DOCUMENT RESUME

ED 033 772 RC 003 753

AUTHOR Ruiter, R.
TITLE The Past and Future Inflow of Students into the Upper Levels of Education in the Netherlands.
Pub Date [63]
Note 32p.

EDRS Price EDRS Price MF-$0.25 HC Not Available from EDRS.
Descriptors Comparative Analysis, *Elementary Schools, *Enrollment Projections, *Models, Occupations, Prediction, Rural Urban Differences, Secondary Education, Sex Differences, *Social Factors, Student Enrollment, Tables (Data), *Universities
Identifiers *Netherlands

Abstract

Theoretical and technical problems are covered in this progress report on methods of forecasting enrollment in grammar schools and universities in the Netherlands. A review of the combined efforts of persons who have contributed to the work of analyzing and forecasting this enrollment is contained. The analysis of grammar school enrollment considers regional changes in provinces, rural and urban regions, and social factors. Existing forecasting models utilized are presented and a new model is considered. It is suggested that the new model would have to forecast: (1) the future occupational distribution and the number of children within each occupational group; and (2) the inflow rate within each group to provide the total number of first-year enrollments in grammar schools. The development of university education is discussed and trends, choice of faculty, regional analysis, male and female differences, and forecasting models are considered. [Not available in hard copy due to marginal legibility of original document.] (SW)

V

THE PAST AND FUTURE INFLOW OF STUDENTS INTO THE UPPER LEVELS OF EDUCATION IN THE NETHERLANDS

by

R. RUITER

Centraal Planbureau, Netherlands

1963

INTRODUCTION

This paper is in the form of a progress report on methods of forecasting enrolment in grammar schools and universities, and covers both theoretical and technical problems.

Several forecasting models have been used in the course of time ; as these are based on previous analyses of enrolment and inflow, both earlier and recent analyses have been included for purposes of comparison.

This report attempts to give a review of the combined efforts of the many persons who have contributed to the work of analysing and forecasting grammar school and university enrolment in the Netherlands, including members of the Statistical Committee of the Universities' Council, and research workers at the Netherlands Economic Institute, the Central Bureau of Statistics and the Central Planning Bureau.

1. SYSTEM AND STRUCTURE OF SECONDARY EDUCATION

On completing six years' primary education, pupils may remain for another two years at primary schools, go to continuation schools or classes (2 years), to secondary technical or vocational schools (2, 3 or 4 years), to secondary modern schools (3 or 4 years), or to secondary grammar schools (5 or 6 years). Only secondary grammar schools lead to the university (± 7 years).

Schools are managed by central or local governments, or by private bodies (whether denominational or non-denominational), and are supervised and paid by central government.

There are several types of secondary grammar schools[1] :

a) grammar schools (" gymnasium ") (six-years). From the beginning of the fifth[1] year the syllabus is divided into an " A " or language section, and a " B " or science section ;

1. Throughout this report the school organization and structure referred to is the one prevailing in 1962-63. The " Mammoth Law " enabling a major reform in this structure was not yet implemented nor did data exist indicating the effect of the proposed changes on the flow of students through the secondary schools.

b) modern grammar schools (" h.b.s. ") (5 years) have a common syllabus for the first three years and then split into " A " and " B " sections ;

c) girls modern grammar schools (5 years), concentrating on literature, music and history ;

d) commercial day schools (three or four years), concentrating on languages, commercial correspondence, geography as related to trade, economics, etc ; quantitively these are an insignificant part of grammar school education.

These various types of school are housed in separate buildings or (with the exception of commercial day education) in lycea. The lyceum has a first year common syllabus after which pupils go into the modern grammar, grammar or girls' modern grammar streams. After a further 2 years (modern grammar) or 3 years (grammar) pupils are split up into A and B sections.

Compulsory education lasts 8 years, so that the choice of secondary school is made while pupils are still in the compulsory education age group. Parents decide the type of school, but many ask the advice of the primary school teachers. Secondary grammar schools are traditionally reserved for the more intelligent children who are generally required to pass an entrance examination.

Every qualified applicant will be admitted to the specific type of school he chooses ; emergency measures (e.g. by redistributing pupils over the schools) being taken if applications exceed the capacity of individual schools.

Everyone who applies is admitted to the university, although, in general, only those with a grammar school or a modern grammar school leaving certificate are entitled to sit for university examinations in faculties specifically appointed for the type of grammar school education followed.

2. WHY FORECASTS

Forecasts are made necessary by educational goals, building requirements and time lags.

One educational goal is to ensure that every qualified pupil can get the type of education he (or his parents) wants, of the denominational type he prefers, from qualified teachers, in adequate buildings and within reasonable distance.

This goal is qualified by two conditions — a minimum number of pupils per school, and output to match society's demand for skilled personnel. Information concerning future job prospects is the instrument used to reach a balance between demand and supply. This does not violate the basic policy of free educational choice, since nobody will be refused admittance to a given type of school.

Limited financial resources and building capacity make it necessary to compare the consequences of expanding education with those of expanding other sectors of the economy.

The time required to produce qualified teachers means that forecasts must be made of the future demand and supply of teachers.

Forecasts of the number of pupils will therefore serve as a basis for :

a) calculating teacher requirements ;

b) calculating the building required for new schools. The demand for building is greater than the supply in the Netherlands and priority allocations are made among the various sectors (housing,

industry, schools, etc.). These allocations require both short and long term forecasts of the number of pupils ;

c) estimating future expenditure on education. After comparison with forecasts of other types of government expenditures, priorities can be assigned ;

d) (to some extent) studies of demand and supply of graduates.

Forecasts covering the nation as a whole would not satisfy all purposes. Regional differentiation is necessary to show where new schools should be located. Universities also recruit their students largely in their own neighbourhood, thus making necessary a regional analysis of the expansion in the number of grammar school pupils, and of the transfer from secondary to higher education.

DEVELOPMENT OF GRAMMAR SCHOOL EDUCATION

General

It was found that forecasts concerning grammar schools should concentrate on :

a) inflow, since increases in first year enrolment are not fully reflected in the total number of pupils until after a certain time lag. A breakdown by sex should be made, past trends for males and females having differed. A breakdown by region is necessary owing to : the differences in the admission growth rates, the use of a cross-section analysis to examine factors determining inflow, the regional recruitment of university students. A breakdown of inflow by type of grammar school stream is not possible since streaming takes place some years after admission ;

b) the number of pupils. Only the total number of pupils for the country as a whole need be known, since forecasts are used to calculate demand for teachers, the required number of new schools and expenditures ;

c) output of grammar school graduates. Analyses and forecasts should be broken down by sex (see *a*), region (see *a*) and type of school leaving certificate. Admission to the different faculties of the university being dependent on the type of certificate obtained, changes in the numbers of these different types will therefore affect inflow into the different faculties and transfer from secondary to higher education.

These points will be considered when examining the results of analyses and methods of forecasting. Some confusion may arise since, although we have wished to retain various analytical and forecasting trials, the method of collecting statistics in the past does not lend itself to the use of refined methods of analysis and forecasting.

Development of full-time secondary education

Table 1 and Graph 1 show the number of first admissions to the first year of full-time secondary education[1] as a percentage of 12 year old population.

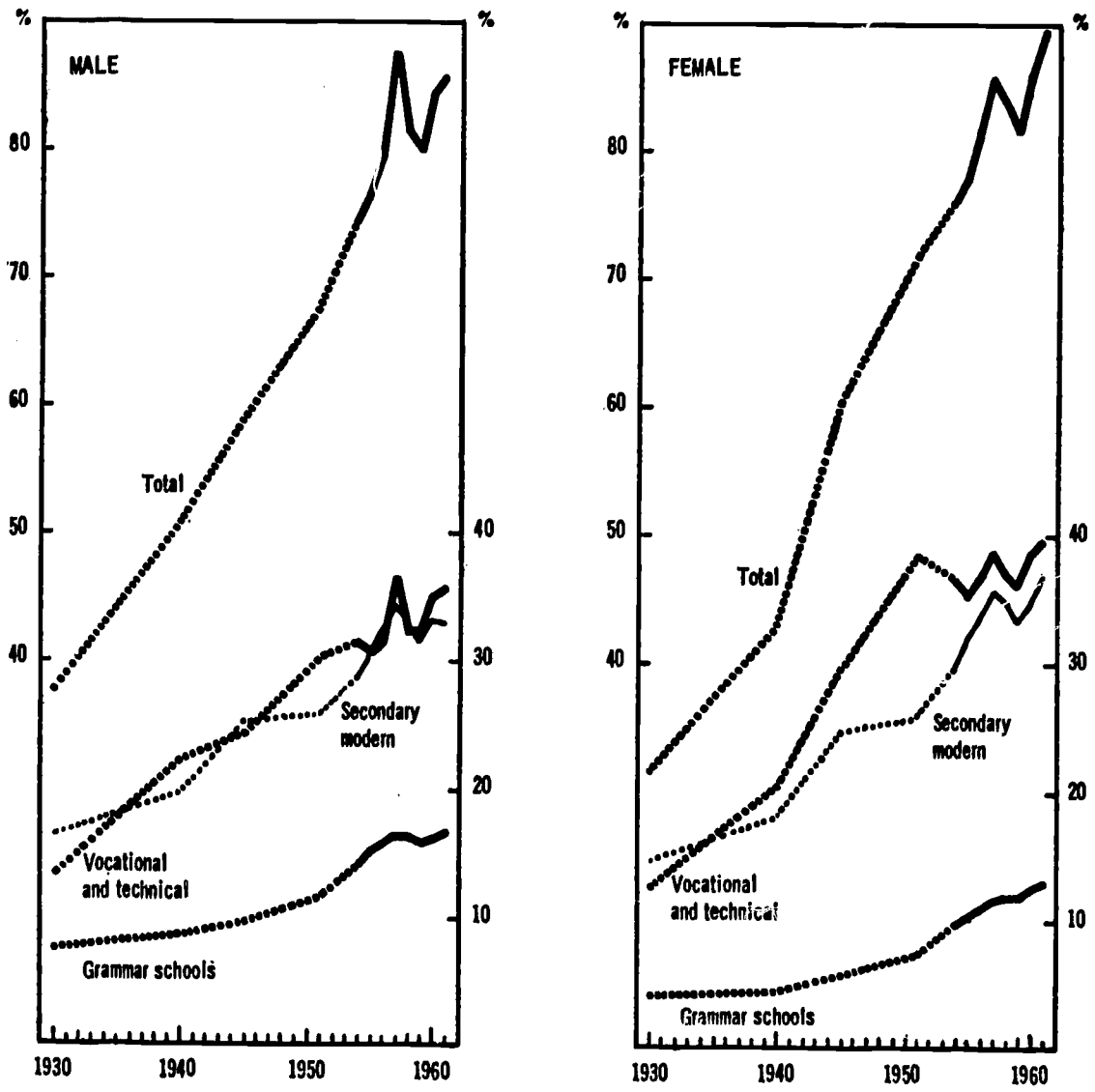
1. Throughout the remainder of this report this category may be abbreviated to " first year admissions " to secondary school.

TABLE 1. NUMBER OF FIRST ADMISSIONS TO THE FIRST YEAR OF FULL-TIME SECONDARY EDUCATION AS A PERCENTAGE OF THE 12 YEAR OLD POPULATION[1]

	MALE				FEMALE			
	GRAMMAR SCHOOLS	SECONDARY MODERN SCHOOLS	VOCATIONAL AND TECHNICAL SCHOOLS	TOTAL	GRAMMAR SCHOOLS	SECONDARY MODERN SCHOOLS	VOCATIONAL AND TECHNICAL SCHOOLS	TOTAL
1930	7.5	16.5	13.6	37.6	4.1	14.7	12.6	31.4
1940	8.6	19.8	22.3	50.7	4.5	18.1	20.4	43.0
1950	11.2	25.4	29.9	66.5	7.1	25.1	33.6	65.8
1957	16.4	34.3	36.8	87.5	11.6	35.6	38.6	85.8
1961	16.5	33.2	36.0	85.7	12.9	36.9	39.8	89.6

1. Excluding agricultural schools.

Graph 1. NUMBER OF FIRST ADMISSIONS TO THE FIRST YEAR OF FULL-TIME SECONDARY EDUCATION AS A PERCENTAGE OF THE 12 YEAR OLD POPULATION



The increase in this grammar school first year admissions rate, which was only slight before the war, accelerated considerably between the end of the war and 1957 ; after that date it remained constant, as it did for all types of secondary education.

No further increase can be expected in this secondary school entrance rate. About 10 per cent of the 12 year olds are incapable of assimilating a secondary education and will remain at primary or special primary schools, and about 5 per cent of the boys will continue their education in agricultural schools. It follows that the post-war increase in secondary school enrolment was accompanied by a corresponding reduction in the number of pupils in the higher forms of primary schools.

Any further decrease in enrolment in the higher forms of primary education not being possible, future increases in enrolment in any one type of secondary education will have to be at the expense of the other types. Competition in this sense between primary and secondary education is being replaced by that between the different types of secondary education.

Analysis of grammar school enrolment

Regional changes

A. *Provinces*

Grammar school enrolment statistics are available as from 1930 for the 11 provinces in the Netherlands. Table 2 shows this enrolment as a percentage of the 12-17 age group for 1930 and 1959 (see also Graph 2).

Table 2. INCREASE IN GRAMMAR SCHOOL ENROLMENT AS A PERCENTAGE OF 12-17 AGE GROUP, BY PROVINCES AND SEX, 1930 AND 1959

	MALE			FEMALE		
	1930	1959	1930-1959	1930	1959	1930-1959
	%	%	INDEX[1]	%	%	INDEX[1]
Groningen	6.3	14.0	222	3.2	8.9	258
Friesland	4.2	11.4	271	1.9	5.9	311
Drenthe	3.0	9.4	313	1.3	5.8	446
Overijssel	4.6	13.5	293	1.9	8.2	432
Gelderland	6.2	12.5	202	3.1	8.5	274
Utrecht	10.2	18.2	178	4.8	12.6	263
Noordholland	9.8	17.8	182	6.0	13.7	228
Zuidholland	7.7	15.2	197	3.6	11.1	308
Zeeland	5.5	15.3	278	2.0	9.3	465
Noordbrabant	3.9	12.8	323	1.4	9.0	643
Limburg	5.7	16.1	282	1.8	8.1	450
Netherlands	6.8	14.7	216	3.3	10.1	303

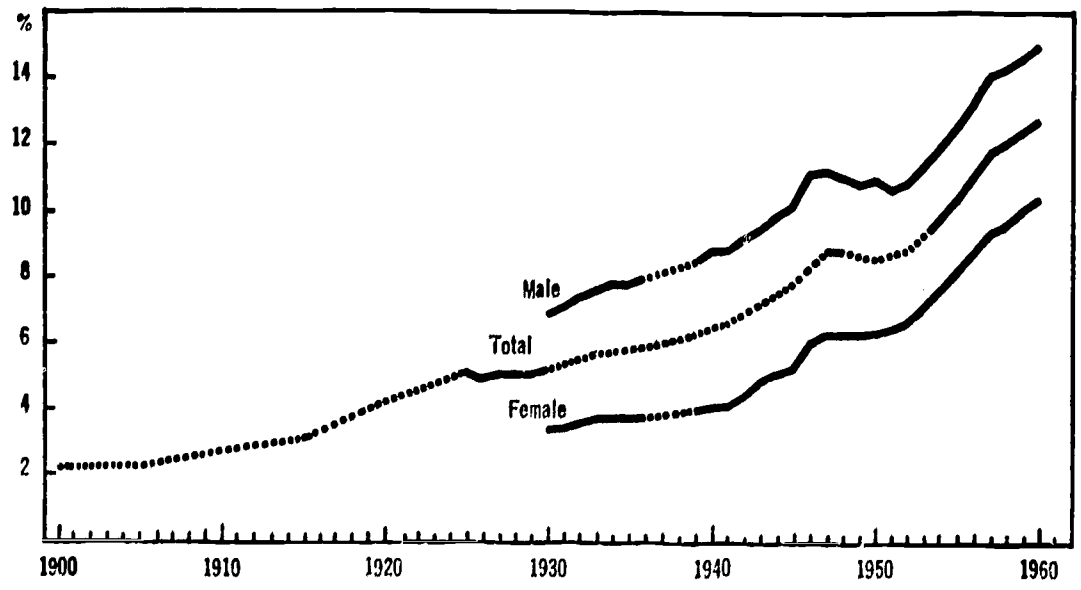
1. $\frac{\text{percentage 1959}}{\text{percentage 1930}} \times 100$.

Provinces with a low enrolment in 1930 show the biggest increase, indicating a levelling out of regional differences.

Graph 3 shows increases in grammar school enrolment for the various provinces over three periods. The curves, which follow as closely as possible the points referring to the given periods, indicate an increase in enrol-

ment for all provinces (the curves representing the longer periods are placed higher on the graph). The slope is steeper the longer the period, indicating a continuous levelling out of regional differences in grammar school enrolment.

Graph 2. NUMBER OF PUPILS IN GRAMMAR SCHOOLS AS A PERCENTAGE OF 12-17 YEAR OLD POPULATION



The increase in the number of grammar school pupils can therefore be attributed to three factors : population increase (i.e. of the total number of the 12-17 age group), a general increase in enrolment rates and the levelling out of regional differences.

Table 3 shows the quantitative effect of these factors. It was assumed that the increase in the enrolment rates of the three provinces which had a high rate throughout the whole period would give a good estimate of the overall increase ; when this increase is exceeded by other provinces, a levelling out of regional differences is shown to take place.

TABLE 3. INCREASE IN GRAMMAR SCHOOL ENROLMENT BETWEEN 1930 AND 1959, BY CONTRIBUTING FACTOR

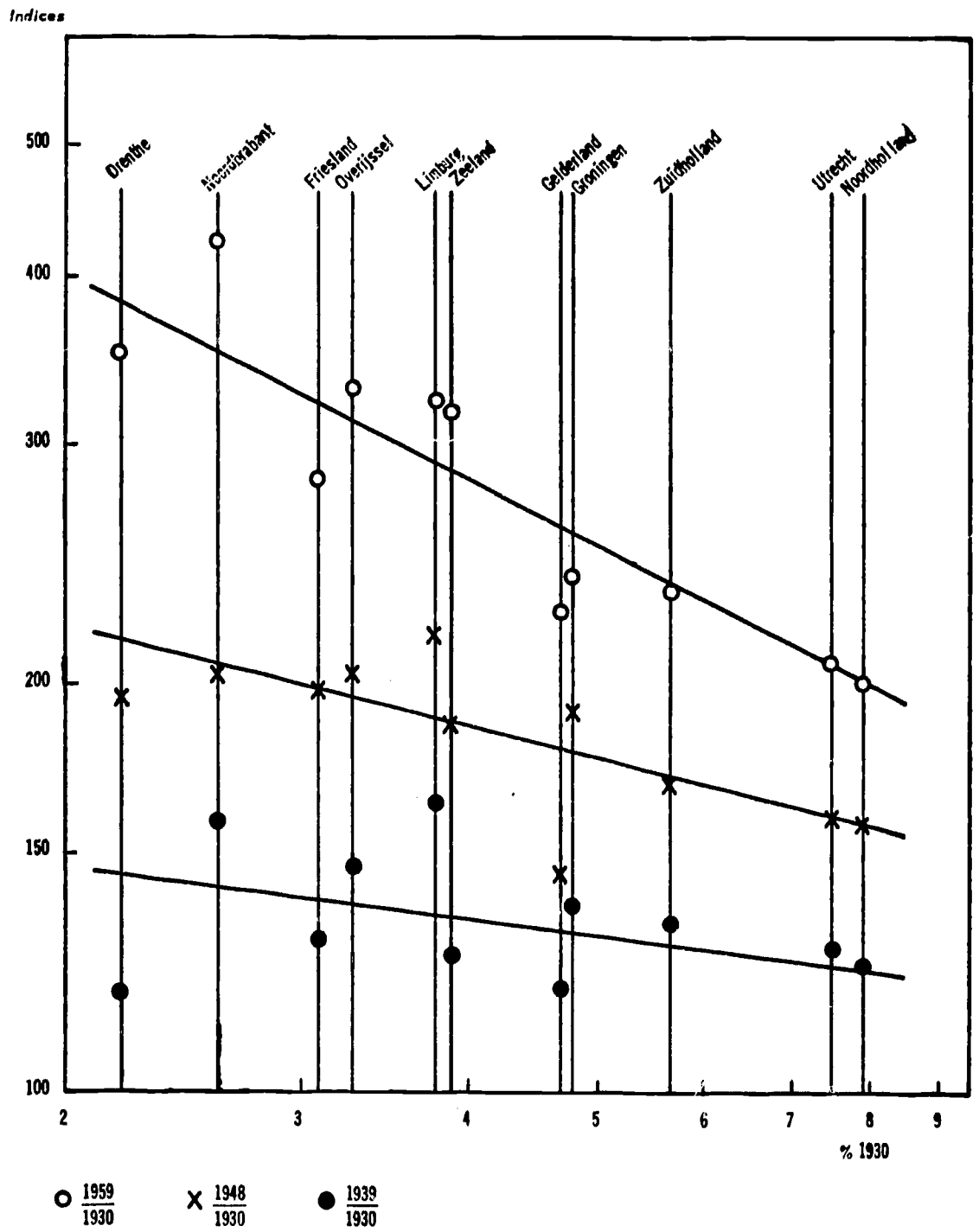
	MALE		FEMALE	
	NO	%	NO	%
Population increase	13,200	20	5,800	12
Increase in enrolment rate	39,000	60	32,500	68
Levelling out of regional differences	13,200	20	9,500	20
	65,400	100	47,800	100

Increased enrolment has been the main source of growth with the levelling out of regional differences and the population increase taking second and third place.

