligence tests differed only relative changes could be studied and this after a transformation of scores to two canonical components, a general component similar to an IQ and a component contrasting spatial and verbal test content.

The comparisons were done between average observed scores at 18 for various groups and scores at 18 expected from scores at 13 according to a common regression line. When the differences between observed and expected scores were expressed as percentages of the standard deviation of final scores the following were the largest differences for educational groups.

Table 3. Major relative changes in general intelligence for educational groups.

	In per cent of S.D. of final scores
Negative changes	
Compulsory school with shortened course	-91
Compulsory school finished after grade 7	-43
Compulsory school finished after grade 8	-31
Positive changes	
"Gymnasium" discontinued	+42
"Gymnasium" completed with "studentexamen", or more	+37
"Gymnasium" continuing, final form	+35
"Gymnasium" continuing, lower than final form	+34
Continuation school	+27
"Realskola" continuing	+22
"Realskola" completed with "realexamen"	+20
Vocational school above "realexamen"	+20

Thus a relationship between formal education and changes in general intelligence is quite evident. When the educational groups are combined according to level, the compulsory level shows a change of -29 per cent and the "gymnasium" level +33 per cent. The difference of 62 per cent of the standard deviation of final scores corresponds to about 10 IQ units.

When a similar analysis was done for socioeconomic groups with educational level controlled some variation was found but much smaller than when comparing educational levels with socioeconomic groups controlled. For relative changes in measured intelligence between 13 and 18 differences in schooling are much more important than differences in socioeconomic background, but the latter of course have had an important influence both on initial level and choice of education.

Due to the use of identical tests in 1961 and 1966 it has also been possible to study trends over a five-year interval of the measured intelligence of the age cohorts. Svensson (1971) has

reported average changes indicating a general increase over the period of about a sixth of a standard deviation, somewhat more for lower than for higher socioeconomic groups. A graduate student is analyzing such data for geographical areas grouped according to population density and location. The average differences in intelligence are related to a number of demographical, economic and cultural ecological variables.

Scholastic achievement and home background.

The investigation which we are going to present here is earlier published in a monograph on Relative Achievement (Svensson, 1971). The main problem dealt with in that investigation is: How is relative achievement associated with sex and home background? This means that a study has been made to ascertain what differences there are in achievement between boys and girls, and between pupils from different social strata when differences in intelligence are taken into consideration.

In the part of the investigation reported here only pupils from the comprehensive school are included, more exactly only pupils who were in grade six in 1966. Totally 6 144 pupils are included, which corresponds to 81 per cent of the possible sample size.

The pupils were divided into three social groups, where the parents' level of education was decisive for the classification.

Group 1. Father and/or mother with matriculation examination or equivalent education.
Group 2. Father and/or mother with only lower secondary school certificate or equivalent education.
Group 3. Father and mother with only elementary school education.

Table 4 shows how the pupils are distributed according to sex and social group.

Table 4. Distribution of the sample according to sex and social group.

Group	Boys		Girls	
	N	%	N	%
1	432	13.9	421	13.8
2	520	16.8	521	17.1
3	2145	69.3	2105	69.1
Total	3097	100	3047	100

In order to avoid as far as possible the difficulties and arbitrariness attendant on the choice of measures of intelligence and achievement in this type of study, a number of so-called external or canonical factor analyses were made, in which different intelligence tests, standardized achievement tests and marks were involved. The analyses gave a very clear structure, in that the covariation between most of the variables could be assigned to either a verbal or a quantitative factor. With this as point of departure the work was devoted to studying relative achievement within the verbal and the quantitative (numerical) domains.

Table 5. Combinations of control and criterion variables.

Domain	Model	Control variable	Criterion/ Control variable	Criterion variable	Correlation between control and criterion
		Intelligence test	Achievement test	School mark	
Verbal	A	Opposites		Swedish	.62
	B	Opposites	Swedish		.75
	C		Swedish	Swedish	.81
Quantitative	A	Number series		Mathematics	.65
	B	Number series	Mathematics		.69
	C		Mathematics	Mathematics	.86

As shown in Table 5, three combinations of control and criterion variables were used in each domain. In the verbal domain, a start was made with a vocabulary test, Opposites, as a measure of intelligence and marks for Swedish as measure of achievement (Model A). Then marks were exchanged for a standardized achievement test (Model B), and finally the achievement test was used to measure ability and marks as measure of achievement (Model C). In the same way, in the quantitative domain, a reasoning test, Number series, was used as measure of intelligence, and marks for mathematics as measure of achievement, while the achievement test of mathematics had to serve as measure of both criterion and control variable. It will be seen from the table that the strength of the correlations increases within both domains from Model A to Model C.