B. *Regions*

The Netherlands are administratively divided into 11 provinces and about 1,000 municipalities. As the number of provinces is too small for statistical surveys and that of municipalities too large, the country has been split up into some 100 regions each covering either one big municipality (towns) or several small ones. Care has been taken to include only similar

Graph 3. GRAMMAR SCHOOL ENROLMENT RATIOS IN 1939, 1948 AND 1959 AS A PERCENTAGE OF 1930 ENROLMENT, RATIOS BY PROVINCES



Graph 4. INCREASE FROM 1949 TO 1957 OF FIRST ADMISSIONS TO THE FIRST YEAR OF GRAMMAR SCHOOL AS A PERCENTAGE OF THE 12 YEAR OLD POPULATION

BASE 100 = PERCENTAGE OF FIRST YEAR ADMISSION IN 1949

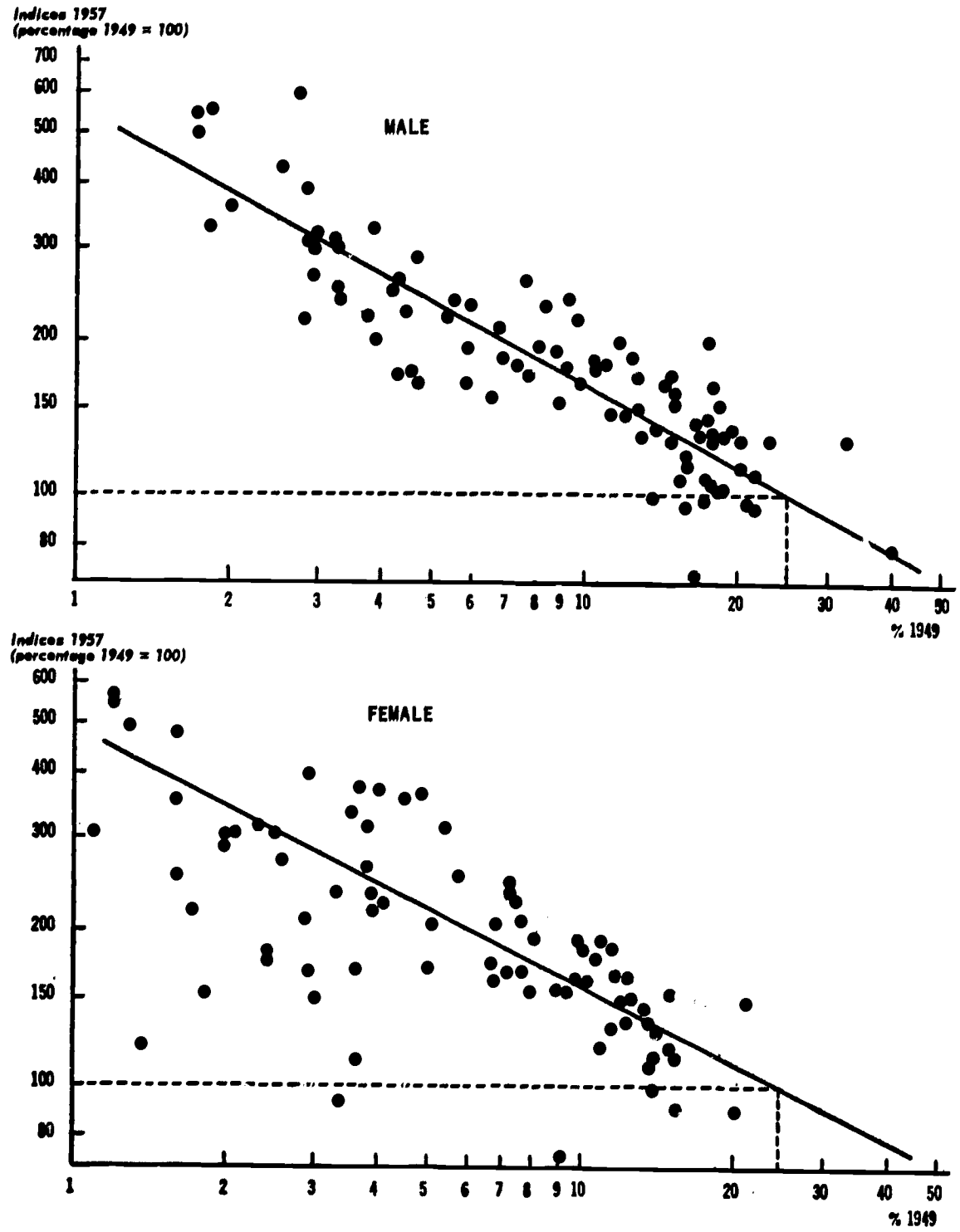


TABLE 4. FIRST ADMISSIONS TO FIRST YEAR OF GRAMMAR SCHOOL AS A PERCENTAGE OF THE 12 YEAR OLD POPULATION, BY CATEGORY OF URBANIZATION AND BY PROVINCE, 1949-1957

	RURAL			URBANIZED RURAL			SMALL TOWNS			LARGE TOWNS			RESIDENTIAL REGIONS		
	1949	1952	1957	1949	1952	1957	1949	1952	1957	1949	1952	1957	1949	1952	1957
a) MALES															
Groningen	4.2	4.9	7.4	3.1	4.5	6.9	—	—	—	15.9	15.3	18.6	—	—	—
Friesland	3.0	4.7	8.1	5.3	7.8	11.8	—	—	—	21.6	19.4	21.0	—	—	—
Drenthe	1.4	4.4	8.7	4.3	8.7	12.0	—	—	—	15.0	8.4	16.2	—	—	—
Overijssel	2.8	5.0	8.3	5.1	8.0	13.0	11.4	13.4	18.2	18.4	20.9	28.2	—	—	—
Gelderland	4.0	6.1	8.9	4.6	7.1	9.9	9.7	12.4	17.1	15.0	14.8	20.0	10.5	14.3	17.4
Utrecht	5.0	6.1	8.3	—	—	—	15.1	19.0	19.7	16.5	19.1	21.7	—	—	—
Noordholland	2.2	7.4	10.8	6.4	9.7	14.4	17.0	18.4	23.0	16.8	20.0	23.8	—	—	—
Zuidholland	5.3	6.5	9.8	5.3	7.3	11.0	12.9	13.6	19.1	19.1	21.1	26.1	21.9	33.4	37.9
Zeeland	8.3	14.3	16.7	10.6	16.6	14.7	21.3	21.3	23.8	17.4	16.7	18.6	—	—	—
Noordbrabant	3.5	4.6	8.7	5.1	7.7	10.4	9.7	13.2	16.9	13.3	16.9	21.4	—	—	—
Limburg	—	—	—	6.5	9.2	14.7	16.2	16.7	17.7	27.2	21.9	30.6	—	—	—
Netherlands	4.1	5.7	9.3	5.7	8.1	12.0	13.9	14.7	19.1	17.0	19.0	23.3	17.2	25.0	25.5
b) FEMALES															
Groningen	2.4	2.8	4.4	1.7	3.0	3.7	—	—	—	13.6	13.1	15.1	—	—	—
Friesland	1.4	2.9	4.0	2.9	3.5	4.8	—	—	—	13.9	11.3	15.7	—	—	—
Drenthe	3.1	2.4	3.8	2.5	4.1	7.0	—	—	—	10.8	8.2	13.1	—	—	—
Overijssel	1.9	2.8	3.3	3.5	5.1	7.0	6.2	9.0	12.9	9.9	13.5	18.3	—	—	—
Gelderland	2.0	3.6	7.2	2.2	3.4	5.9	7.2	8.5	11.6	11.7	13.4	17.9	5.9	8.4	11.3
Utrecht	3.7	5.2	6.4	—	—	—	7.2	14.1	17.1	11.4	13.1	14.2	—	—	—
Noordholland	0.6	1.5	6.5	3.4	5.2	10.0	13.8	14.8	17.0	13.0	13.7	18.4	—	—	—
Zuidholland	1.9	3.1	6.1	2.4	4.5	7.2	8.2	10.1	15.3	12.1	15.8	19.7	18.0	24.1	26.1
Zeeland	4.7	7.4	11.4	2.2	5.0	8.1	15.3	18.5	13.7	7.4	14.2	16.9	—	—	—
Noordbrabant	0.9	2.3	5.4	2.8	3.7	7.5	5.5	10.1	14.5	8.5	11.9	17.8	—	—	—
Limburg	—	—	—	3.2	3.4	6.2	9.3	13.3	14.7	18.4	12.4	17.1	—	—	—
Netherlands	2.1	3.5	5.4	2.8	3.9	6.8	8.4	10.9	15.4	12.2	14.0	17.7	11.6	17.4	20.6

municipalities in a given region so as to make the regions more or less homogeneous from an economic-geographic point of view. For these regions figures for first-year enrolment in secondary education are available for certain years as from 1949.

Graph 4 shows for the various regions the increase in the rate of first-year admissions to grammar schools from 1949 to 1957 as a percentage of the 12 year old population in relation to the 1949 percentage. The curves follow the points representing the regions as closely as possible. It also shows the existence of a strong tendency to level out regional differences in grammar school inflow rates, the increases being higher where the 1949 percentages were lowest, and that the increase was very low or non-existent in those regions where the rate was about 20-24 per cent in 1949, suggesting that the upper limit for this rate is about 24 per cent.

C. *Rural and urban regions*

The regions can be divided into various categories of urbanization. The five categories mostly used are rural, urbanized rural, small towns, large towns, and residential regions.

Tables 4*a* and 4*b* show first year admission rates to grammar schools as a percentage of the 12 year old population for the different categories of urbanization, with a breakdown by province.

Tables 4*a* and 4*b* show that the difference as between provinces for a given category of urbanization is not very large[1], indicating that the differences in enrolment rates as between provinces in general may to some extent be explained by the differences in the urbanization of the regions.

Table 4*a* bears out the statement above that the upper limit of inflow rates has been reached in big towns and residential regions.

These tables also show that there is a potential resource for the future expansion of grammar school enrolment, since in most of the rural areas the first-year entrants rate is much lower than that in Zeeland, for example. The same may be said for other categories, *mutatis mutandis*. In view of the rapid increase in enrolment in the past, these resources might be mobilised quickly.

Table 5 shows the increase in first-year admission rates in the different categories of urbanization for the period 1949-1957.

TABLE 5. BREAKDOWN OF THE INCREASE IN FIRST-YEAR ADMISSIONS TO GRAMMAR SCHOOLS FROM 1949 TO 1957 AS A PERCENTAGE OF THE 12 YEAR OLD POPULATION, BY CATEGORY OF URBANIZATION; INDEX 1949 = 100

TYPE OF REGION	MALE	FEMALE	TOTAL
Rural	227	257	239
Urbanized rural	210	243	226
Small towns	137	183	162
Large towns	137	145	141
	160	179	169

1. See also Table 2.

Further regional analysis

First-year admissions to grammar schools as a percentage of the 12 year old population varies considerably according to region, as indicated in Graph 5 and Table 6.

TABLE 6. NUMBER OF REGIONS ACCORDING TO GRAMMAR SCHOOL FIRST-YEAR ADMISSION RATE, 1957

ADMISSION RATE[1] (*Per cent*)	NUMBER OF REGIONS	
	MALE	FEMALE
40 and over	1	—
35 — < 40	2	1
30 — < 35	5	—
25 — < 30	14	3
20 — < 25	20	14
15 — < 20	17	14
10 — < 15	24	14
5 — < 10	5	33
0 — < 5	1	10
Total	89	89

1. First-year admissions as a percentage of the 12 year old population.

Graph 5 is designed to show the factors which determine these differences, and data on income, urbanization, composition of the labour force, etc. were assembled for the regions with extreme first-year admission rates. These have been collated in Table 7, together with figures for the Netherlands as a whole.

Regions with high grammar school first-year admission rates also have high secondary modern school rates, but low technical and vocational education rates. In these regions income is high and also the percentage of professional and managerial occupations. They do not differ much from the low rate regions with regard to the percentage of non-agricultural employers and " workers on own account ". Regions with low enrolment rates for grammar schools are typically rural ; they show a low percentage of population living in towns and a high percentage of farmers and agricultural labourers. With this is correlated a low percentage of army recruits in intelligence class 1 and 2 and a high percentage of Reformed and Dutch Reformed. In low rate regions the distance to the nearest grammar school is greater than in regions with high rates.

The characteristics of high and low enrolment regions show that student inflow into grammar schools may be determined by many factors.

Further information concerning the correlation between grammar school first-year admission and possible determining factors is given in Table 8. Regions are here grouped in deciles and, for each decile, the average first-year admission rate and average value for the various factors are shown.

Grammar school first-year admission rates are correlated with almost all factors, but very strongly with the percentage of labour force in professional, managerial and clerical occupations, urbanization and percentage of army recruits in intelligence classes I and II.

Graph 5. FIRST ADMISSIONS TO GRAMMAR SCHOOLS AS A PERCENTAGE OF THE 12 YEAR OLD POPULATION, 1957

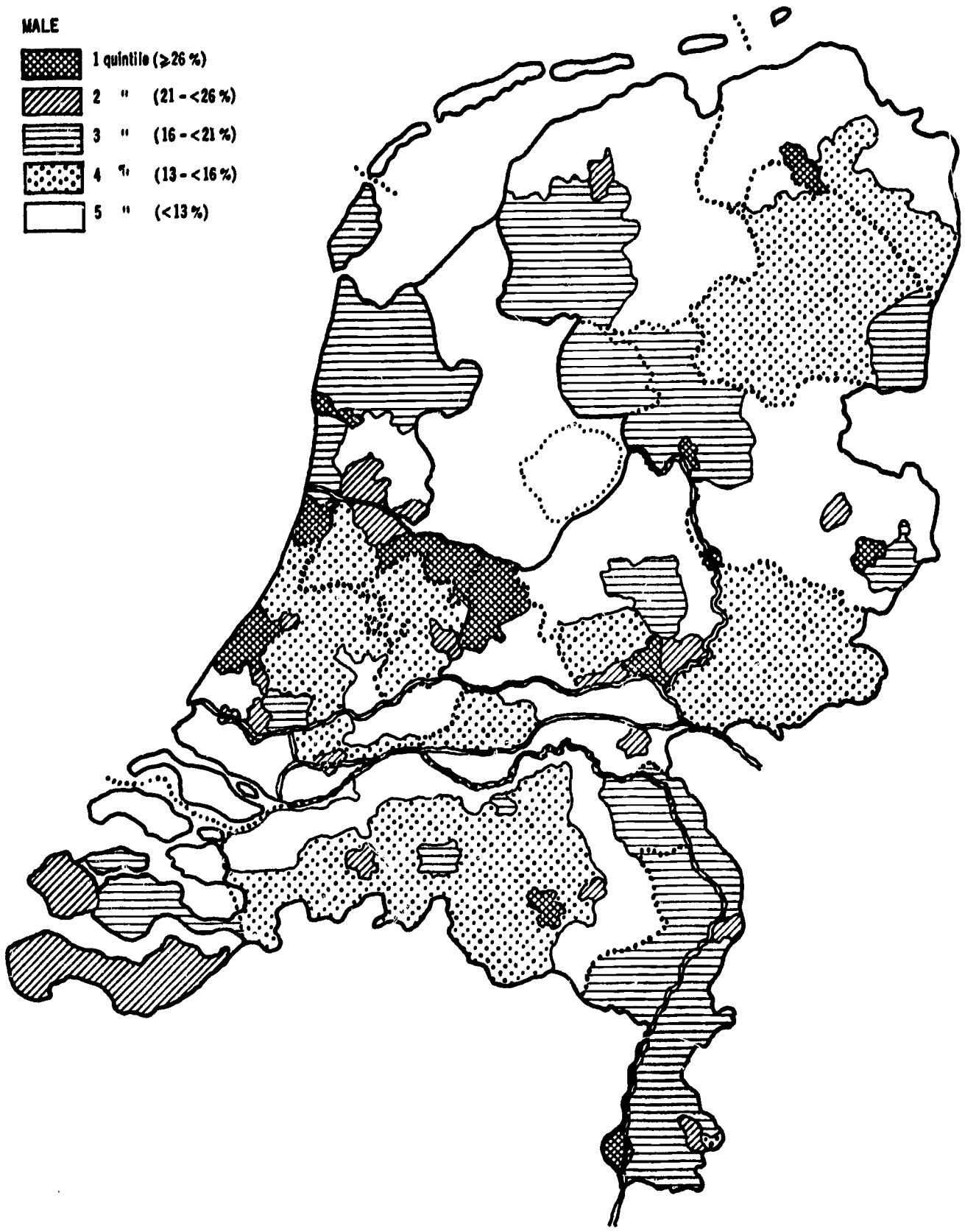


TABLE 7. CHARACTERISTICS OF REGIONS WITH EXTREME MALE GRAMMAR SCHOOL FIRST YEAR ADMISSION RATES, 1957

	18 REGIONS WITH		
	HIGH ENROLMENT RATES	LOW ENROLMENT RATES	NETHERLANDS
First-year admissions to grammar schools as a percentage of the 12 year old population	30	10	20
First-year admissions to secondary modern schools as a percentage of the 12 year old population	38	30	33
First-year admissions to secondary technical and vocational schools as a percentage of the 12 year old population	30	42	36
Average income per capita (guilders)	2,060	1,380	1,710
Per cent of taxpayers with income over 6,000 guilders	19	13	16
Per cent of taxpayers with income over 10,000 guilders	7	4	5
Per cent in labour force of :			
Professional and managerial occupations	19	4	10
Clerical workers	20	8	14
Non-agricultural employers	9	8	8
Non-agricultural workers on own account	10	11	10
Farmers	1	22	9
Agricultural labourers	1	9	4
Non-agricultural labourers	40	38	45
Per cent of population in towns of :			
> 100,000 inhabitants	54	—	30
> 50,000 "	70	—	40
> 20,000 "	85	—	50
> 10,000 "	90	4	56
> 5,000 "	93	20	64
Religious composition of total population in per cent :			
Catholic	35	28	38
Reformed	28	44	31
Dutch Reformed	8	17	10
Others and non-religious	29	11	21
Per cent of army recruits in intelligence classes :			
1 + 2 (30 per cent highest intelligence)	41	21	30
Average distance to nearest grammar school in km.	2	8	4

To give due weight to the differences in the labour force composition and at the same time to reduce the number of variables involved an index for this composition has been calculated as follows : the numbers in the various occupational groups in a given region were multiplied by the grammar school admission rates for the children in these groups — calculated for the country as a whole — and divided by the total number in all groups. This weighted average of the labour force composition for a region has been called the " social class index ".

TABLE 8. GRAMMAR SCHOOL FIRST ADMISSION RATE DECILES AND SOCIAL FACTORS, 1957 (MALES)

REGIONS GROUPED IN FIRST-YEAR ADMISSION RATE DECILES	DECILE AVERAGES									
	1	2	3	4	5	6	7	8	9	10
First-year admissions to grammar schools[1]	34	28	25	22	20	17	15	14	11	9
First-year admissions to secondary modern schools[1]	37	37	35	32	31	28	32	30	31	29
First-year admissions to secondary technical and vocational schools[1]	28	33	34	39	34	38	37	39	40	44
Average income per capita (*in guilders*)	2,090	2,110	1,795	1,630	1,650	1,400	1,520	1,440	1,490	1,260
Per cent of tax payers with income over 6,000 guilders	20	20	16	15	15	15	15	14	15	11
Per cent of tax payers with income over 10,000 guilders	8	8	5	5	5	5	5	4	5	3
Per cent in labour force of :										
Professional and managerial occupations	20	18	13	11	10	6	7	6	4	3
Clerical workers	20	17	17	14	13	10	11	10	8	7
Non-agricultural employers	10	11	8	8	8	8	8	8	9	7
Non-agricultural workers on own account	10	9	9	9	9	10	9	10	12	10
Farmers	1	3	2	4	6	20	18	16	20	26
Agricultural labourers	1	2	1	3	3	6	5	4	10	6
Non-agricultural labourers	38	40	50	51	51	40	42	46	37	41
Per cent of population in towns of :										
20,000 inhabitants and over	87	71	92	64	53	16	20	4	—	—
5,000 inhabitants and over	93	89	92	82	65	32	46	36	23	15
Religious composition of total population in per cent :										
Catholic	37	37	47	38	67	49	40	54	23	43
Reformed	27	30	23	31	17	29	38	30	50	36
Dutch Reformed	8	8	6	11	5	10	12	8	16	15
Others and non-religious	28	25	24	20	11	12	10	8	11	6
Per cent of army recruits in intelligence classes 1 and 2	42	39	37	36	30	23	26	25	24	18
Average distance to nearest grammar school in km.	1.5	3	1.5	3	5	9	7	9	12	15

1. As a percentage of the 12 year old population.

Table 9 gives simple correlations between grammar school admission rates, the social class index and other variables showing the best correlations on scatter diagrams.

TABLE 9. SIMPLE CORRELATIONS BETWEEN MALE GRAMMAR SCHOOL FIRST YEAR ADMISSION RATES AND SOCIAL FACTORS IN 90 REGIONS, 1957

REGRESSION EQUATIONS	CORRELATION COEFFICIENTS	STANDARD ERROR OF REGRESSION COEFFICIENT	
			AS A % OF REGRESSION COEFFICIENT
G = 9.04 SC —12.5	0.89	0.492	5
G = 1.11 PM + 7.7	0.85	0.073	7
G = 1.70 IC — 8.6	0.79	0.141	8
G = 0.17 U 5,000 + 9.7	0.75	0.016	9
G = —1.08 D +26.6	—0.74	0.104	10
G = 0.13 U 20,000 +14.1	0.72	0.014	10
G = 0.51 I 1 + 2 + 4.2	0.71	0.054	10
G = 1.30 T 6,000 — 0.75 ...	0.66	0.158	12

G = number of male first-year admissions as a percentage of males 12 years old.
SC = social class index.
PM = number of males in professional and managerial occupations as a percentage of male labour force.
IC = income per capita in 100 guilders.
U 5,000 = percentage of population living in towns of over 5,000 inhabitants.
D = average distance to nearest grammar school in km.
I 1 + 2 = per cent of army recruits in intelligence classes I and II.
T 6,000 = per cent of tax payers with an income of 6,000 guilders or more.
U 20,000 = percentage of population in towns over 20,000 inhabitants.

The social class index gives the best " explanation " of grammar school first-year admission rates. This explanation might be improved by taking more factors into account.

The results of some of the tests in which combinations of the social class index and other variables were used to explain the regional differences in grammar school first-year admission rates are shown in Table 10.

The introduction of other variables produces only insignificant improvements to the correlation coefficient. The social class index alone gives as good an explanation as any combination of this index and other variables. This does not mean, however, that the other factors have no influence at all — they just do not improve the explanation. The regression coefficients, standard errors and magnitude of the various factors give the impression that distance has no influence (unstable regression coefficient, large standard error) ; the same holds for intelligence. The influence of the urban/rural factor is small and just the opposite of what was to be expected. Income might have considerable influence, and the number of secondary modern schools as a percentage of grammar schools very little.

It might be argued that, as a consequence of the high degree of correlation between the social class index and other factors, the influence of these factors cannot be measured correctly. It is also possible that a given factor might have a different effect in regions with a different social class index.

TABLE 10. MULTIPLE CORRELATIONS BETWEEN MALE GRAMMAR SCHOOL FIRST YEAR ADMISSIONS AND SOCIAL FACTORS IN 90 REGIONS, 1957

	SC	D	SMS	I 1 + 2	T 6,000	U 20,000	RU	CONSTANT	REGRESSION COEFFICIENT
G =	9.04 (5)							—12.5	0.89
G =	7.51 (9)	—3.5 (32)						— 4.9	0.90
G =	7.4 (9)	—1.4 (90)	—0.47 (33)					— 4.2	0.91
G =	7.8 (11)	—1.6 (81)	—0.46 (35)	—0.039 (144)				— 4.3	0.91
G =	5.5 (20)	—4.3 (35)	—0.36 (42)	—0.07 (76)	—0.47 (32)			— 8.9	0.92
G =	7.5 (9)	—3.2 (91)	—0.45 (35)			—0.02 (146)		— 2.5	0.91
G =	7.8 (9)	—3.2 (62)	—0.46 (34)				0.03 (86)	— 5.1	0.92
				AVERAGE VALUES OF FACTORS					
19.5	3.5	0.6	3.8	30.2	15.6	40.9	42.5		

SMS = No. of secondary modern schools as a percentage of No. of grammar schools.
D = average distance in log km.
RU = percentage of people living outside towns of 5,000 or more inhabitants.
For other variables see Table 9. Figures between brackets show standard errors in percentage of regression coefficients.

TABLE 11. CORRELATIONS BETWEEN SOCIAL CLASS INDEX AND OTHER SOCIAL FACTORS

FACTOR	REGRESSION COEFFICIENT	FACTOR	REGRESSION COEFFICIENT
D	—0.72	RU	—0.78
SMS	—0.52	IC	0.72
I 1 + 2	0.80	Ca	—0.15
T 6,000	0.71	Re	—0.12
U 20,000	0.72	DR	—0.09

Ca = per cent of Catholics in the population.
Re = per cent of Reformed.
DR = per cent of Dutch Reformed.
See Tables 9 and 10 for the other variables.

The social class index is closely correlated with almost all factors except religious.

To overcome the problems of intercorrelation mentioned above the analysis was repeated for five groups of regions with the same social class index. It was then seen that the various factors had no influence apart from the number of secondary modern schools as a percentage of the number of grammar schools, where influence was slight.

This lengthy analysis therefore shows that regional differences in grammar school student inflow are determined by differences in the occupational distribution.

Social composition of total grammar school student inflow first-year admission

The sharp increase in grammar school rates (Table 1) was accompanied by very small changes in the social composition of first-year entrants, as measured by fathers' occupation.

TABLE 12. FIRST-YEAR ENTRANTS TO GRAMMAR SCHOOLS, BY SOCIAL CLASS (PER CENT)

SOCIAL CLASS	MALE			FEMALE		
	1942	1949	1960	1942	1949	1960
Upper[1]	24	25	24	35	35	30
Middle[2]	51	52	51	46	49	52
Lower[3]	23	21	23	17	14	16
Unknown	2	2	2	2	2	2
Total	100	100	100	100	100	100

1. Professional and managerial occupations, army officers, owners of big firms, higher ranks in civil service, professors, etc.
2. Owners and managers of small and medium sized firms, primary school teachers, warrant officers, employees in middle grades, etc.
3. Skilled and unskilled industrial labourers, lower grade clerks, etc.

The social composition of female first-year entrants has become more like that of males. This may be due to the fact that their first-year entrance rate increasingly approaches that of males.

The following table shows first-year admission rate by social class.

TABLE 13. FIRST-YEAR ADMISSIONS TO GRAMMAR SCHOOLS AS A PERCENTAGE OF THE 12 YEAR OLD POPULATION BY SOCIAL CLASS

SOCIAL CLASS	MALE			FEMALE		
	1942	1949	1960	1942	1949	1960
Upper	45	50	67	36	45	63
Middle	14	15	25	7	9	19
Lower	4	4	7	2	2	4
Total	10	11	17	6	7	13

In Table 14 it is seen that the increase in the first-year admission rate shows slight differences for the three social classes.

TABLE 14. RATE OF FIRST-YEAR ADMISSIONS[1] TO GRAMMAR SCHOOLS IN 1960 AS A PERCENTAGE OF THAT IN 1949

SOCIAL CLASS	MALE	FEMALE
Upper	135	142
Middle	160	207
Lower	150	190
Total	157	175

1. As a percentage of the 12 year old population.

Some occupational groups show a high rate of first-year admissions. (Table 15) :

TABLE 15. FIRST-YEAR ADMISSIONS TO GRAMMAR SCHOOLS AS A PERCENTAGE OF THE 12 YEAR OLD POPULATION, BY OCCUPATIONAL GROUP OF FATHER AND BY SEX, 1960

	MALE	FEMALE	FEMALE AS % OF MALE
Professional occupations	85	80	94
Employees : higher grades	85	79	93
middle "	68	56	82
low "	20	12	60
Teachers	59	52	88
Owners of firms : with personnel	23	20	87
without personnel	9	5	56
Farmers : with personnel	15	10	67
without personnel	4	2	50
Non-agricultural labourers	5	2	40
Agricultural labourers	4	1	25

Female rate is lower than male, but the difference is smaller where the male rate is high.

Grammar school enrolment by intelligence and social-economic groups

Each year all 19 year-old males undergo a medical and psychological examination for military service. The conscripts are also questioned concerning their educational level, occupation of father, religion, etc. This material provides additional information on grammar school enrolment tendencies. The following tables show some of the results of a sample survey of 5,000 conscripts.

The table shows that participation in grammar school education has been dependent on the occupation (social class) of the father and on intelligence. Even in the same intelligence class great differences in participation in grammar school education among 19 year-olds can be observed between the various family occupational groups. This is the reason why the multiple regression analysis of regional differences in grammar school first-year admission rates showed intelligence to have no significant influence on these rates.

TABLE 16. THE 19 YEAR-OLD MALE POPULATION WITH GRAMMAR SCHOOL EDUCATION AS A PERCENTAGE OF ALL 19 YEAR OLD MALES, BY OCCUPATION OF FATHER AND DEGREE OF INTELLIGENCE, 1962

FATHERS' OCCUPATION	INTELLIGENCE CLASS							TOTAL	NO. OF PERSONS
	1	2	3	4	5	6	UN-KNOWN		
Professional, managerial	71	45	39	28	17	—	37	49	311
Employees middle and lower	38	26	13	11	3	—	18	23	801
Employers	37	21	8	2	—	—	4	13	922
Self-employed	24	18	7	8	—	—	—	12	328
Labourers	12	7	2	1	—	—	3	4	2,069
Unknown	22	13	7	3	—	—	4	8	356
Total	33	18	7	4	1	1	6	13	
No. of persons	717	1,427	998	653	529	242	221		4,787

Table 17 gives a breakdown by urban and rural areas of grammar school participation of 19 year-olds coming from the various occupational groups and the three highest intelligence classes.

TABLE 17. THE 19 YEAR-OLD MALE POPULATION WITH GRAMMAR SCHOOL EDUCATION AS A PERCENTAGE OF ALL 19 YEAR-OLD MALES, BY OCCUPATION OF FATHER, INTELLIGENCE, AND URBAN AND RURAL AREAS, 1962

	INTELLIGENCE CLASS					
	1		2		3	
	URBAN	RURAL	URBAN	RURAL	URBAN	RURAL
Professional, managerial	70	75	46	42	50	17
Employees, middle and lower	38	39	24	29	12	15
Employers	48	28	29	18	13	6
Self-Employed	27	21	23	14	5	8
Labourers	12	11	9	5	3	2
Unknown	20	23	12	15	—	16
Total	35	28	20	16	8	6
No. of persons	457	260	771	656	481	517

For the various occupational groups no systematic difference in grammar school participation can be seen as between urban and rural areas[1]. This is in accordance with the findings of the multiple regression analysis where no specific influence of the rate of urbanization on grammar school first-year admission rate could be calculated when the influence of differences in occupational composition (social class index) was also taken into account.

1. Only "employers" show a difference. This will be due, however, to the fact that this group also includes farmers and therefore is not homogeneous in urban and rural areas.

Differences in grammar school student inflow and participation as between urban and rural areas are thus a reflection of differences in occupational distribution only.

This model did not work satisfactorily. We saw that provinces show different growth patterns for grammar school enrolment, and that the percentage of freshmen going to the various universities varies according to province. The increase in the number of freshmen at the different universities was therefore determined by the increase in grammar school enrolment in these provinces. This is the starting point for the following model.

The most elaborate model starts with regional forecasts of grammar school enrolment and numbers of grammar school graduates with required breakdowns by type of certificate and sex. The results of these forecasts can be summarized in a table showing number of grammar school graduates with a breakdown by region, year and sex (outflow table).

The other table used — based on the most recent material available — shows the number of freshmen as a percentage of grammar school graduates with a breakdown by region, university faculty and sex (inflow matrix). By multiplying this table by that mentioned above (after appropriate summation) the number of freshmen per university and faculty in successive years can be obtained.

Up to this stage the model assumes that everything will remain constant except grammar school enrolment in the various regions.

This is realistic in so far as we have seen that graduates form a constant percentage of first year enrolments in grammar schools and that transfer of grammar school graduates to the university is also constant.

The following changes may be expected however :

1. an increase or decrease in the number of freshmen — as a percentage of grammar school graduates — in some faculties, since some adaptation to estimated demand for graduates is expected ;
2. new universities will be opened and additional faculties added to existing universities.

Analysis of stagnation

Graph I shows that after a rapid increase in the grammar school first-year admission rate up to 1957, no further increase is apparent (especially for boys).

This stagnation of first year grammar school inflow rate will lead to a stagnation in the number of certificated grammar school leavers in 1963 (six years after 1957) as a percentage of the 18 year old population, and in 1970 (seven years after 1963) to a stagnation in the output of university graduates as a percentage of the 25 year old population. As the development of the economy requires an increasing proportion of certificated grammar school leavers this stagnation — if continued — will create very serious problems.

This stagnation has aroused a great deal of interest and heated debate among those interested in long-term educational forecasts. As the causes of this stagnation are of the utmost importance when making long-term forecasts of grammar school and university enrolment, some of the theories put forward and the criticisms they make are mentioned below.

A. *Labour market theory*

Some are of the opinion that in a situation of full employment in which everyone — regardless of type and length of training undergone — has a wide range of occupational possibilities, the motivation to undertake a long and strenuous grammar school course is weakened. This would lead to stagnation or even to a decrease in the grammar school enrolment rate.

Since the end of World War II, however, there always has been, generally speaking, a state of full employment accompanied by increasing grammar school enrolment rates, so that the labour market theory does not cover the facts over a long period.

B. *Consumers' society theory*

Some hold that society today can be characterised as a consumers' society in which rising income is being increasingly spent on consumption goods rather than for productive purposes (savings, investment, education). People would prefer television sets to further education for their children.

Up to now, however, increasing per capita income has been accompanied by increasing grammar school enrolment rates ; a larger proportion of people with higher income send their children to grammar schools, and inter-country comparisons also show a positive relation between enrolment and per capita income[1].

C. *Technical education theory*

There is a feeling that during the past ten years jobs requiring technical training have been better paid than those requiring the more academic training provided in secondary modern and grammar schools. This might influence the distribution of children in the various types of schools and especially those of the lower social classes. This would result in lower enrolment rates in grammar schools and higher rates in lower technical and vocational education, but Table 1 does not show any evidence of such a trend.

D. *Reserve theories*

Three types of reserve theory have been advanced.

1. The first is as follows : all secondary schools recruit their pupils from the 12-13 year-old age group. When all the 12-13 year olds (or all those mentally and physically capable of doing so) receive a secondary education, no further increase in enrolment in any of the three sectors (grammar, secondary modern or technical) is possible. After 1957, in fact, no further increase in enrolment was possible in secondary education as a whole (see section 3, Development of full-time secondary education). But is this also true for grammar school enrolment ? This theory considers the three types of secondary education as being non-competitive, but is true only up to a certain point. Although the social composition of the pupils in the various types of secondary education differs, there

1. See *Policy conference on economic growth and investment in education, II Targets for education in Europe in 1970.* OECD, Paris, 1962, diagram 5.

is also considerable overlapping. Upper class children will be sent to grammar schools (with only a few exceptions), but lower class children (even with the same intelligence score) are found in all types of schools and so for these groups the various types of secondary schools are competitive. As grammar schools still have a prestige value there is no reason to doubt that grammar school enrolment will increase. This will be accompanied by a decrease in enrolment in other types of schools.

2. Others consider that all intelligent children are already in grammar schools so that no further increase is possible. Table 16, however, which permits grammar school reserves to be calculated does not bear this out. The removal of all social and psychological barriers to transfer from primary to secondary education would increase the average enrolment in grammar schools from 33 per cent, 18 per cent and 7 per cent in intelligence classes 1, 2 and 3 respectively, to those of the top social class (professional and managerial occupations) namely 71 per cent, 45 per cent and 39 per cent. This indicates a reserve numerically higher than those already attending grammar schools.
3. The most recent reserve theory draws its conclusions from the Tables 12-15 presented in section 3. The line of reasoning is as follows : Table 14 shows that the increase in the enrolment rates does not differ much for the various social classes. It follows, therefore, as there has been no further increase in the grammar school first-year admission rate for all 12-year-olds, that Table 15, which shows the situation in 1960, also shows that for 1957. Table 13, however, shows that in 1949 there was still a reserve for grammar school education amongst children of the upper social class and which subsequently attended grammar schools. This resulted in very high first-year admission rates for some occupational groups in 1957 (Table 15), for example 85 per cent for children whose fathers were in professional and managerial occupations and higher grade employees. The same percentage will also be reached for some sections of middle-level employees and the teaching profession, two rather heterogeneous groups. Further increase does not seem possible for these groups. As the number of pupils in these groups constitutes about 50 per cent of the total grammar school population, it can be deduced that, as from 1957, the increase in grammar school student inflow should fall to 50 per cent of what it was before 1957. This theory gives a 50 per cent explanation of the causes of stagnation in grammar school student inflow ; the question still remains as to why groups which have not yet reached the top level have shown no further increase.

Forecasting models

Existing models

In the course of time various forecasting models have been used, and are mentioned below. They are based on the analysis of grammar school student inflow or first-year admission rates as presented in the previous section 3.

1. The first model was based on a trend extrapolation of the grammar school enrolment ratios. As this is commonly used no further details will be given. This model worked quite well up to 1957, when stagnation in grammar school inflow rates and enrolment began.
2. A second model was based on a trend extrapolation and a maximum boundary was set for grammar school student inflow. This boundary was found by extrapolating the first-year admission rates in the three types of secondary education. It was assumed that the year the sum of these extrapolated rates equalled 100 per cent of the 12 year old population (minus deductions for mentally and physically retarded children, etc.) the maximum rate for grammar school education would be reached. This model has given fairly satisfactory results up to the moment, but we now think on the basis of an inadequate theory, and is therefore not used any more. For further comments on the theory underlying this model, reference is made to what has been said above under the reserve theory, number 1. Models 1 and 2 were used to forecast grammar school enrolment as a whole.
3. A model used to forecast regional grammar school inflow and enrolment was based on the 1957 figures shown in Tables 4*a* and 4*b*. It was assumed that, within the forecasting period (1959-1974), regional differences within the various urbanization categories would be levelled out, i.e. that all the lower percentages would be equal to the highest attained in one of the regions within a given urbanization category. The theory behind this model was that any regional differences in grammar school first-year admission rates would disappear as a consequence of levelling out the social and economic differences between regions in the same urbanization category. This model did not work satisfactorily in the short run as grammar school enrolment was already beginning to stagnate before the work was completed.
4. A further regionally differentiated model started with three basic elements :
   a) the tendency to level out regional differences observed over a long period (see previous section and Graph 3) ;
   b) a maximum boundary for grammar school inflow rates (see previous section), and
   c) Tables 4*a* and 4*b*.

   The line of reasoning was as follows : as a consequence of levelling out social and economic differences, regional differences in grammar school first-year admission rates within urbanization categories would also be levelled out, and those between urbanization categories would decrease. It was therefore assumed that rural areas in 1974 (end of the forecasting period) would have the same rates as the prevailing average in urbanized rural areas, those of the latter areas would go up to the prevailing average in small towns, those in small towns would become those prevailing in big towns and in big towns and residential regions the maximum boundary would be reached (24 per cent).

   In practice this model also failed to give satisfactory short-term results.

5. Models 1-4 were either based on outmoded theories (as we now see it) or did not give satisfactory results. Therefore a new model was required when it became necessary for various reasons to have a university enrolment forecast for 1970 incorporating the latest developments in grammar school enrolment, and the transfer from grammar schools to universities.

   The average pupil takes about six years to complete grammar school, so that first-year admission rates had to be forecast for only two school years, namely 1963/1964 and 1964/1965. It was then decided that grammar school first-year admission rates in 1964 should be restored to the highest level attained in any recent year, or, if a definite trend could be seen, 1964 rates could be estimated by simple extrapolation.

   Graph 6 gives the results of this model, which is certainly the most sophisticated one as it does not pretend any knowledge of factors determining inflow into grammar schools; it is also the most unsatisfactory one from a scientific point of view.

It may work quite well of course, and in any case no significant deviation from the forecasts can be expected as it covers only two years.

NOTE. Some forecasts of university enrolment have implicitly made a forecast of grammar school enrolment. These models will be dealt with later on.

A possible new, long-term model

Clearly a new model for long-term forecasting will have to be made, into which all previous experience must be incorporated.

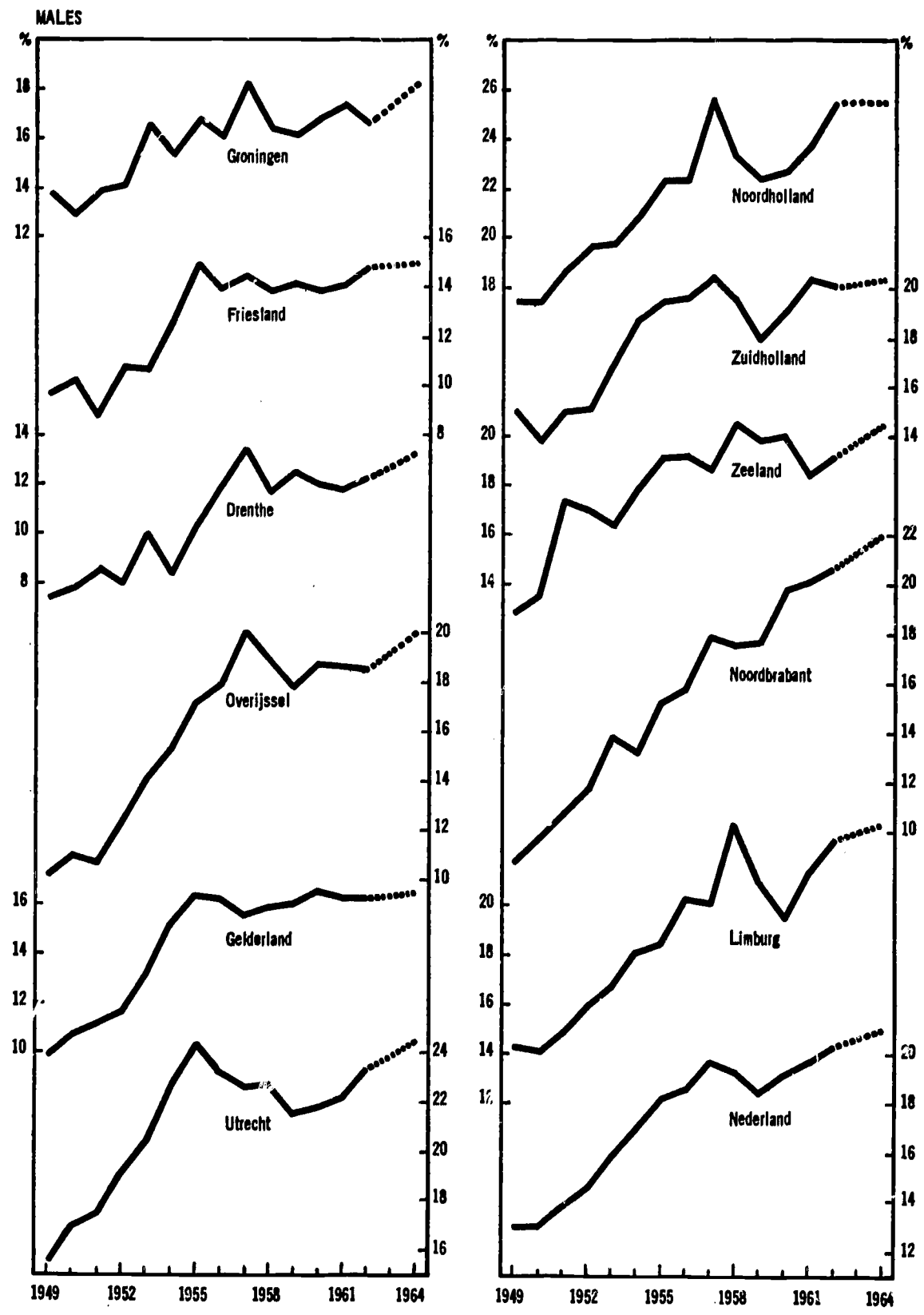
In the foregoing section various factors determining grammar school inflow were mentioned, including the levelling out of regional differences and the maximum boundary for grammar school enrolment, and the influence of the occupational composition of the labour force.

The large differences in grammar school first-year admission rates among the various occupational groups have remained so stable over time that regional differences are no more than a reflection of occupational distribution.