The relations between relative achievement and different background variables were studied by the help of the method of analysis of covariance. By making separate analyses within the verbal and the quantitative domains, and by being able in both domains to "divide" the relationship between scores on intelligence tests and marks into two steps, it was possible to get a rather detailed picture of how sex and social background covary with relative achievement.

The results obtained from the comprehensive school are shown very schematically in Figures 4 and 5, and are summarized below.

1. The girls were far superior to the boys in relative achievement within the verbal domain, and their superiority can be seen clearly in all the models used to estimate relative achievement. Thus, they have higher scores on achievement tests than could be expected from their intelligence (Model B), after which they are awarded higher marks than justified by these, in themselves, very high achievement scores (Model C). These two co-operating trends cause girls to get clearly higher marks in Swedish than boys when verbal intelligence is kept constant (Model A).
2. Within the quantitative domain, the relationship between sex and relative achievement is more complicated. When sex differences in the intelligence test, Number series, are

taken into consideration, the differences between boys' and girls' knowledge of mathematics are very small, as expressed in school marks. Behind this "harmonious" situation, however, are concealed two clearly significant trends, although in different directions. At equal intelligence, boys score higher than girls on achievement tests; when scores on achievement tests are equal, girls are awarded higher marks.

3. Pupils with highly educated parents (group 1) get higher marks for Swedish than pupils whose parents have only an elementary school education (group 3), even when the great differences in verbal ability have been allowed for. This is true of both boys and girls, and is due mainly to the fact that group 1 pupils are awarded higher marks than expected from their scores on achievement tests. On the other hand, the differences are small and non-significant between the groups in achievement test scores with intelligence kept constant.

4. There are very great differences between group 1 and group 3 in the quantitative domain, when relative achievement is estimated according to Model A. As in the verbal domain, boys and girls from group 3 have difficulty in obtaining marks corresponding to their intelligence, but here it is not because they are given marks that are too low in relation to their scores on achievement tests. The reason for their low marks seems instead to be inability to convert their intelligence into good achievement test scores. The differences between groups 1 and 3 are very small when relative achievement is estimated according to Model C, but very great when Model B is used.

5. Within both the verbal and the quantitative domains, group 2 occupies an intermediate position, i.e. its relative achievement is higher than that of group 3 but lower than that of group 1.