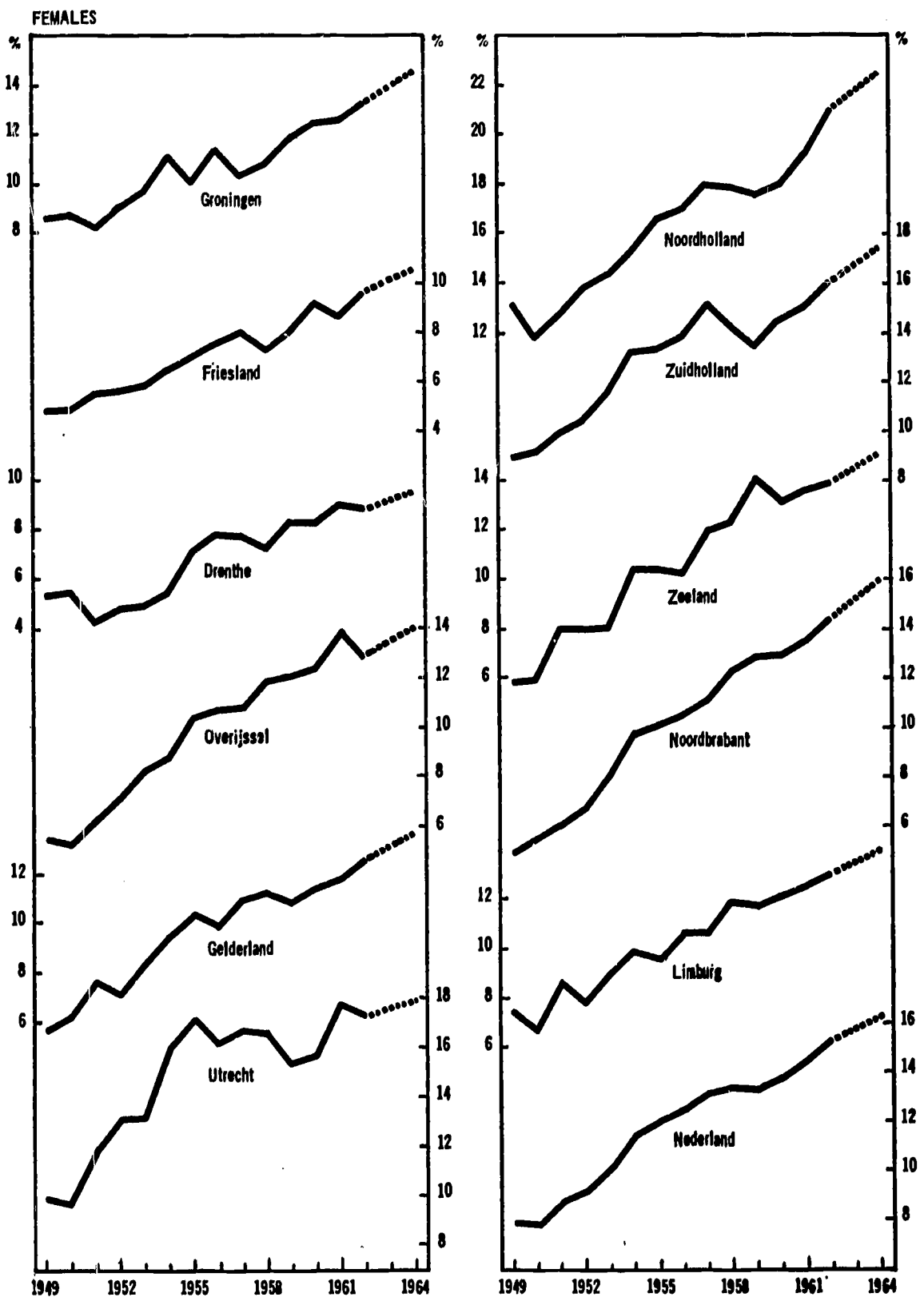
Similarly, it would not be surprising to find that the levelling out of regional differences in grammar school enrolment is purely a reflection of the levelling out of regional differences in occupational distribution. Full proof of this theory is possible only when the 1960 census gives the occupational distribution with a breakdown by regions comparable to the 1947 census, but a preliminary investigation into changes in the distribution of physicians over the country supports the hypothesis.

Neither would it be surprising if a maximum boundary for grammar school enrolment rate were found only in those regions where no changes in occupational distribution have occurred (in residential regions with a constant percentage of professional and managerial occupations with constant top-level enrolment rates) or in regions where the increase in enrolment rates in the occupational groups has been offset by an outflow of occupational groups with top-level participation rates. This may occur in big towns from which, since the war, there has been an outflow of professional and managerial personnel and of higher grade employees.

Graph 6. FIRST YEAR ADMISSIONS TO GRAMMAR SCHOOLS AS A PERCENTAGE OF THE 12 YEAR OLD POPULATION — PROVINCES



Graph 6a. **FIRST YEAR ADMISSIONS TO GRAMMAR SCHOOLS AS A PERCENTAGE OF THE 12 YEAR OLD POPULATION — PROVINCES**



If this is true then the three factors determining grammar school enrolment are in reality one : the occupational distribution of the labour force. The new model therefore would have to forecast : (*a*) the future occupational distribution and the number of children within each occupational group ; (*b*) the inflow rate within each group to provide the total number of first-year enrolments in grammar schools.

(*a*) is not directly educational forecasting and we shall not discuss the problems raised. Concerning (*b*) — there are sufficient intelligence resources in the lower occupational groups for a further increase in grammar school inflow and enrolment (see previous section). Only when the increase in inflow for a given intelligence class and occupational group results in the same percentage as that now found for the highest occupational group is further increase impossible. A continuous decline in the increase in grammar school inflow rates can therefore be expected. As this sets a maximum boundary only, the question still remains as to the methods to be used to forecast the increase in the various occupational groups. It is again the results of analysis which will decide the method. The following will be undertaken shortly :

a) cross-section analysis of grammar school enrolment rates for the various occupational groups ;
b) a regional analysis of changes in grammar school enrolment rates of occupational groups over time ;
c) field research covering 20,000 sixth grade elementary school pupils concerning the factors determining grammar school enrolment in the various occupational groups.

The analyses might be restricted to male participation only, as there is a definite relationship between male and female enrolment in the various occupational groups. The higher the male enrolment, the smaller the difference between male and female enrolment becomes.

Should long-term forecasts prove necessary before these surveys are completed, the model would be based on four elements : occupational forecasts, trend increase in grammar school enrolment for the various groups, the maximum boundary now set by enrolment for the highest occupational group, and decreasing differences between male and female enrolment.

This model could be applied both to the country as a whole and to regions.

NOTE. In all OECD countries more intensive economic development requires an increase in grammar school enrolment. Enrolment for the lower occupational groups is much smaller than for the higher groups, so that most of the increase will have to come from the lower groups. A comparison among OECD countries of the inflow and enrolment rates for the various occupational groups might indicate the factors which determine enrolment and OECD could play a very useful part in this task.

FIRST-YEAR ADMISSIONS AND TOTAL SCHOOL ENROLMENT

After having estimated the number of first-year admissions, total enrolment is calculated with the help of the following table.

The calculation of total grammar school enrolment is shown below on the basis of a hypothetical inflow.

TABLE 18. PUPILS ATTENDING GRAMMAR SCHOOLS AS A PERCENTAGE OF THE CORRESPONDING NUMBER OF FIRST-YEAR ADMISSIONS BY NUMBER OF YEARS SINCE ADMISSION AND BY FORM (MALES)

IN FORM	NO. OF YEARS AFTER ADMISSION								
	1	2	3	4	5	6	7	8	9
1	25.0	0.5	—	—	—	—	—	—	—
2	64.0	37.0	5.5	0.5	—	—	—	—	—
3		45.5	34.0	10.5	1.5	—	—	—	—
4			34.5	28.0	10.5	2.5	—	—	—
5				25.0	23.0	10.5	3.0	0.5	—
6					9.0	6.0	3.0	0.5	0.1
	89.0	83.0	74.0	64.0	44.0	19.0	6.0	1.0	0.1

TABLE 19. FIRST-YEAR ADMISSIONS AND TOTAL ENROLMENT (MALES)

YEAR	NO. OF FIRST-YEAR ADMISSIONS	PUPILS BY NUMBER OF YEARS SINCE ADMISSION AS PERCENTAGE AND TOTAL NUMBERS									TOTAL ENROLMENT
		YEARS AND PER CENT									
		1	2	3	4	5	6	7	8	9	
		89%	83%	74%	64%	44%	19%	6%	1.0	0.1	
1949	100										100
1950	100	89									189
1951	100	89	83								272
1952	100	89	83	74							346
1953	200	178	83	74	64						599
1954	200	178	166	74	64	44					726
1955	200	178	166	148	64	44	19				819
1956	100	89	166	148	128	44	19	6			700
1957	100	89	83	148	128	88	19	6	1	—	662
1958	100	89	83	74	128	88	38	6	1	—	607
1959	200	178	83	74	64	88	38	12	1	—	738
1960	200	178	166	74	64	44	38	12	2	—	778

Table 18 was drawn up by keeping track of first-year admissions in 1949 through the grammar school[1].

The final data were collected in 1959.

It would be interesting to have similar tables for a number of first-year cohorts for analysing changes.

The breakdown by number of years since admission, in Table 19, and the estimated total enrolment make possible an estimate of the numbers in the different forms.

NUMBER OF CERTIFICATE HOLDERS LEAVING SCHOOL

The number of certificate holders leaving school can be calculated from the number of first-year admissions in the same way as was total enrolment ; the following table is used :

1. For further details see : *Careers of grammar school pupils* in Dutch : *Schoolloopbaan van de leerlingen bij het v.h.m.o. (generatie 1949)*, Zeist 1960.

TABLE 20. BREAKDOWN OF NUMBER OF CERTIFICATE HOLDERS LEAVING SCHOOL AS A PERCENTAGE OF THE CORRESPONDING NUMBER OF FIRST-YEAR ADMISSIONS, BY NUMBER OF YEARS SINCE ADMISSION

	NO. OF YEARS SINCE ADMISSION					TOTAL
	5	6	7	8	9	
Male	13	21	12	4	1	51
Female	19	23	9	2	—	53

These data are available for one year only as they were also based on the 1949 admissions followed through 9 years of grammar school.

To analyse changes over time in the percentage of certificate holders leaving school, the number of leavers is expressed as a percentage of admissions 6 years earlier.

TABLE 21. CERTIFICATE HOLDERS LEAVING GRAMMAR SCHOOL AS A PERCENTAGE OF ADMISSIONS, SIX YEARS EARLIER[1]

YEAR CERTIFICATE GRANTED	MALE	FEMALE
1935-1940	61	51
1941-1945	67	60
1946-1950	62	57
1951-1955	57	54
1956-1960	58	58

1. The percentages are higher than in Table 20 due to differences in definitions.

No systematic changes are apparent, so that forecasts may be calculated on the basis of constant percentages of certificate holders leaving school. Similarly no differences were found in the various provinces, so that national percentages may also be applied regionally.

TABLE 22. PERCENTAGE OF MALE GRAMMAR SCHOOL-LEAVING CERTIFICATE HOLDERS BY TYPE OF SCHOOL AND STREAM

	GRAMMAR SCHOOL		MODERN GRAMMAR SCHOOL		COMMERCIAL DAY SCHOOL	TOTAL
	LANGUAGE SECTION	SCIENCE SECTION	LANGUAGE SECTION	SCIENCE SECTION		
1900	26	7	—	67	—	100
1910	16	7	—	67	10	100
1920	13	6	—	58	23	100
1930	11	7	16	54	12	100
1940	10	10	22	51	7	100
1950	9	11	22	54	4	100
1952	11	12	22	50	5	100
1954	11	13	22	49	5	100
1956	10	13	23	49	5	100
1958	12	12	25	47	4	100
1960	11	13	25	47	4	100
1961	10	12	24	51	3	100

The biggest changes occurred before 1930. After 1950 no systematic changes are apparent and most forecasts have therefore assumed a constant distribution of certificate holders leaving school.

TABLE 23. PERCENTAGE OF FEMALE GRAMMAR SCHOOL CERTIFICATE HOLDERS LEAVING SCHOOL, BY TYPE OF SCHOOL AND STREAM

	GRAMMAR SCHOOL		MODERN GRAMMAR SCHOOL		COMMERCIAL DAY SCHOOL	GIRLS MODERN GRAMMAR SCHOOL	TOTAL
	LANGUAGE SECTION	SCIENCE SECTION	LANGUAGE SECTION	SCIENCE SECTION			
1900	5	3	—	9	—	83	100
1910	9	4	—	39	10	38	100
1920	11	5	—	36	22	26	100
1930	16	5	14	37	11	17	100
1940	16	6	24	25	3	26	100
1950	14	9	25	22	1	29	100
1952	15	9	21	19	1	35	100
1954	15	8	21	18	1	37	100
1956	13	8	20	15	1	43	100
1958	13	8	17	16	1	45	100
1960	13	8	17	13	1	48	100
1961	11	7	17	15	1	49	100

Most of the changes took place before 1950; since then the percentage of "girls' modern grammar school" has continued to increase. Nothing is known about the factors governing this distribution and, as no one dares to have a theory concerning future changes in this distribution, recent percentages are also used in forecasts.

DEVELOPMENT OF UNIVERSITY EDUCATION

PARTICIPATION IN UNIVERSITY EDUCATION

Trends

General. The number of freshmen has grown considerably, both in total numbers and as a percentage of the 18 year old population.

TABLE 24. NUMBER OF UNIVERSITY FRESHMEN, 1900-1961

	NUMBER			AS PERCENTAGE OF 18 YEAR OLD POPULATION		
	MALE	FEMALE	TOTAL	MALE	FEMALE	TOTAL
1900	703	28	731	1.5	—	0.8
1910	970	129	1,099	1.8	0.3	1.0
1920	1,645	277	1,922	2.5	0.5	1.6
1930	1,970	498	2,468	2.7	0.7	1.7
1940	3,501	440	3,941	4.2	0 5	2.4
1950	3,715	726	4,441	4 3	0.9	2.7
1960	5,860	1,341	7,201	6.4	1.5	4.0
1961	6,550	1,310	7,870	6.8	1.4	4.1

Male students constitute about 7 per cent of the total number of 18 year old males. Female enrolment in the university is roughly only one-quarter of that of males.

Freshmen come mainly from day grammar schools.

TABLE 25. NUMBER OF FRESHMEN WITH GRAMMAR SCHOOL CERTIFICATE AS A PERCENTAGE OF TOTAL NUMBER OF FRESHMEN

1930	81.0	1950	81.7
1936	81.4	1960	85.4

In spite of the increased possibilities for university admission offered to graduates of engineering schools, teacher training institutes and higher agricultural schools, etc. their position in relation to the total number of freshmen has gone down.

Our analysis will be restricted to freshmen who have graduated from grammar schools, and will show the extent to which the increase in the number of freshmen is due (*a*) to the increased numbers of grammar school graduates or (*b*) to the increased proportion of graduates who enter the university.

Stimulating the transfer from grammar schools to the university. A. Since 1900, four new universities have been added to the seven then existing : the Netherlands School of Economics (1913), the Catholic University at Nijmegen (1923), the Catholic School of Economics (1927) and the Technical University at Eindhoven (1957), thus providing a more even distribution over the country and allowing catholics to attend a university of their own destination.

B. The continuous increase in the number of faculties and in the specialisations they cater for has offered a wider outlet for the diversified interests of grammar school leavers.

C. More faculties, both existing and new, have been made accessible to certificate holders from the different types of grammar schools.

TABLE 26. NUMBER OF FACULTIES ACCESSIBLE TO THE DIFFERENT TYPES OF GRAMMAR SCHOOL CERTIFICATE HOLDERS

CERTIFICATE HOLDERS FROM	NUMBER OF FACULTIES		
	1900	1930	1960
Grammar school — language section	4	7	9
Grammar school — science section	5	10	12
Modern grammar school — language section	—	2	4
Modern grammar school — science section	4	9	10

D. The number of scholarships has increased considerably, especially for the university.

TABLE 27. NUMBER OF SCHOLARSHIPS FOR THE UNIVERSITY

	NUMBER	AS A PERCENTAGE OF ALL UNIVERSITY STUDENTS
1900	18	0.6
1920	245	2.9
1934	505	3.9
1950	2,485	8.4
1955	4,223	14.2
1960	11,239	27.6

E. The changing distribution of leaving-certificate holders (see Tables 22 and 23) for the various types of grammar school will also influence the transfer to university education, since each type has an entry quota.

TABLE 28. BREAKDOWN OF FRESHMEN AS A PERCENTAGE OF GRAMMAR SCHOOL CERTIFICATE HOLDERS, BY TYPE OF SCHOOL, 1960

	GRAMMAR SCHOOL		MODERN GRAMMAR SCHOOL		TOTAL[1]
	LANGUAGE SECTION	SCIENCE SECTION	LANGUAGE SECTION	SCIENCE SECTION	
Male	78	90	29	65	60
Female	72	78	10	40	44

1. Freshmen as a percentage of all grammar school-certificate holders excluding those holding commercial day school and girls modern grammar school certificates which do not give access to university examinations.

Transfer from grammar school to the university. Table 29 and Graphs 7 and 8 show the number of university freshmen as a percentage of all certificated grammar school leavers from 1900 to 1960. Two sets of percentages have been calculated, one actual and the second hypothetical. The second of these percentages have been calculated to exclude the influence of the changing distribution of grammar school leavers holding various types of certificate. To that purpose numbers for the various types of certificated leavers were calculated since 1900 on the basis of the 1959 distribution, and multiplied by the respective transfer percentages. The number of freshmen thus calculated would have gone to the universities if the distribution of the grammar school leavers had remained constant and if the number of leavers per certificate going to the universities would have followed the actual proportions.

Graph 7 shows that, apart from the increase during World War I and in the boom years before 1930, the percentage for males went down continuously between 1900 and 1939. The 1952 percentage is as low as that of 1939, but, since 1952 there has been a sharp increase.

The female percentage rises until the end of World War I, then falls, to remain stable after World War II.

Graph 7. UNIVERSITY FRESHMEN AS A PERCENTAGE OF GRAMMAR SCHOOL CERTIFICATE LEAVERS

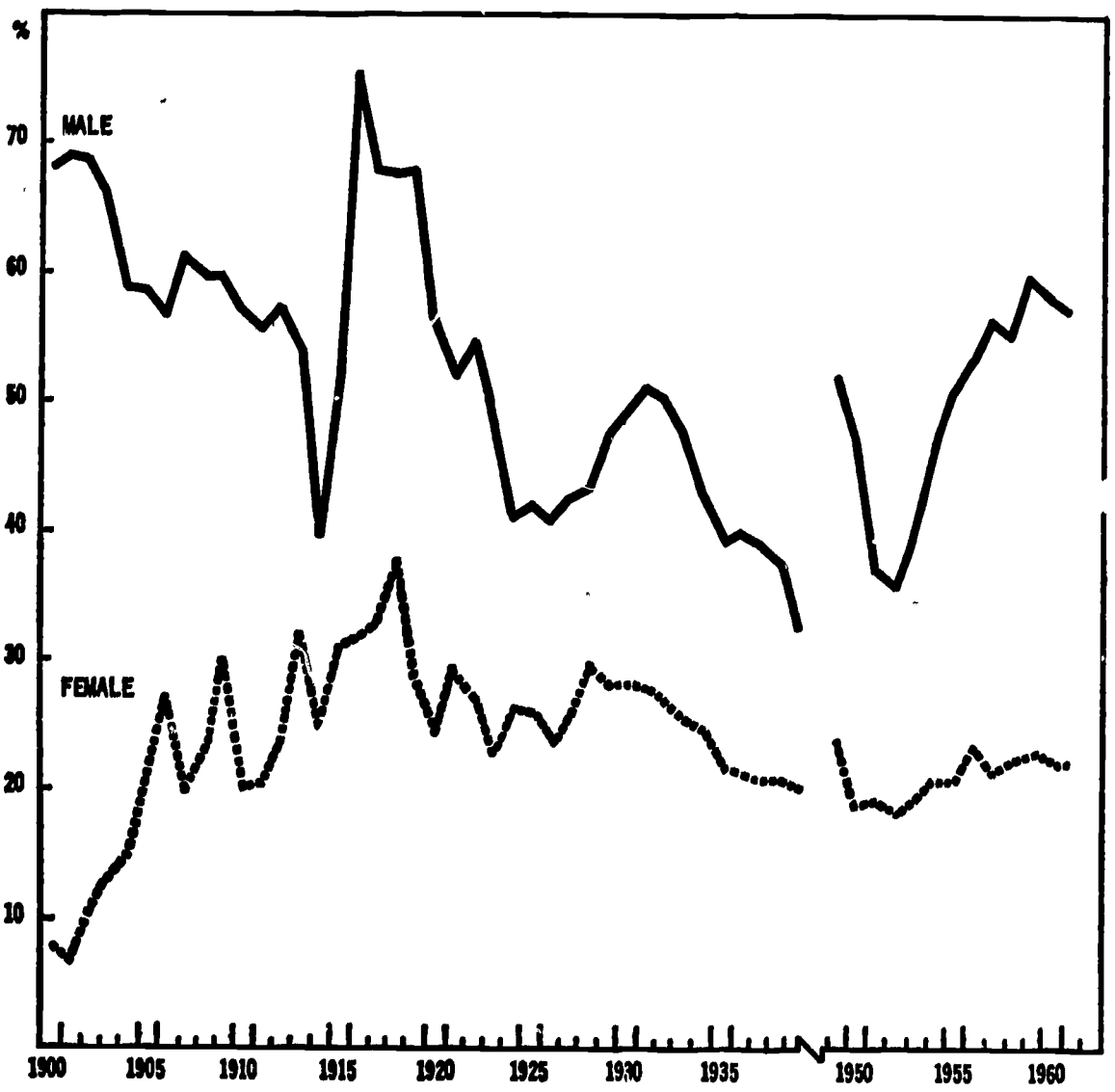


TABLE 29. NUMBER OF FRESHMEN AS A PERCENTAGE OF GRAMMAR SCHOOL CERTIFICATE LEAVERS

	ACTUAL		WITH CONSTANT DISTRIBUTION OF GRAMMAR SCHOOL LEAVERS ACCORDING TO TYPE OF SCHOOL	
	MALE	FEMALE	MALE	FEMALE
1900	68	8	49	17
1910	57	20	47	17
1920	56	24	54	20
1930	50	28	52	20
1939	32	20	42	15
1950	47	19	47	15
1959	60	23	60	23
1960	58	22	59	23

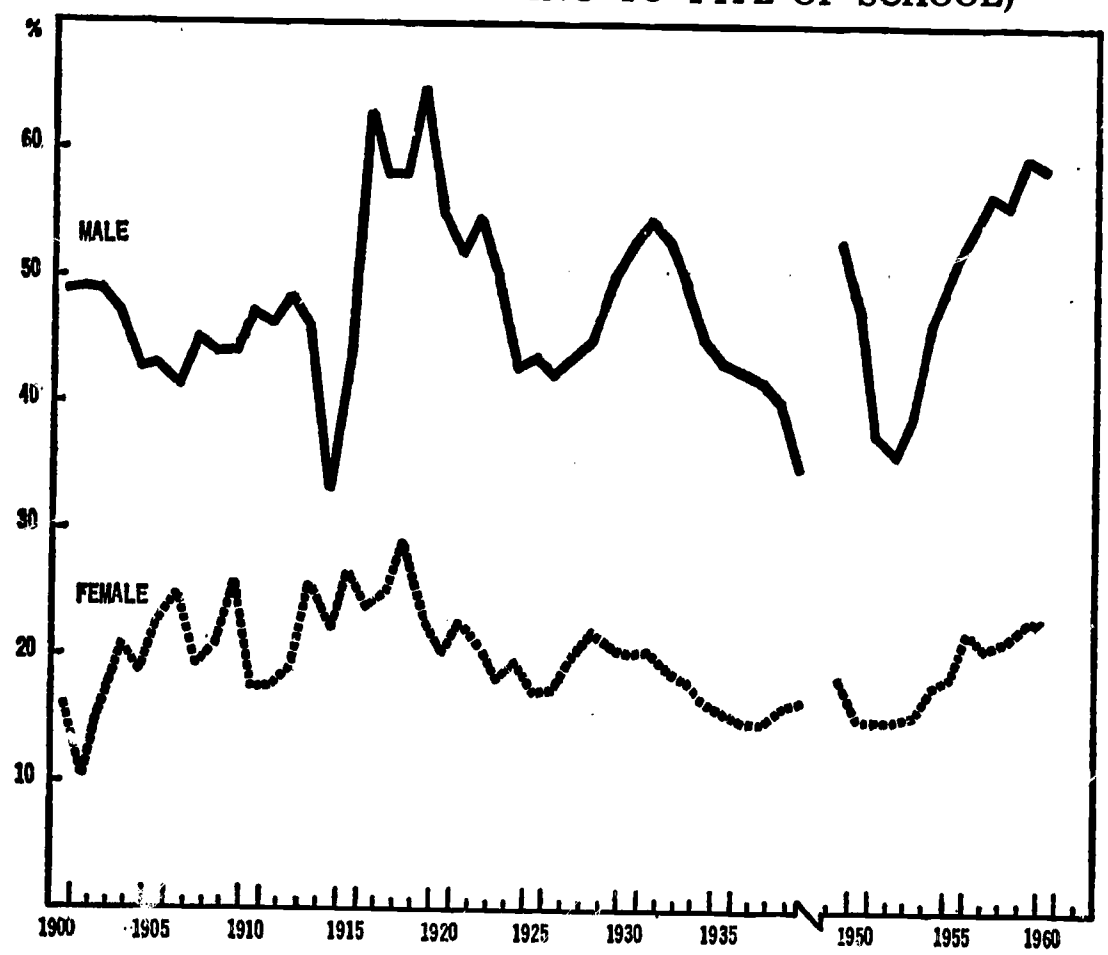
Graph 8 does not show the same decrease as Graph 7 in the percentage for males between 1900 and 1939, since this curve is not now influenced by the increase in the low transfer rate schools (commercial day school and modern-grammar language section) between 1900 and 1940 (see Tables 22 and 28).

For female students, up to 1918 the curve in Graph 8 shows a much slighter increase than in Graph 7, since Graph 8 does not take account of the sharp increase in graduates from the high transfer rate schools (grammar school, modern grammar school science section, see Tables 23 and 28).

Graph 8 (constant distribution according to type of school) shows that the transfer percentages for males oscillated between 40 per cent and 55 per cent, and for females around 20 per cent. This is surprising, since an increase was to be expected as a result of the stimulating measures mentioned above. Possibly, however, without these measures transfer percentages would have gone down.

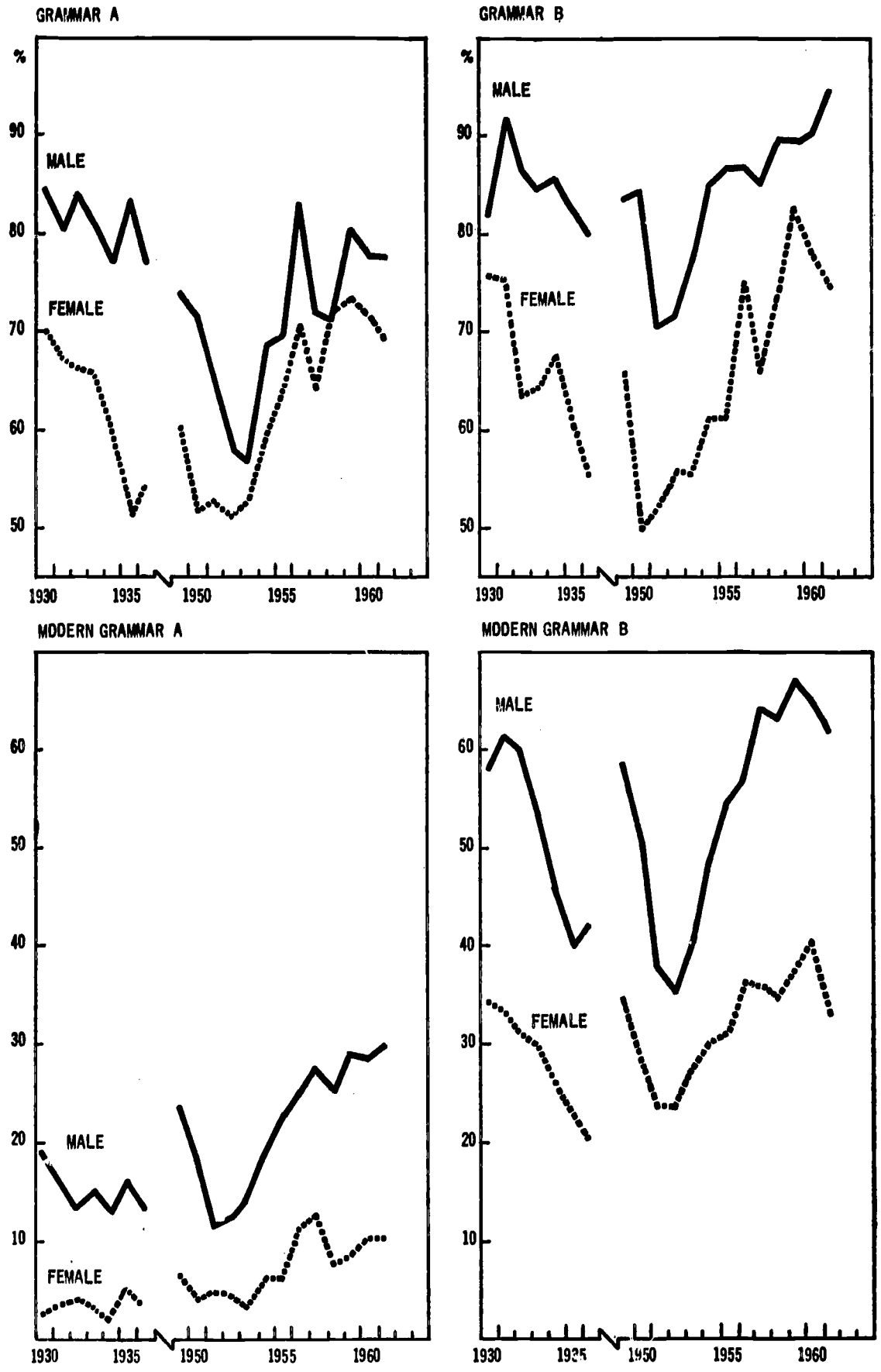
Graph 8 clearly shows the influence of World War I, the boom between 1925 and 1930, and the depression period which followed. After World War II, transfer percentages were high, fell continuously until 1952, and then rose sharply. No analysis of post-war transfer percentages has provided a reason for this cyclical movement.

Graph 8. UNIVERSITY FRESHMEN AS A PERCENTAGE OF GRAMMAR SCHOOL CERTIFICATED LEAVERS (ASSUMING A CONSTANT DISTRIBUTION ACCORDING TO TYPE OF SCHOOL)



Graph 9 shows that transfer percentage curves for the various types of schools follow the same trend as that for the total transfer.

Graph 9. **UNIVERSITY FRESHMEN AS A PERCENTAGE OF GRAMMAR SCHOOL CERTIFICATED LEAVERS, TO TYPE OF CERTIFICATE**



This analysis leads to the conclusion that the increase in the number of university freshmen is a consequence of the increasing number of grammar school graduates and not of an increase in the transfer rate from grammar school education to university education.

The female backlog. Table 24 shows that, in 1960, the transfer rate for females was 4.9 per cent lower than for males ; this may be explained by differences in grammar school enrolment, the percentage of grammar and modern grammar school graduates and the difference in the number of freshmen without a grammar school leaving certificate. Table 30 gives a breakdown of this 4.9 per cent difference.

Graph 10. NUMBER OF STUDENTS AS A PERCENTAGE OF THE 18-24 YEAR OLD POPULATION IN RELATION TO PER CAPITA INCOME, 1903-1960

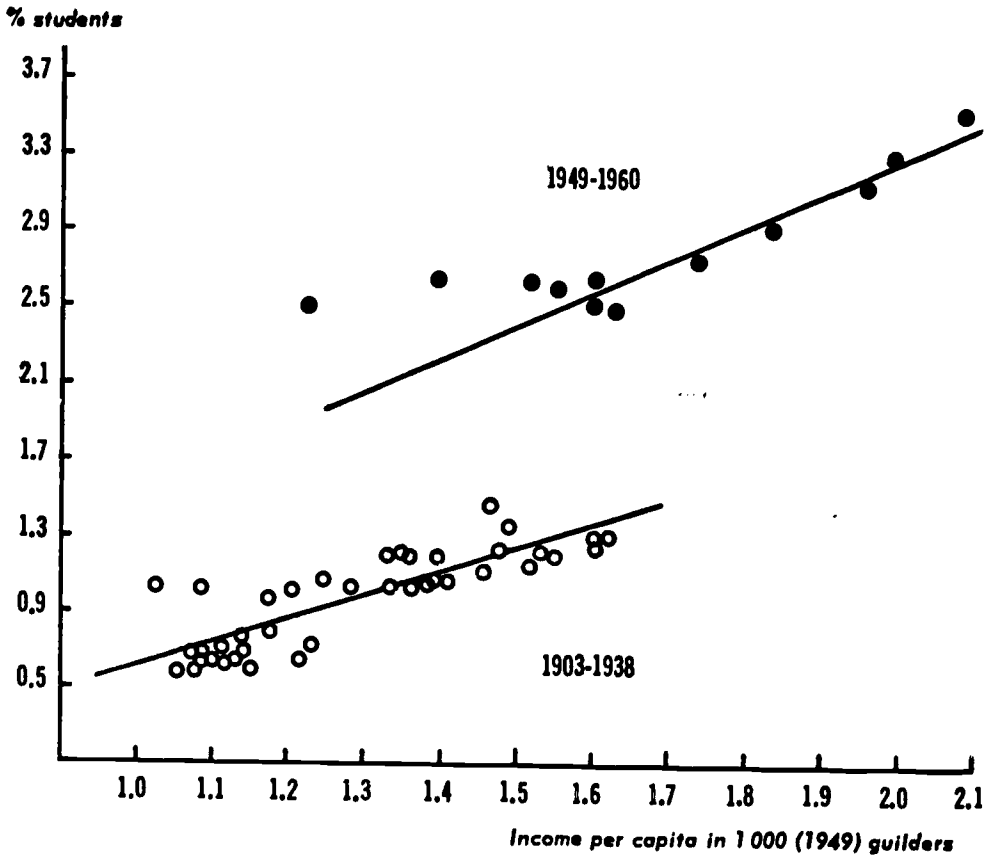
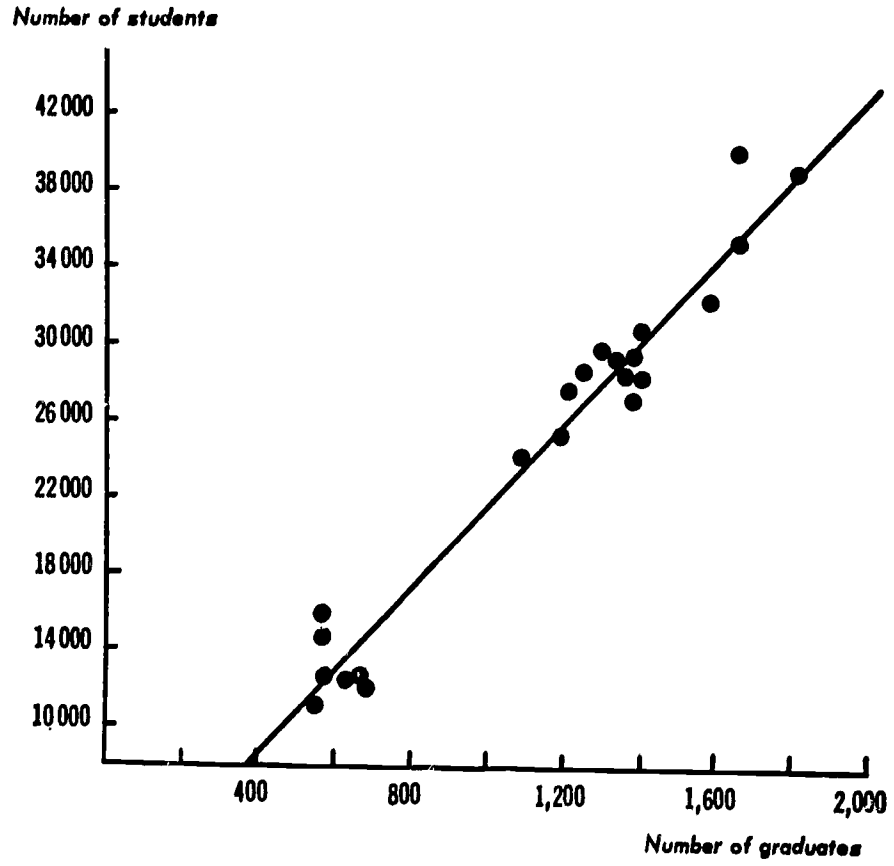


TABLE 30. BREAKDOWN OF DIFFERENCE BETWEEN MALE AND FEMALE TRANSFER RATES

DIFFERENCE DUE TO	PER CENT
Lower grammar school enrolment	0.7
Low proportion of grammar and modern grammar school certificates in the number of certificate holders	1.8
Lower percentage of transfer to universities	1.6
Fewer freshmen without grammar school certificate	0.8
	4.9

Graph 11. NUMBER OF STUDENTS AND NUMBER OF GRADUATES 25 YEARS EARLIER, 1935-1960



Neither the proportion of grammar and modern grammar school graduates nor the transfer percentages for the various categories of graduates shows an increase (Table 23 and Graph 9), so it may safely be assumed that the backlog in the female transfer percentage will remain.

Other tests of trend analyses. Two other analytical models have been used to try to explain the number of university students over time. One model assumes a relationship between the number of students and income per capita, and the other between the number of university graduates in a given year and the student population 25 years later. These relationship are illustrated in Graphs 10 and 11.

Graph 10 shows a difference in the relationships between the periods before and after World War II. As no comparable break can be found in grammar school enrolment (section 3) or in the transfer from grammar schools to universities (see above), the reasons for this break will have to be sought in the changes in the distribution of school leaving certificate holders according to types of school (the increases in the percentage of male certificate holders for modern grammar school, language section, and commercial day school — with low or zero percentage of transfer to the university — ceased just before the war — see Table 22) and in the fact that, after the war, the ratio of students to freshmen increased as a consequence of a shift on the part of students to faculties requiring a longer period for graduation and a general tendency to prolong the duration of university studies.

In Graph 11, part of the correlation shown is due to an increase in population. Its analytical value would therefore improve if the number of

students were considered as a percentage of the 18-25 age group and of graduates as a percentage of the 25 year olds. The theoretical assumptions underlying the hypotheses of a relationship between the number of students and the number of graduates 25 years earlier greatly resemble those on page 108 — a possible new model for grammar school enrolment — showing that the composition of the occupational groups in the labour force is a predominant factor in grammar school enrolment. As all grammar school graduates (regardless of their social background) will normally enter professional, managerial, etc. occupations, where grammar school enrolment rates are higher, total grammar school enrolment will increase continuously. This self-generating process of grammar school enrolment is illustrated, *mutatis mutandis,* in Graph 11.

As the percentage transfer from grammar schools to universities is said to be constant, both approaches given here first measure grammar school enrolment (rates). If this is true, however, then an analytical model tailored to fit the analysis of grammar school enrolment would be preferable.

Regional analysis

There are large regional differences in the number of freshmen as a proportion of the 18 year old population.

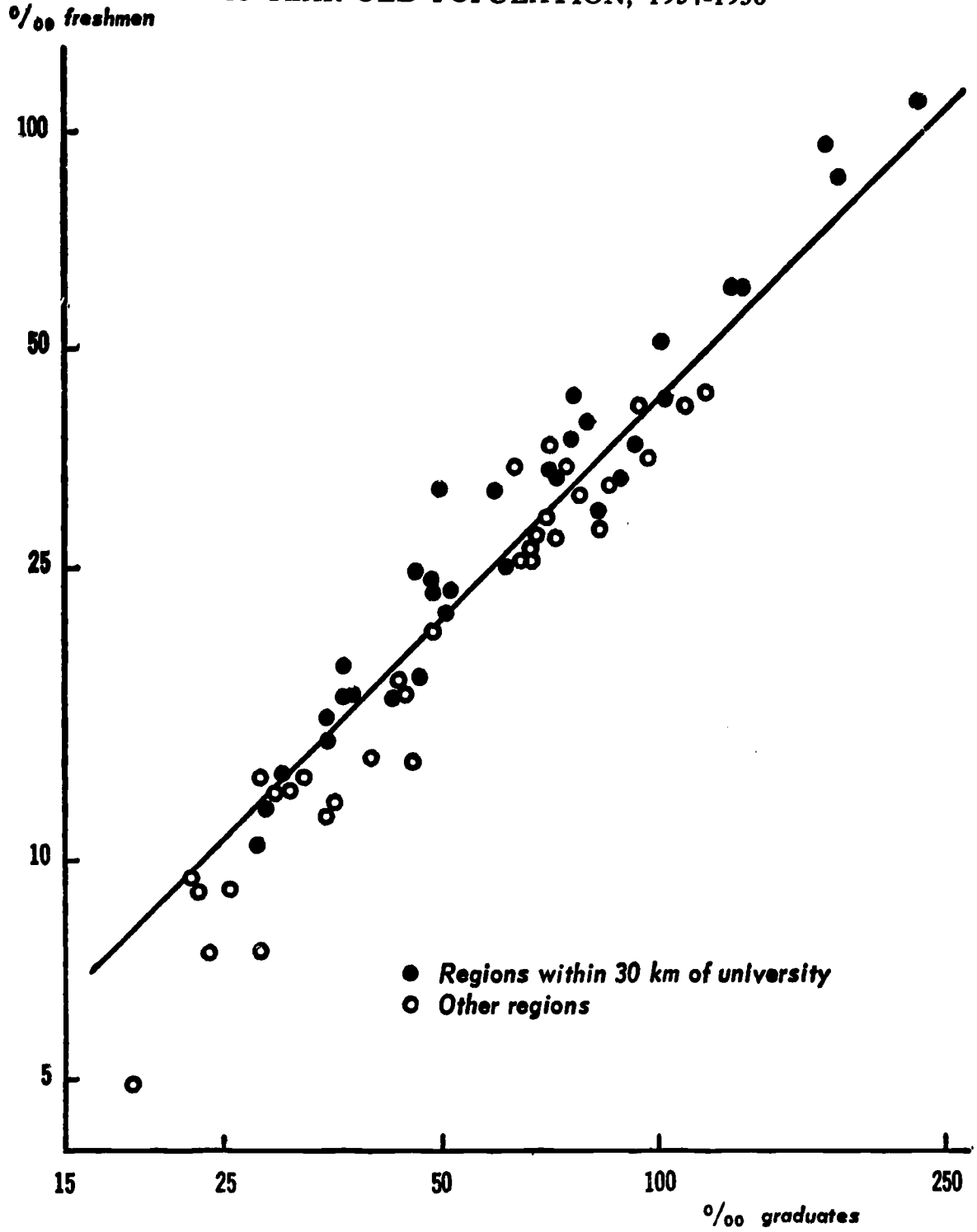
TABLE 31. NUMBER OF FRESHMEN AS A °/₀₀ OF THE 18 YEAR OLD POPULATION, 1954-1956, IN 134 REGIONS

°/₀₀	NO OF REGIONS
0 — < 10	21
10 — < 20	51
20 — < 30	30
30 — < 40	18
40 and over	14
	134

Regions with low proportions (< 10 °/₀₀) are rural ; those with more than 40 °/₀₀ are towns or residential areas. These regions also respectively showed low and high grammar school enrolment rates (section 3) so that the inference is that regional differences in the number of grammar school graduates (as a proportion of the 18 year old population) largely determine those for freshmen. The correlation is shown in Graph 12[1].

1. The distribution of certificate-holders by sex and type of school varies according to region. The percentage of those transferring to the university varies according to school category. (See Table 28.) To eliminate the influence of these different distributions on the total transfer percentage for the regions, the following procedure was adopted :
The number of certificate-holders of each type in the regions was multiplied by the corresponding national transfer percentage. The sum of these weighted graduates was divided by the national transfer percentage for all grammar school graduates. This gives a new number for those leaving grammar school.
The number of freshmen, divided by the number of grammar school leavers thus calculated, gives for each region a transfer percentage uninfluenced by regional differences in the distribution of certificate-holders by sex and type of school.
These percentages are shown in Graph 12. (A sample only of the regions to simplify).

Graph 12. NUMBER OF UNIVERSITY FRESHMEN AND OF GRAMMAR SCHOOL GRADUATES AS PERCENTAGE OF THE 18 YEAR OLD POPULATION, 1954-1956



The close correlation shows that regional differences in enrolment in higher education are mainly due to differences in grammar school enrolment.

Not all the points representing the various regions lay on the regression line, showing that regional differences exist in the number of freshmen as a percentage of grammar school graduates.

Regions with very high or low percentages are difficult to classify. The 10 regions with the lowest percentages include towns and rural areas, and those with the highest, towns and residential regions, especially in the western part of the country.