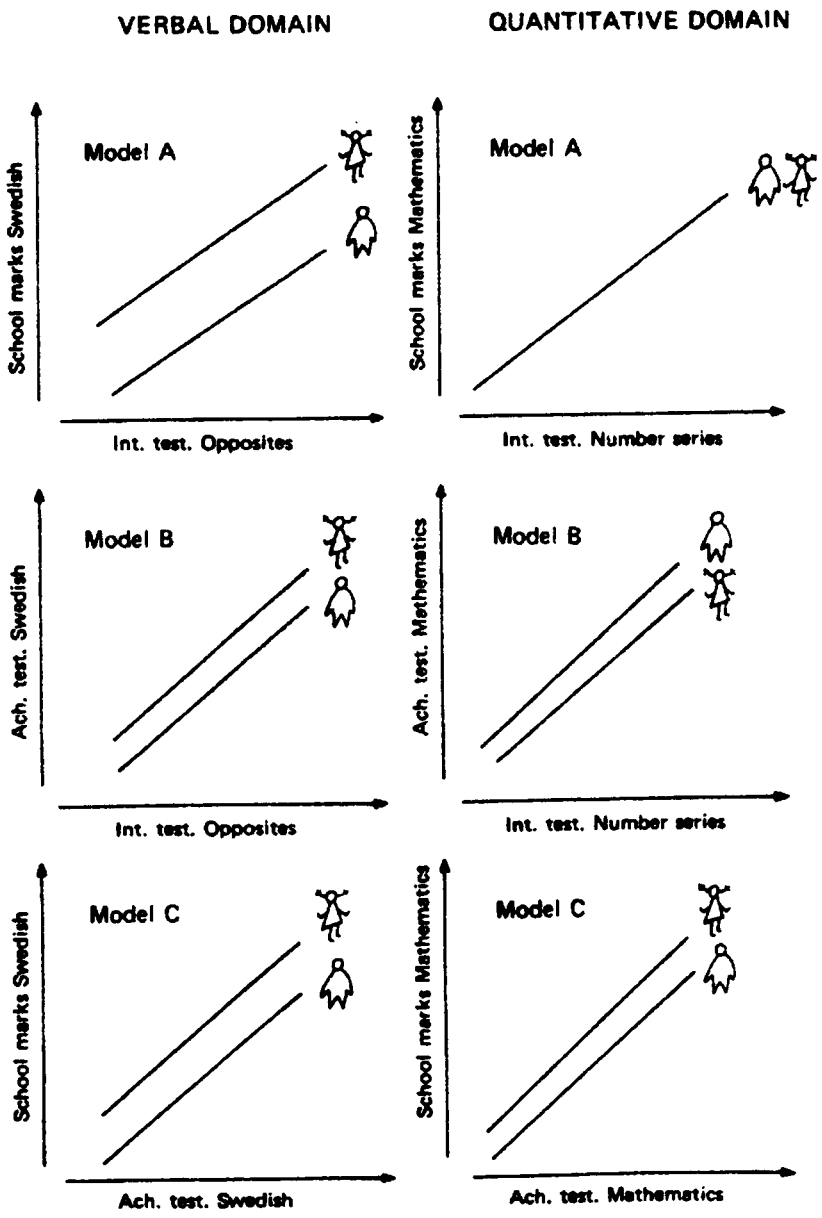

Fig. 4. Comparisons between boys and girls in relative achievement.

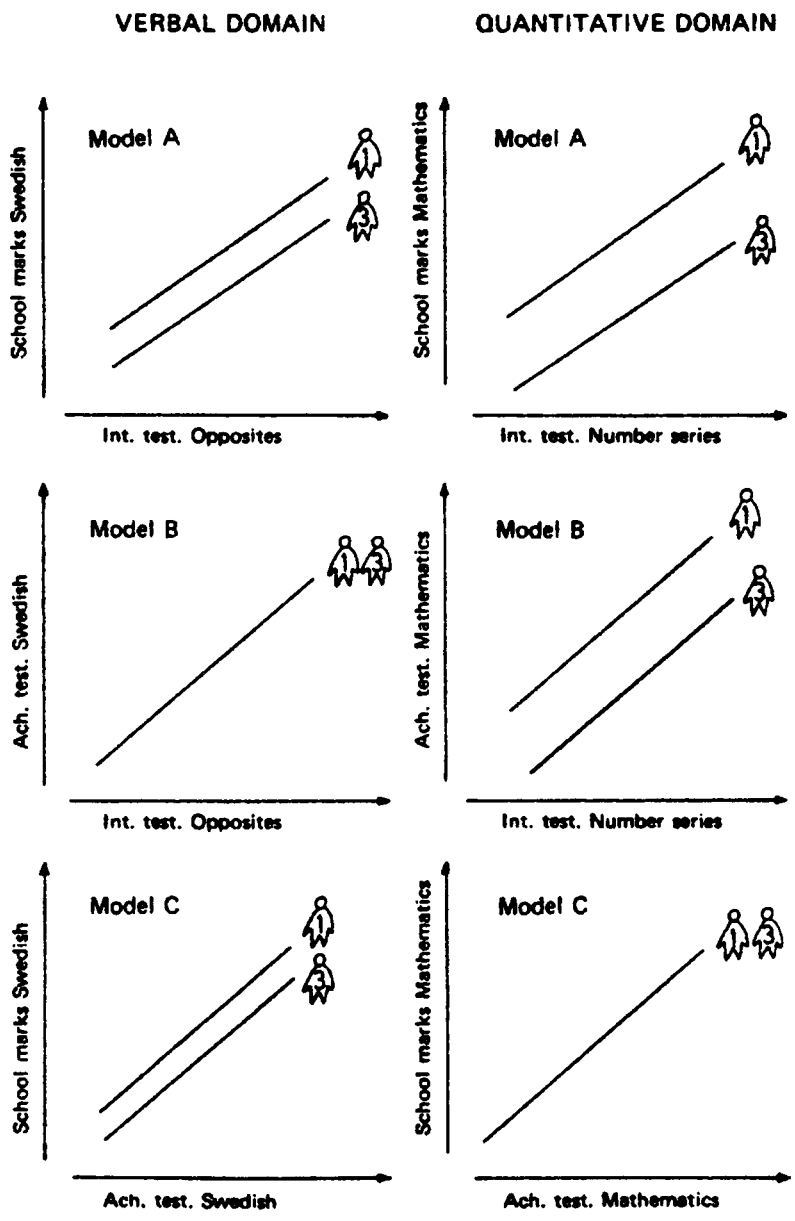

Fig. 5. Comparisons between groups 1 and 3 in relative achievement.

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