Graph 13. NUMBER OF FRESHMEN AS A PERCENTAGE OF GRAMMAR SCHOOL GRADUATES, 1954-1956

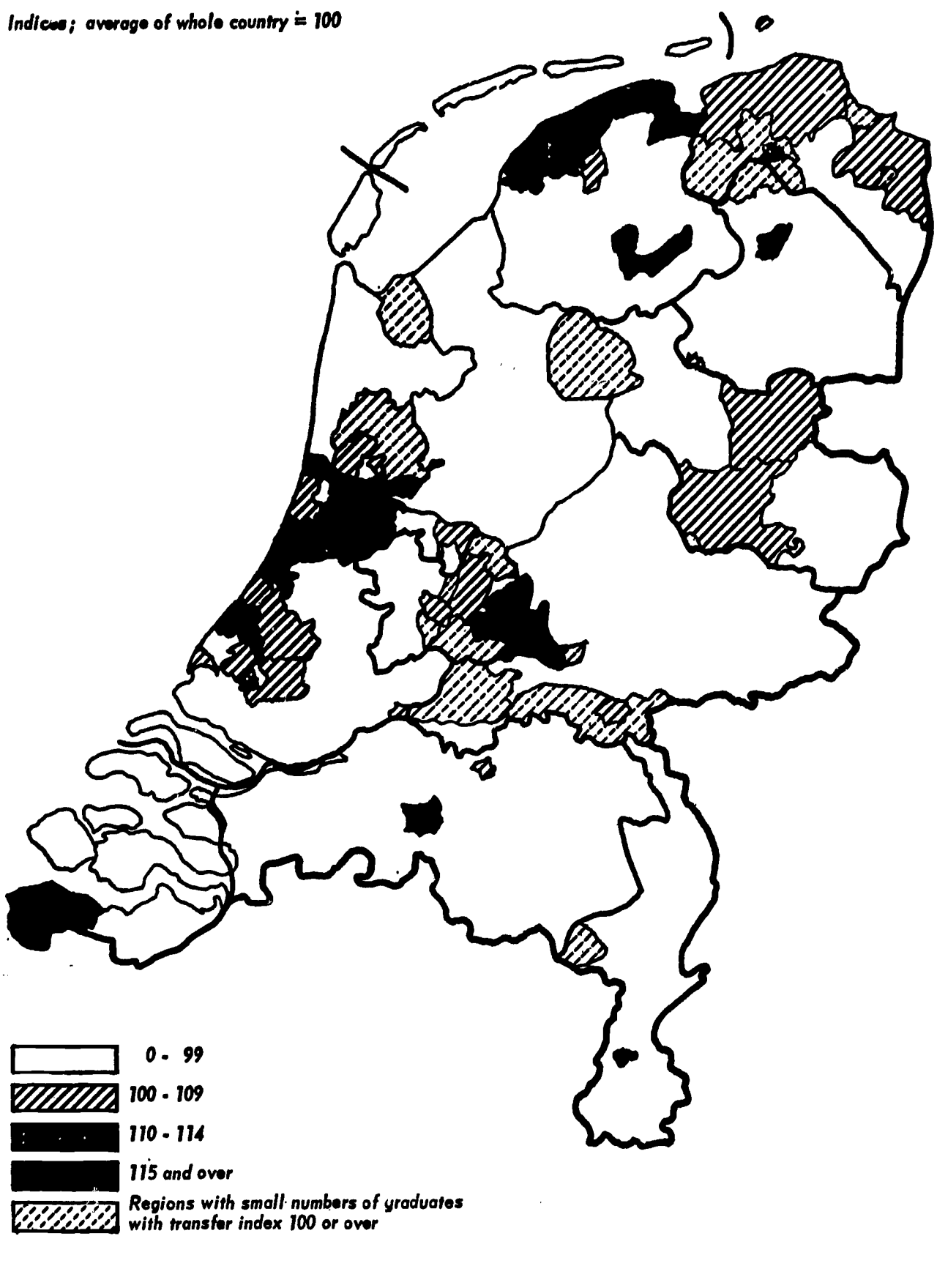


TABLE 32. NUMBER OF FRESHMEN AS A PERCENTAGE OF GRAMMAR SCHOOL GRADUATES, 1954-1956, 134 REGIONS

PER CENT	NO OF REGIONS
< 30	7
30 — < 40	46
40 — < 50	59
50 — < 60	18
60 and over	4
	134

Graph 13 shows the (indexed) regional variation in these percentages. Boundaries between regions with the same indices have been omitted to simplify the graph.

If circles with a radius of 30 km are drawn around the universities, nearly all regions with a high percentage of freshmen in relation to the number in grammar school graduates are found to be within them. There are still considerable differences in the percentages of the various regions inside and outside the circles, those inside showing an average percentage of 46 and those outside 39. This difference might possibly be explained by the distance to the university, but the areas within the circles might also, for example, be high-income regions. In this case, differences in transfer percentages as between regions inside and outside the circles might be due to differences in per capita income. For the regions outside the circles, multiple regression analyses have been used to show whether there is correlation between the percentages and *a*) the number of male university graduates of 45 years and older as a percentage of grammar school leavers, *b*) per capita income, *c*) the number of scholarships as a percentage of all grammar school graduates, *d*) degree of urbanization, and *e*) per cent of grammar school graduates with high marks, but no significant correlations were found. The higher percentages in the regions near a university, therefore, reflect the influence of the distance from the university[1].

The results of the analyses of regional differences in the number of university freshmen as a percentage of the 18 year old population showed them to be due mainly to differences in the number of grammar school graduates (or grammar school enrolment) and to a less degree to distance from the university.

The results of this analysis can be used for calculating the additional number of freshmen obtained on opening a university in a town where none existed. It may be safely assumed now that the percentage of grammar school graduates going to university education will rise to 46 in the 30 km radius, i.e. that, depending on the town chosen, an additional 40-60 students

1. Distance from a university has not been included in a multiple regression analysis covering all regions because it is difficult to get an adequate measure of this distance. A theoretically satisfactory distance factor would have to take account of : distribution of the grammar school graduates by sex and type of school, since the various categories have not the same access to the university, distances to 11 universities with varying numbers of faculties, and some of which are denominational, some important, others not. Graph 13 shows that, outside a 30 km radius no systematic influence of distance from university is apparent. The "distance from university" troubles were overcome by restricting the analysis to the regions outside the 30 km circles.

will seek admission to the university (or 1 per cent of the existing total number of freshmen in the Netherlands).

Times series and cross-section analyses come to the same conclusion, i.e. that the transfer of grammar school graduates to the university can be regarded as constant[1].

Earlier attempts to explain the regional differences in the number of university students as a percentage of the 18-25 age group, or the number of freshmen as a percentage of the 18 year old population attributed them to the percentage of male university graduates of 45 years and older in the male labour force, income per capita, and intelligence, but did not take into account the number of grammar school graduates as a causal variable.

As the transfer of grammar school graduates to the universities can be considered as constant, one can say that they do not explain participation in university education but, instead, participation in grammar school education by phenomena connected with university education. For a better analysis of grammar school enrolment reference should be made to section 3.

Choice of faculty

Trends

Past trends : Past trends in the choice of faculty are shown in Table 33.

Table 33. NUMBER OF FRESHMEN IN THE DIFFERENT FACULTIES AS A PERCENTAGE OF ALL FRESHMEN, 1900-1960 (MALE)

	1900	1910	1920	1930	1940	1950	1960
Theology	11.8	7.5	3 6	7 6	5.2	4.5	2.2
Law	20.6	23.2	20.1	12.3	11.3	9.3	6.8
Medicine	24.7	25.9	15.8	15.6	13.9	16.5	9.8
Dentistry	.	.	2.6	4.6	2.2	2.9	2.6
Mathematics and physics	10.8	5.3	9.4	10.2	10.4	12.2	16.8
Arts	2.8	4.3	5.1	6.5	4.2	5.4	9.7
Geography	—	—	—	1.3	1.3	1.4	1.6
Psychology	—	—	—	—	—	1.9	2.5
Economics	—	—	14.9	9.2	17.1	12.4	13.5
Veterinary science	3.3	5.6	2.2	0.9	1.4	2.3	1.2
Political and social sciences	—	—	—	—	—	4.0	4.0
Technology	22 4	21 0	22 8	20 5	24.5	23.0	26.0
Agriculture	3.6	7.2	3.5	5.1	6.3	4.0	3.3
Colonial law, etc.	—	—	—	6.2	2.2	0.2	—
	100.0	100.0	100.0	100.0	100.0	100.0	100.0

The changes in the distribution of faculties imply changes in the demands of graduates, e.g. a shift from theology and law to geography, psychology, economics, political and social sciences, but what is the explanation of the constant percentages in technology, and in mathematics and phyiscs ?

1. Apart from the influence of the distribution of grammar school graduates by sex and type of school and the slight influence of the distance from the universities.

Influence of demand on choice of faculty

A. *Short term*

In view of the growing number of forecasts concerning the demand for graduates, and the information given to grammar school pupils concerning the job prospects for university graduates it would seem logical to base forecasts of the number of freshmen by faculty on the results of studies showing demand for university graduates.

A report giving forecasts of demand and supply of graduates by faculty and the required breakdown of freshmen by faculty (as a percentage of all freshmen) to balance supply and demand was completed in 1959[1]. The press gave great publicity to this report which was distributed widely among grammar school pupils. No other report on the subject had ever been so well and effectively distributed.

Its effect on the choice of faculty is analysed below.

To achieve equilibrium between supply and demand the information given to grammar school pupils concerning jobs should try to influence their choice so as to bring the distribution by faculty in line with Table 34.

TABLE 34. PERCENTAGE DISTRIBUTION OF FRESHMEN BY FACULTY, ACTUAL AND ACCORDING TO DEMAND FOR GRADUATES

	1955-1957	1958-1962	1963-1967	1968-1972
	ACTUAL	ESTIMATED ACCORDING TO DEMAND FOR GRADUATES		
Medicine	12	11	10	10
Dentistry	2	4	4	4
Mathematics and physics	15	15	16	17
Arts	13	9	5	4
Geography	3	1	1	1
Law	7	12	10	10
Economics	11	13	14	14
Social sciences	6	3	4	4
Psychology	4	3	3	3
Technology	20	22	25	25
Veterinary science	1	1	1	1
Theology	3	3	3	3
Agriculture	3	3	4	4
	100	100	100	100

Estimates show an increase in the requirements of freshmen in dentistry, mathematics and physics, economics, and technology and a decrease in medicine, arts (expected surplus of grammar school teachers), geography, social sciences and psychology to avoid a surplus. The increase in law students is not due to increased demand, but to avoid the shortage which would occur if the percentage remains as low as in the period 1955-1957.

Table 35 compares the actual percentages for 1959-1961, with those required to meet the estimated demand for graduates (1958-62).

1. *Number of university graduates up to 1980*, Zeist 1959 (in Dutch).

TABLE 35. BREAKDOWN OF FRESHMEN BY FACULTY, ACTUAL AND ACCORDING TO ESTIMATED DEMAND

	1959-1961 (ACTUAL)	1958-1962 (DEMAND)
Medicine	11.2	11
Dentistry	2.4	4
Mathematics and physics	16.3	15
Arts	14.1	9
Geography	2.2	1
Law	7.4	12
Economics	10.9	13
Social sciences	4.8	3
Psychology	3.7	3
Technology	20.8	23
Veterinary science	1.2	1
Theology	1.7	3
Agriculture	3.3	3
	100.0	100

No conclusions can be drawn from Table 35 concerning any effect the report (i.e. information service) might have had on the distribution of freshmen by faculty. It is possible that the actual percentages were what might be expected, for example, from distribution trends. The following procedure was adopted to overcome these difficulties.

First the percentages which might be expected in 1959-1961 were calculated on the basis of 1951-1958 trends, the average being used for some faculties and the extrapolated trend for others. The actual 1951-1958 percentages oscillate around either the average or the trend, and a similar oscillation was assumed for the period 1959-1961. An upper and lower limit for the expected average or trend 1959-1961 percentage was calculated for each faculty, shown by the lines on Graph 14. If the 1959-1961 percentage was what might have been expected then it lies somewhere between these lines[1]. The actual percentages for 1952-1961, the average actual percentage 1959-1961, the upper and lower limits for the expected percentage 1959-1961 and the demand percentage are all shown in Graph 14.

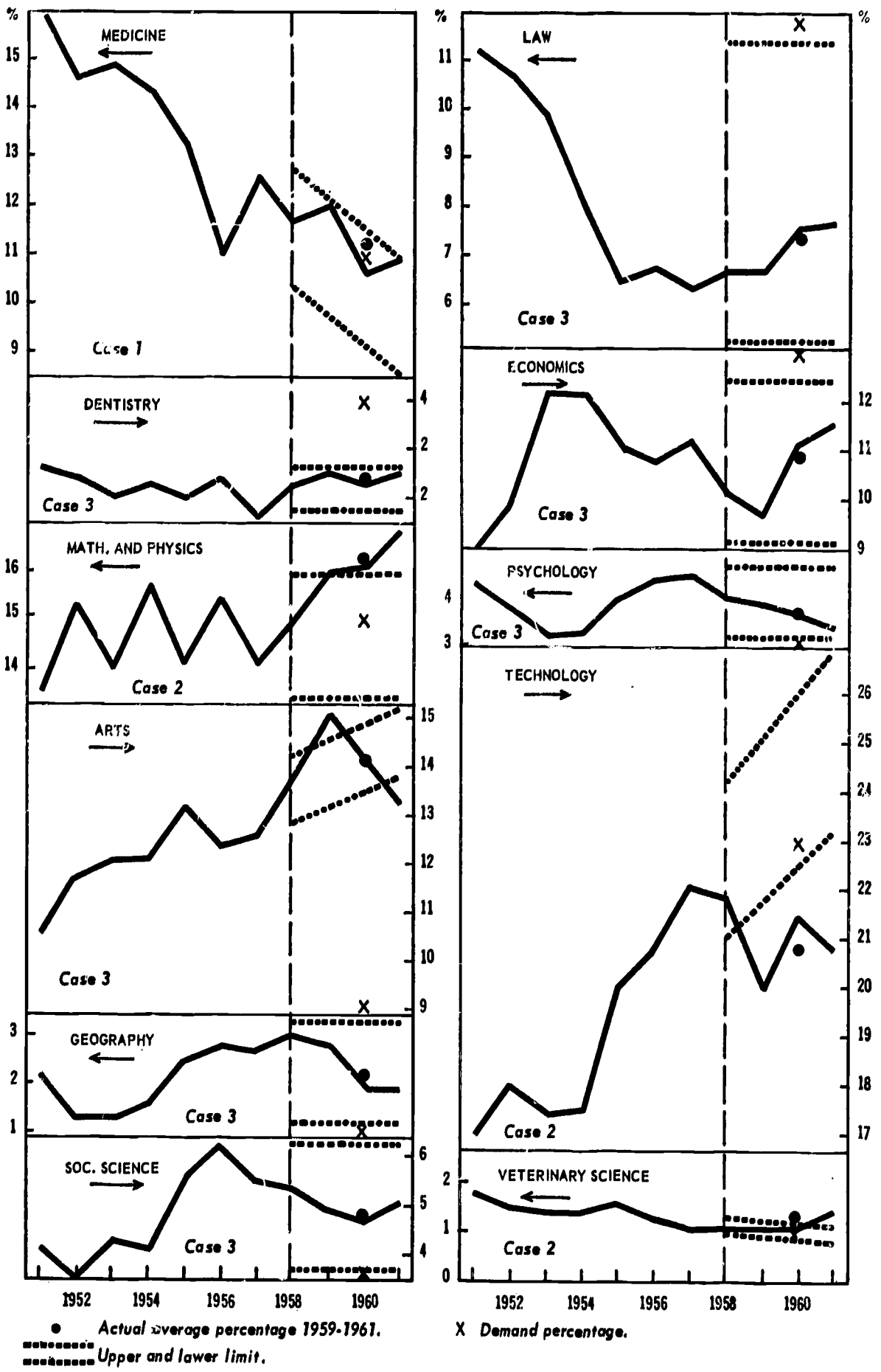
An analysis of the position of the demand and actual average percentages in relation to the above-mentioned lines makes it possible for conclusions to be drawn concerning the effects of job information.

If both the demand and the actual percentage lie between the lines (case no. 1), then no conclusions concerning the effect of job information can be drawn as the students and the job information wanted to do the same thing. But if the actual percentage lies outside the lines and the demand percentage between the lines (case no. 2), then it is certain that job information had no effect.

The effect of job information can always be inferred when the demand percentage lies outside the lines, i.e. if job information sought to influence freshmen so as to change their distribution by faculty. Three cases can be distinguished here. If the actual percentage lies within the lines (case no. 3) then the freshmen did not listen to the advice included with job information.

1. The distance between the lines was chosen so that the expected percentage would lie between the upper and lower limit in 9 out of 10 cases.

Graph 14. NUMBER OF FRESHMEN IN VARIOUS FACULTIES AS A PERCENTAGE OF ALL UNIVERSITY FRESHMEN



● *Actual average percentage 1959-1961.* X *Demand percentage.*

Upper and lower limit.

If the actual percentage lies outside the lines and at the same side as the demand percentage (case no. 4) then this may be interpreted as a success for the information service. If the actual percentage lies outside the lines and on the opposite side to the demand percentage (case no. 5) then again it may be concluded that job information failed.

Table 36 summarises these conclusions.

TABLE 36. EFFECT OF JOB INFORMATION ON CHOICE OF FACULTY

POSITION OF DEMAND PERCENTAGE	CASE NO	POSITION OF ACTUAL PERCENTAGE	WHETHER JOB INFORMATION AFFECTS CHOICE
Between lines	1	between lines	not possible to draw any conclusion
	2	outside lines	no
Outside lines	3	between lines	no
	4	outside lines and at the same side as demand percentage	yes
	5	outside lines but opposite the demand percentage	no

The results have been shown in Graph 14.

Apart from medicine, where no conclusion can be drawn, job information had no effect on any of the faculties.

In general, the choice of the 1959-1961 freshmen was much the same as that of the freshmen before 1959, i.e. they just followed " tradition ".

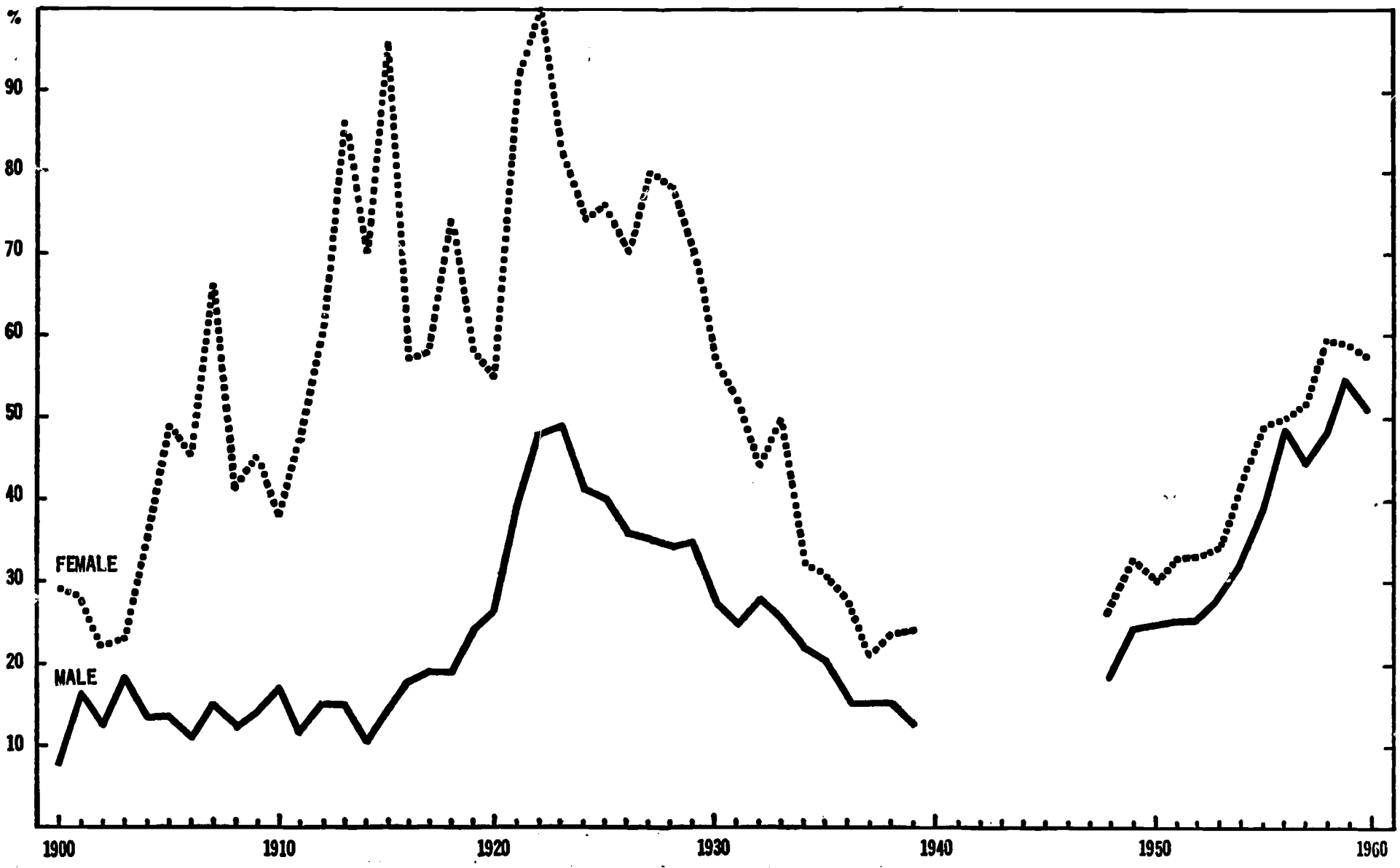
B. *Long term*

Another test concerning the influence of demand on choice of faculty is illustrated in Graph 15, where freshmen in the faculty of arts are shown as a percentage of grammar school graduates, language section, the only ones allowed to sit for the examination of this faculty, whose graduates generally become grammar school teachers.

The male percentage remained practically constant until 1919 ; about 1920 this faculty was extended to include examinations in modern foreign languages and history, thus extending the occupational possibilities of its graduates — especially the teaching of these subjects in grammar schools. This gave rise to a rapid increase in the percentage taking arts. After 1923 a decrease can be noted and a tendency towards stabilization by 1929. After this year there was an increasing surplus of grammar school teachers, accompanied by an ever decreasing percentage for arts. The grammar school teacher shortage in the period after World War II brought about a rapid increase in the percentage for arts.

This shows that inflow reacts to the actual labour market position of the graduates. This is seven years too late since the university course lasts

Graph 15. NUMBER OF FRESHMEN IN THE FACULTY OF ARTS AS A PERCENTAGE OF GRAMMAR SCHOOL, LANGUAGE SECTION, GRADUATES, 1900-1960



seven years. The findings may be summarised as follows. Freshmen do not react to forecasted demand but to actual demand. It may be that by means of an adequate job information service a slow adaption of inflow to estimated demand can be obtained.

Regional analysis

Regional differences in choice of faculty can be seen by expressing the number of freshmen in the various faculties as a percentage of the corresponding type and number of grammar school graduates, for regions, and then plotted on a map.

An analysis of the map for technology shows that in the neighbourhood of the two Institutes of Technology high percentages of freshmen in technology are found and in the neighbourhood of the universities (all of which have a faculty of mathematics and physics) low percentages. The distance from the nearest Institute of Technology and from the nearest university therefore partly determines the percentages of freshmen in technology.

A multiple regression analysis of regional differences in the percentage of freshmen in technology gave the following explanation :

$$T = \underset{(6\,\%)}{-\,23.7\ TU} + \underset{(19\,\%)}{6.3\ U} + 57.4 \qquad R = 0.90$$

in which :

T = number of freshmen in technology as a percentage of male graduates from B sections of grammar and modern grammar schools ;
TU = distance to nearest Institute of Technology in log.km ;
U = distance to nearest university in log.km ;

the percentages in brackets show standard errors of regression coefficients as a percentage of these coefficients.

The regression equation shows that as the distance from Institute of Technology increases the percentage in technology falls, while an increase in the distance from universities tends to increase the percentage.

With the help of the regression equation the residuals (that part of the percentage of freshmen in technology which cannot be explained by the regression equation) were calculated and again plotted on a map. These residuals did not show any correlation with factors characteristics of various regions, so that only the distance from the nearest Institute of Technology and from the nearest university systematically determines regional differences in the percentage of freshmen in technology.

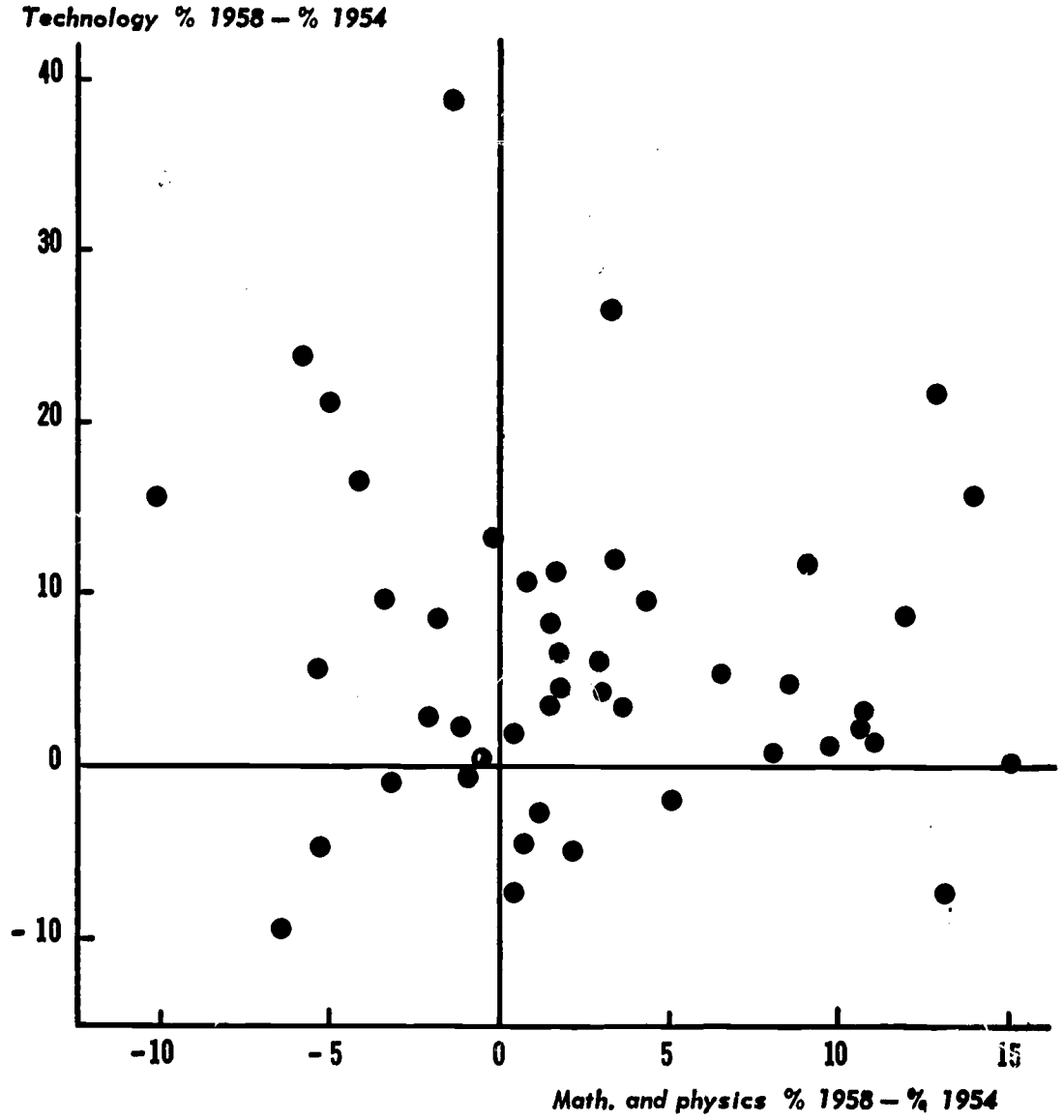
The map for the percentages of freshmen in economics (economics can be studied in two Schools of Economics and in three of the six (general) universities) also showed a systematic relationship between the percentage of freshmen in economics and the distance from the nearest School of Economics. This relationship was not as clear however as that for technology. For the other faculties (all incorporated in general universities) no such relationships can be found.

The reason for these divergencies is clear. The distance of a given region is the same for all the faculties in the (general) university, but is not the same for the Institute of Technology. When a region is located near an Institute of Technology grammar school leavers will be tempted to study technology, but for those who resist the temptation distance does not

make any difference what they choose. So far as distance is concerned the position of the faculty of economics is between that of technology and all other faculties.

Other factors besides distance may also determine regional differences in the percentages of freshmen in the various faculties. An analysis of these regional differences might indicate the factors that determine the choice of faculty. Before starting the analysis an enquiry was first made to show to what extent regional differences were stable. The percentage of freshmen in a given faculty for a given year in the regions did not correlate with those in succeeding years (with the exception of tehnology and economics). Thus, none of the factors characteristic of the regions (income, urbanization, etc.) systematically determines the regional differences in the percentages in the various faculties (again with the exception of distance to Institute of Technology and to nearest School of Economics).

Graph 16. NUMBER OF FRESHMEN IN TECHNOLOGY IN RELATION TO THOSE IN MATHEMATICS AND PHYSICS AS A PERCENTAGE OF GRAMMAR SCHOOL (SCIENCE SECTION) GRADUATES, 1958 MINUS 1954, IN 50 REGIONS



Interrelationship between faculties

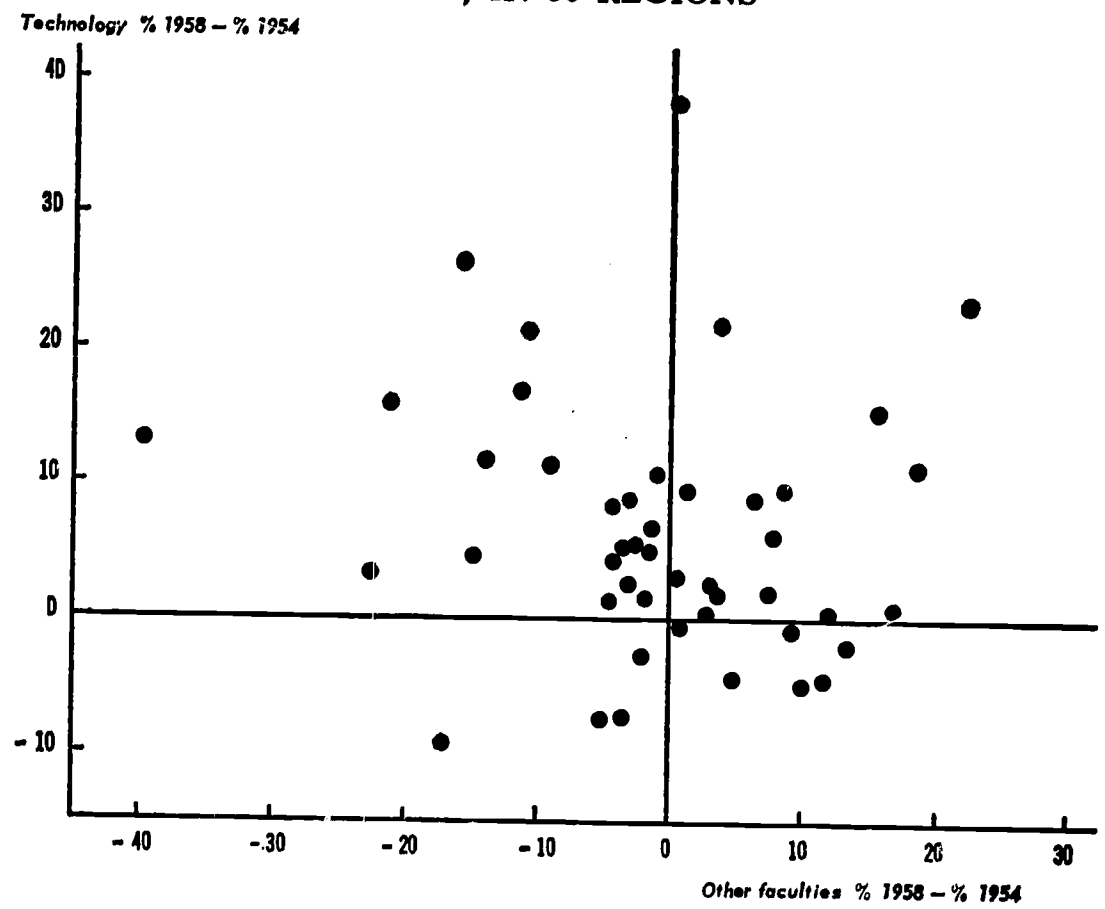
For some forecasting models it is necessary to know what would happen to the percentage of freshmen in certain faculties if the percentage in a given faculty were to increase.

Although this may be examined on the basis of data in Table 33, only unreliable trend correlations may be obtained.

Another approach is to investigate the correlation between (*a*) the regional percentage increases or decreases in one faculty and (*b*) those in other faculties.

Graphs 16 and 17 illustrate two of these tests. They show that there is no systematic relationship between the 1958 minus the 1954 percentages for technology students in relation to the corresponding percentages for (*a*) mathematics and physics and (*b*) all other faculties[1].

Graph 17. NUMBER OF FRESHMEN IN TECHNOLOGY IN RELATION TO OTHER FACULTIES AS A PERCENTAGE OF GRAMMAR SCHOOL (SCIENCE SECTION) GRADUATES 1958 MINUS 1954, IN 50 REGIONS



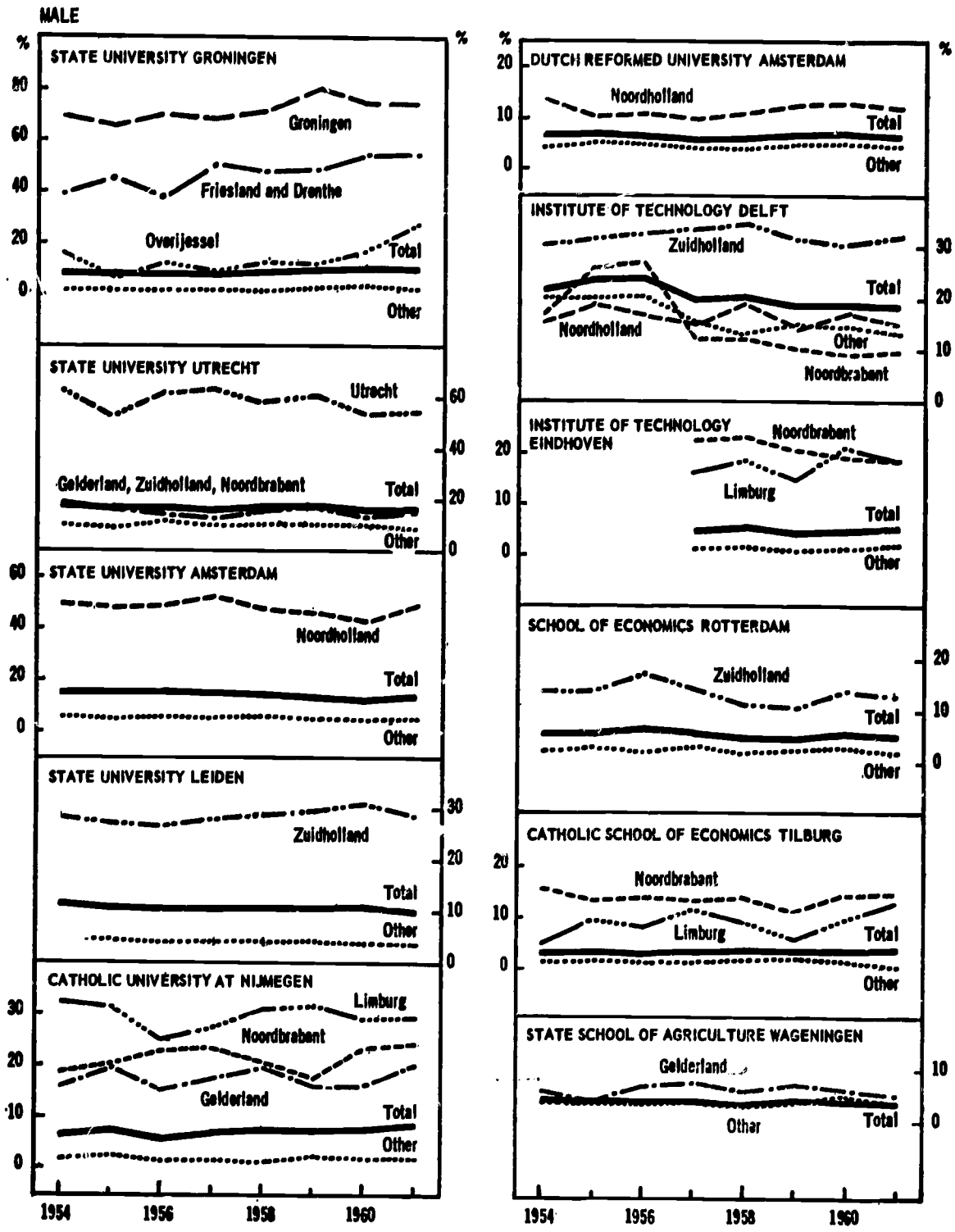
DISTRIBUTION OF FRESHMEN OVER UNIVERSITIES

Trends

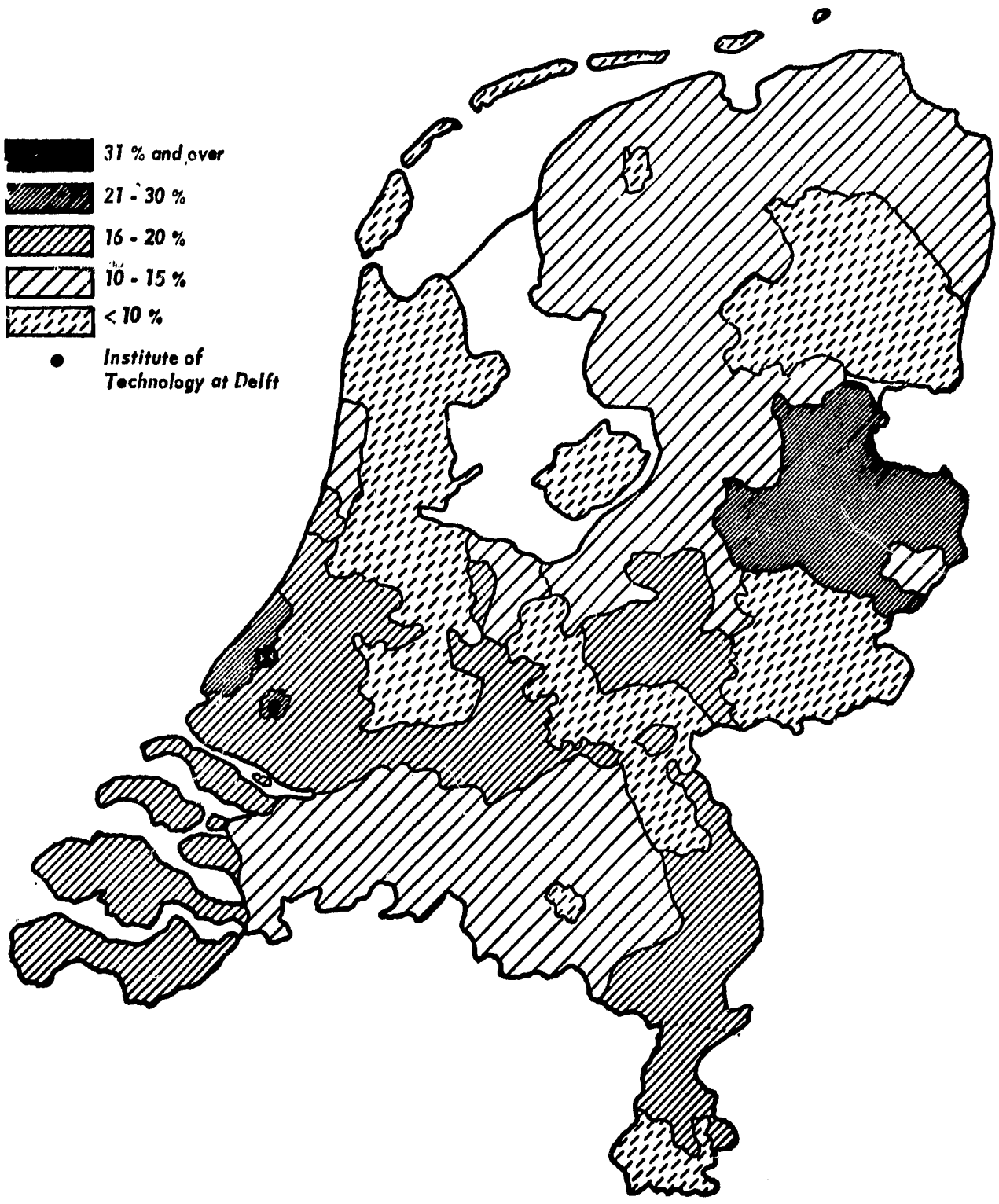
Attendance at the university in their home or nearest province was shown to be stable for male freshmen over the period 1954-1960 (see Graph 18).

1. These graphs refer to grammar and modern grammar school graduates, B sections, and those faculties to which these graduates have access.

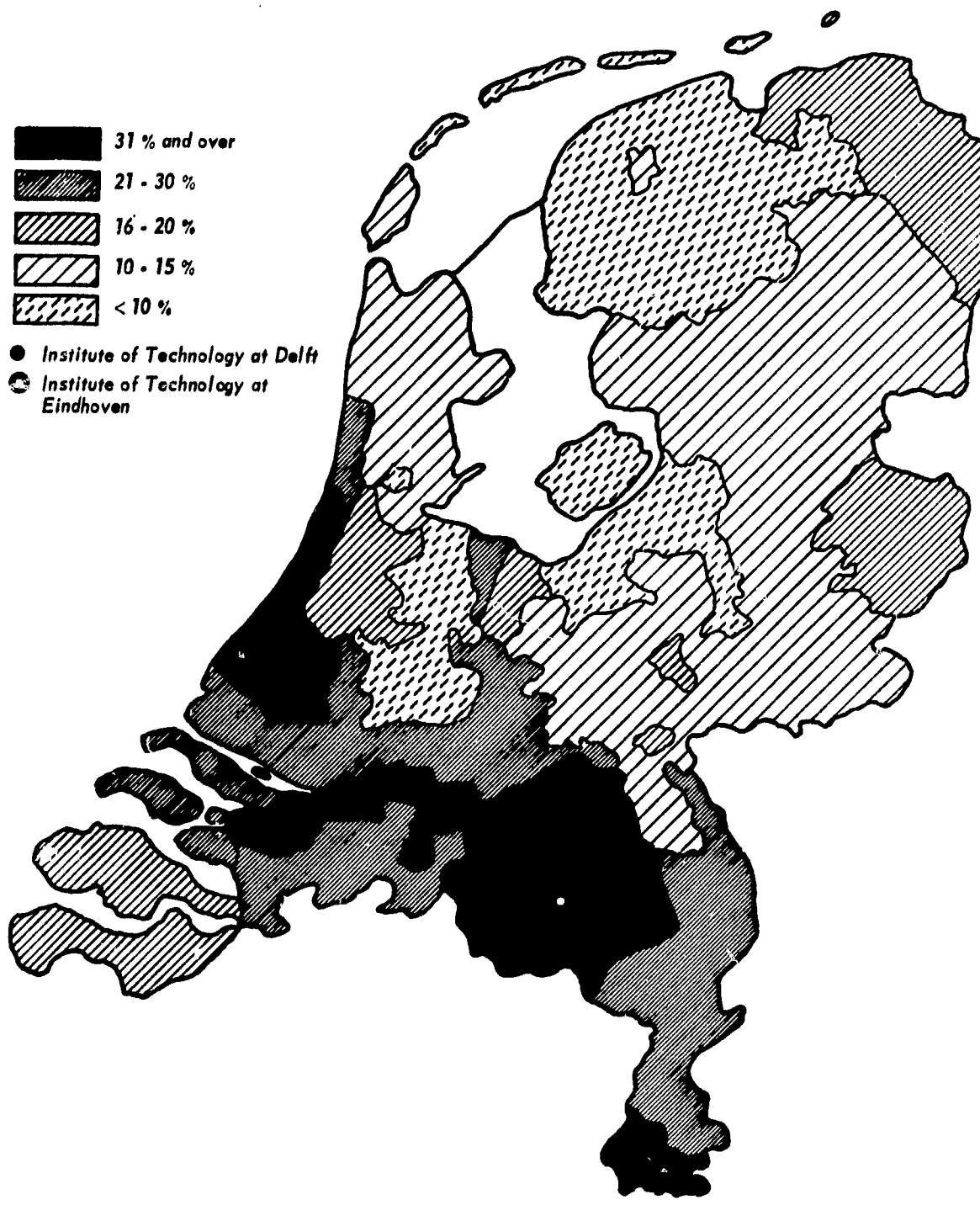
Graph 18. FRESHMEN ATTENDING THE UNIVERSITY SITUATED IN THEIR HOME OR NEAREST PROVINCE AS A PERCENTAGE OF THE TOTAL NUMBER OF FRESHMEN IN THE PROVINCE



Graph 19. NUMBER OF FRESHMEN IN TECHNOLOGY AS A PERCENTAGE OF MALE GRADUATES FROM GRAMMAR AND MODERN GRAMMAR SCHOOLS (SCIENCE SECTION), 1954



Graph 20. NUMBER OF FRESHMEN IN TECHNOLOGY AS A PERCENTAGE OF MALE GRADUATES FROM GRAMMAR AND MODERN GRAMMAR SCHOOLS (SCIENCE SECTION), 1958



A definite change can be seen in the Noordbrabant percentage of freshmen going to the Delft Institute of Technology after the opening of the Institute of Technology at Eindhoven in 1957 (Eindhoven is in Noordbrabant).

Regional distribution

Universities recruit their students mainly from the surrounding neighbourhood[1] and the distribution of freshmen in a region is in relation to the distance from the university, as shown in Table 37.

TABLE 37. PERCENTAGE OF TOTAL NUMBER OF FRESHMEN JOINING UNIVERSITY A, IN RELATION TO THE DISTANCE FROM UNIVERSITY A AND FROM UNIVERSITY B[2]

DISTANCE FROM UNIVERSITY B IN KM	DISTANCE FROM UNIVERSITY A IN KM					
	0- < 10	10- < 30	30- < 60	60- < 100	100- < 150	150 AND OVER
0 — < 10	—	—	4	—	—	2
10 — < 30	—	61	19	2	—	5
30 — < 60	94	82	38	19	14	4
60 — < 100	—	82	67	33	23	7
100 — < 150	—	—	84	60	41	28
150 and over	97	93	87	71	65	50

The table shows decreasing percentages from left to right, i.e. the percentage of freshmen going to a particular university falls as the distance to that university grows and the distance to another university remains constant. Percentages increase from the top to the bottom showing that in regions with the same distance to a particular university the percentages of freshmen going to that university increase with increasing distances to another university.

This table may be used to estimate the change in distribution of freshmen among universities when a new one is opened.

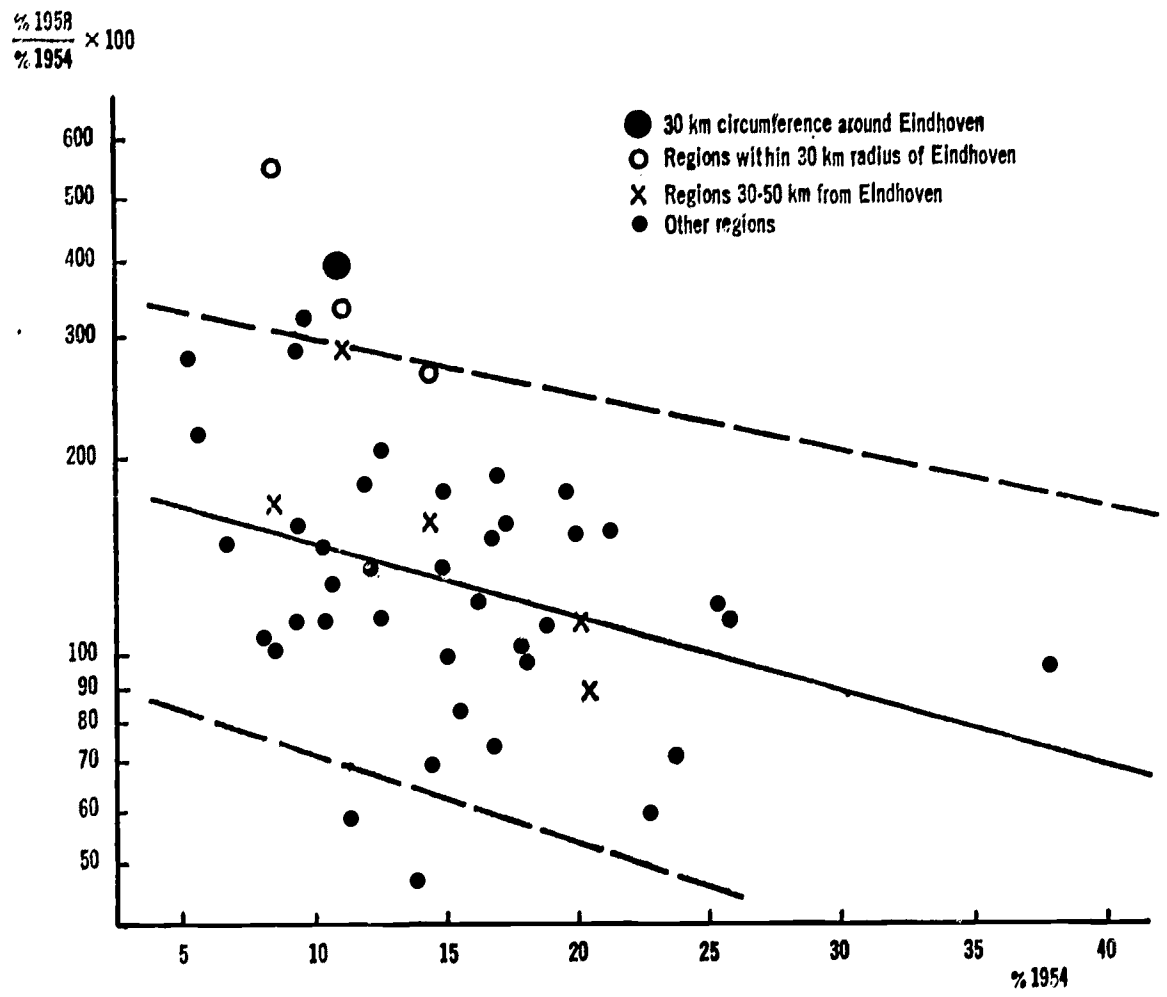
AN EXPERIMENT : THE INSTITUTE OF TECHNOLOGY AT EINDHOVEN

The results of the analyses of the transfer of grammar school graduates to the university, of the choice of faculty, and of the distribution of freshmen in universities discussed in this chapter can be used for forecasting the future inflow of students into the university ; to a certain extent they are of theoretical value only.

1. This does not mean that the presence of a university has a strong influence on the transfer of grammar school graduates to the university but that freshmen prefer to study at the nearest university.

2. The table refers to the four general (State) universities only. This gives six combinations for two universities with corresponding distances and numbers of freshmen per region. The percentages in the table are calculated for the sum of the students of the various combinations in order to exclude, as far as possible, atypical situations.

Graph 21. NUMBER OF FRESHMEN IN TECHNOLOGY AS A PERCENTAGE OF MALE GRAMMAR SCHOOL (SCIENCE SECTION), GRADUATES 1954 AND 1958



The opening of a new Institute of Technology at Eindhoven, in 1957, makes it possible to check the results of these analyses by comparing the situation in 1954 with that in 1958, i.e. one year after the opening of the Eindhoven Institute.

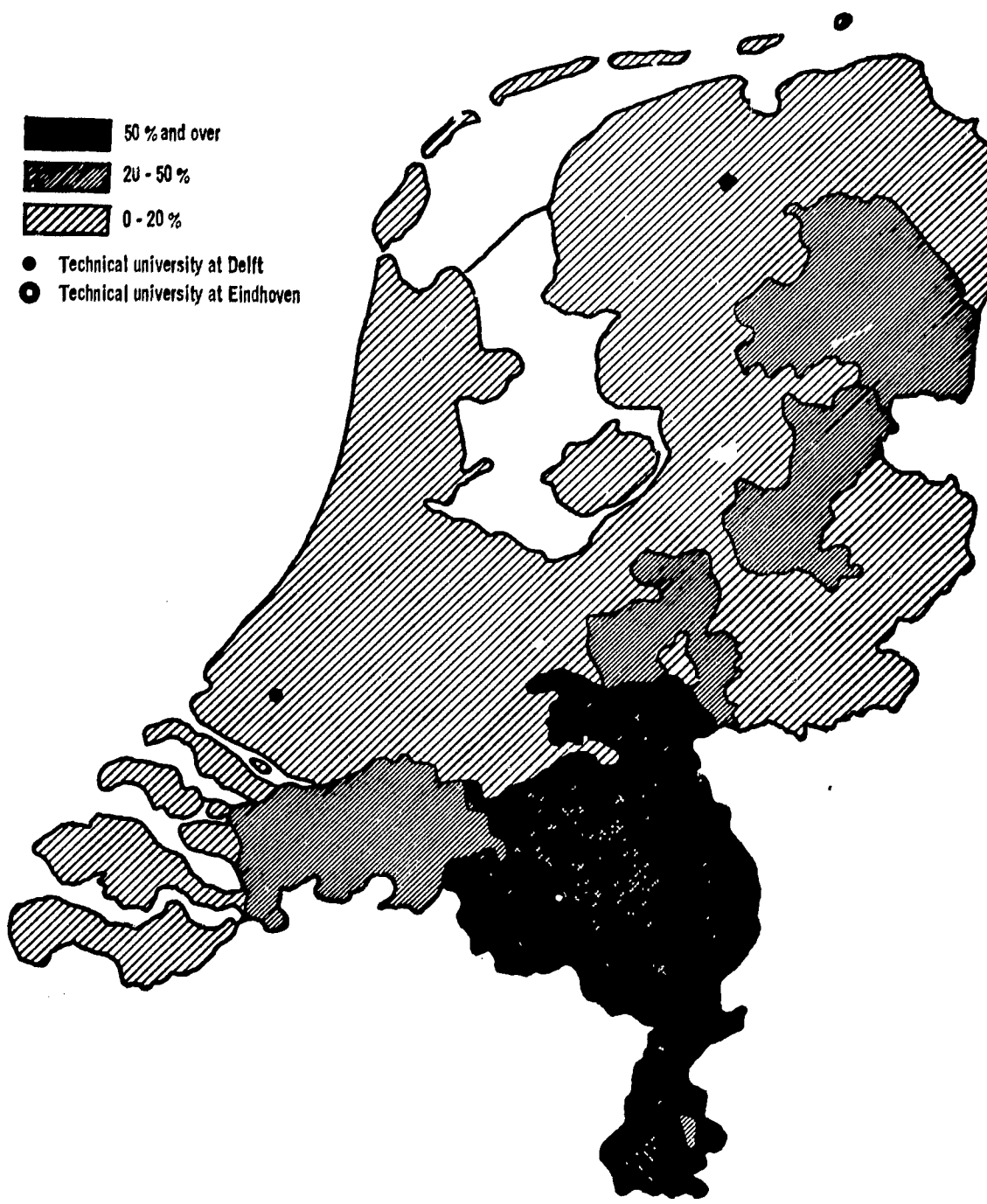
Graphs 19 and 20 show the number of freshmen in technology as a percentage of the male graduates from grammar and modern grammar schools (B section) in 1954 and 1958 respectively.

The graphs show a general increase in the percentages in technology and that the highest percentages are to be found in the neighbourhood of the institutes of technology, namely Delft in 1954, Delft and Eindhoven in 1958. The percentages decrease as the distance from the Institutes increases. This shows that the opening of the Institute of Technology at Eindhoven has increased the number of freshmen as a percentage of grammar school graduates. To what extent is shown in Graph 21.

This graph shows, for regions, the relationship between the number of freshmen as a percentage of male grammar and modern grammar school graduates — science section — in 1954, and the increase in this percentage between 1954 and 1958.

The line in the graph follows the dots representing the regions as closely as possible. The broken lines are so placed that 90 per cent of the dots lie between them.

Graph 22. FRESHMEN AT THE INSTITUTE OF TECHNOLOGY AT EINDHOVEN AS A PERCENTAGE OF THE TOTAL NUMBER OF FRESHMEN IN TECHNOLOGY, 1958



The line shows a slope, indicating that the increase in the percentages was highest in regions where the 1954 percentages were lowest.

Regions within a 30 km radius from Eindhoven show a larger increase not found in regions 30-50 km away from Eindhoven. It then follows that the influence of Eindhoven on the percentage of freshmen in technology has been restricted to a region 30 km around Eindhoven[1].

In this region the 1958 percentage of freshmen in technology had increased to 31. Graph 21 shows that without an Institute of Technology the percentage of 11 in 1954 would have increased to : 1.5 × 11 % = 16 % in 1958. It therefore follows that the percentage of technology has doubled in the Eindhoven 30 km region as a consequence of the opening of the Institute of Technology. This correspond to 40 additional freshmen in technology.

These additional students in technology may or may not mean a reduction in the other faculties. If not, then they are additional freshmen as such. Table 35 shows what has happened in the 30 km region around Eindhoven as compared to all other regions.

TABLE 38. NUMBER OF MALE FRESHMEN[1] IN TECHNOLOGY IN RELATION TO OTHER FACULTIES AS A PERCENTAGE OF MALE, GRAMMAR AND MODERN GRAMMAR SCHOOL GRADUATES, SCIENCE SECTION — 1954 AND 1958, REGIONS

REGIONS	1954		1958	
	TECHNOLOGY	OTHER FACULTIES	TECHNOLOGY	OTHER FACULTIES
30 km around Eindhoven	11	39	31	35
All other regions	16	36	20	40

1. With leaving certificate from grammar and modern grammar schools science section.

In the Eindhoven region the percentage in other faculties fell by 4 while that in other regions increased by 4. This indicates that 8 per cent, or 20 freshmen switched over from other faculties to that of technology in the Eindhoven region as a consequence of the opening of the Institute of Technology.

In then follows that of the 40 additional freshmen in technology 20 can be regarded as additional freshmen as such[2], while the other 20 are at the expense of other faculties.

The influence of the opening of the Eindhoven Institute of Technology on the number of freshmen as a percentage of grammar school graduates was shown to be restricted to 30 km radius from the Institute. That on the distribution of freshmen in technology in both institutes extended over a much greater region, as shown in Graph 22.

1. This is in accordance with the results of the theoretical analysis, p. 122.
2. This figure is comparable to that mentioned in the section headed Regional Analysis, arrived at by the use of a theoretical model showing the influence of a new university on the transfer of grammar school graduates to the university.

Table 39 shows the influence of distance from both institutes on the distribution of freshmen in technology in the institutes.

TABLE 39. FRESHMEN AT THE EINDHOVEN INSTITUTE OF TECHNOLOGY AS A PERCENTAGE OF THE TOTAL NUMBER OF FRESHMEN IN TECHNOLOGY, AND REGIONS, IN RELATION TO THE DISTANCE FROM DELFT AND EINDHOVEN, RESPECTIVELY, 1958

DISTANCE FROM DELFT IN KM	DISTANCE FROM EINDHOVEN IN KM				
	0-<30	30-<60	60-<90	90-<150	150 AND OVER
0 — < 30	—	—	1	1	—
30 — < 60	—	20	7	3	—
60 — < 90	70	51	13	4	—
90 — < 150	80	75	25	8	9
150 and over.....	—	—	64	16	8

An increase in the distance from Eindhoven is accompanied by a fall in the percentage and an increase in the distance from Delft by a rise in percentage.

It should be noted that the Institute of Technology at Eindhoven (in 1958) had only three technological faculties catering for about 50 per cent of the number of students in the 12 faculties at the Delft Institute, so that diagonal percentages of 25 might be expected. As they are, in fact, much lower, it follows that freshmen in technology prefer Delft to Eindhoven, this preference becoming more marked as the distance from both institutes increases. The percentages exceed 50 near Eindhoven indicating that freshmen in the neighbourhood of Eindhoven switched over from other technological faculties to those offered at the Eindhoven Institute.

This means that Table 39 differs from Table 37 in which the distribution of freshmen is shown in relation to distance from universities which are on an equal footing.

The Eindhoven experiment largely substantiated the results of the theoretical analysis given earlier and which therefore may be regarded as a solid basis for forecasting.

FORECASTING MODELS

In the course of time several models for forecasting inflow into university education (or university enrolment) have been used in the Netherlands, and are mentioned below. They are of two types : (*a*) for integral forecasts covering the country as a whole, and giving the total number of students either with or without a breakdown by faculty, and (*b*) forecasts for individual universities. Integral forecasts serve as a basis for estimating total third level educational expenditure and required building capacity and for demand/supply forecasts. The forecasts for the individual universities are used as a basis for their expansion plans, in terms of buildings, finance, and staff required.

(14)

A. *Integral models*

1. The earlier models were based on an extrapolation of the inflow trend into universities as a percentage of the 18-year-old population or on total enrolment in universities as a percentage of the 18-25 age group. As this is a commonly used method no further details will be given.
2. A second model was based on the relationship between university enrolment as a percentage of the 18-25 age group and per capita income (see Graph 10). Extrapolation of income per capita together with Graph 10 gives the future number of students.
   Educational planners find this model very attractive as it puts all the work of forecasting on to the economist who has to provide estimates of future income per capita. It is doubtful, however, whether the educational planner is justified in using the relationship between income per capita and inflow into university education, which is his own responsibility (see page 121).
3. A third model started with an estimate of grammar school enrolment (see section 3, p. 107 for the various models used here), broken down by sex, and which was then used to calculate the number who pass their final examinations, broken down by type of certificate. The figures obtained were then multiplied by the estimated percentage of those who will go to the university to arrive at the total number of freshmen.
   One of the advantages of this model is that its calculations follow step-by-step the course of a pupil from the 6th class of the primary school to the first year of the university.

It has been shown above that grammar school graduates form a constant percentage of first year enrolment, and that the best estimate for the breakdown of graduates by type of certificate is that of recent years and that the best estimate for the transfer of grammar school graduates to the university is a constant percentage. It then follows that this model can be reduced, without any ill effects to one forecasting the number of grammar school first enrolments (with a breakdown by sex) and the number of university freshmen as a constant percentage of grammar school first year enrolments six years earlier.

This model must give the best estimates for the next six years to come for the number of freshmen for these six years is already determined by the number of first year enrolments now in grammar schools.

When a breakdown by faculty was required, two methods were used. In one, the prevailing distribution of freshmen in faculties was taken, in the other the distribution which would balance graduate supply and demand (Table 34). As freshmen did not react to estimated demand the former system has given the best results up to now.

For long-term forecasts the best method might be to start with the existing distribution but assuming a slow adaptation to estimated demand.

B. *Models with a breakdown by university and faculty*

1. One of the models of this type started with an integral forecast (see above) and, assuming a constant distribution of students in the universities, the total number of students was divided among the universities.

After making the corrections these changes require to the inflow matrix, this is multiplied by the outflow table to obtain the new number of freshmen, by university and faculty.

The following example shows the methods by which corrections to the inflow matrix are made.

In the field of technology two changes are expected. The number of freshmen in technology — as a percentage of grammar school graduates — is expected to increase as a result of the increasing demand for graduates in this faculty. This will affect the percentages of technology in all regions. The other change is that a technical university has recently been opened at Enschede (in the eastern part of the country). This will raise the percentage of technology in some regions and change the distribution of freshmen in technology in many regions The national increase in the percentage of technology freshmen will not be the same for all regions ; being bigger where percentages are now low and moderate where they are now high. Graph 21 makes it possible to estimate future percentages for the various regions. A corresponding reduction will have to be made from the percentages for other faculties as the total transfer of grammar graduates to the university will remain constant (section 4, page 116). As there is no systematic relation between the percentage increases in technology and the decreases in others (section 4, page 134), the best solution is for *pro rata* reductions to be made from the percentages for other faculties corresponding to the increase in technology.

The opening of the Institute of Technology at Enschede will mean that technology percentages will increase in the regions which are nearer to Enschede than to the two existing Institutes of Technology. The new percentages for technology in these regions are calculated with the help of the formula given in section 4 (page 132). Part of the increase in the number of technology freshmen represents additional freshmen and part a transfer of freshmen from other faculties. The number of additional freshmen may be estimated on the basis of the experience provided by the Eindhoven Institute of Technology (section 4, page 138). A corresponding deduction should be made from the other faculties for the increase due to transfer.

The total number of technology freshmen thus calculated will be distributed over three Institutes of Technology and we now know their distribution (by region) in relation to relative distance from two institutes only (Table 39). We can therefore, proceed as follows :

Let us assume that the distances from a given place " A " to the institutes at Delft, Eindhoven and Enschede are 125 km, 45 km and 15 km respectively. The table shows that, of the existing number of freshmen in " A " 75 per cent will go to Eindhoven and 25 per cent to Delft, i.e. a Delft-Eindhoven ratio of 25 : 75. If the Institute at Eindhoven were transferred to Enschede, it follows from the table that 80 per cent of the freshmen in " A " would go to Enschede and 20 per cent to Delft, i.e. a Delft/Enschede ratio of 20 : 80. A combination of the two equations shows the percentage ratio of freshmen at Delft : Eindhoven : Enschede to be 100 : 300 : 400.

The new distribution of technology freshmen for the three Institutes of Technology is thus calculated for the various regions and introduced in the inflow matrix simultaneously with the changes in percentages of technology, etc. Since all changes do not take place in the same year, inflow matrices are made for each year in which changes are expected to take place.

First year enrolments and total enrolment

Statistics have been kept for some years showing when students were first enrolled in the university so that it is possible to relate the number of students who stayed x years in universities to the corresponding number of freshmen x years earlier.

Table 40. Breakdown of number of male university students by years elapsed since enrolment as a percentage of the corresponding number of freshmen, and by faculty, 1956/1957

	Number of years since enrolment										
	0	1	2	3	4	5	6	7	8	9	10
Theology	100	85	77	79	72	60	43	33	22	15	12
Law	100	97	93	89	87	58	38	25	18	13	10
Social science	100	86	109	103	76	79	56	25	16	24	18
Medicine	100	92	92	86	92	76	76	70	49	30	17
Dentistry	100	90	90	87	79	81	60	56	30	21	11
Mathematics and physics	100	88	81	83	78	74	63	55	40	30	25
Psychology	100	96	105	112	101	71	72	53	38	35	18
Arts	100	86	82	75	70	65	53	45	38	21	21
Economics	100	83	72	77	75	64	54	43	26	18	17
Veterinary science	100	75	85	100	100	76	66	27	19	15	11
Technology	100	92	83	82	74	65	49	36	19	13	8
Agriculture	100	90	87	67	67	60	41	27	11	16	5
Total	100	89	84	83	79	68	56	44	28	20	14

Percentages sometimes exceed 100 and are sometimes higher than for the preceding year showing an influx from other faculties.

Table 40 is similar to that for grammar school pupils (Table 18), but whereas Table 18 was made after tracing first year enrolment in a given year, over nine years, Table 39 was made by combining the statistical material for one year (number of students by years since first enrolment) with that for several years (number of freshmen by faculty in successive years).

When the number of freshmen is estimated for successive years, the total number of students enrolled can be calculated by using Table 40, in the same way as Table 18 allows the total number of grammar school pupils to be calculated when the number of freshmen in successive years is given.

Table 40 can be made for any year and for the various universities. The material collected is still too scanty however to permit the analysis of variations in the percentages.

Number of graduates

The best method for calculating the number of university graduates when the number of first enrolments is known is to use a table similar to that for grammar school graduates (Table 20).

Such a table exists for graduates who were first enrolled in the university in the years 1930-1932 and for undergraduates who were first enrolled in the years 1948-1950. The latter table will be completed shortly, and will give the number of graduates as a percentage of the corresponding number of freshmen, and the number of years elapsed since first enrolment.

Lack of statistics meant that post-war forecasts of graduates had to use the figures relating to the 1930-1932 freshmen, or those showing the number of graduates as a percentage of freshmen seven years earlier.

TABLE 41. BREAKDOWN OF THE NUMBER OF GRADUATES 1955-1957, AS A PERCENTAGE OF THE CORRESPONDING NUMBER OF FRESHMEN SEVEN YEARS EARLIER, BY FACULTY AND SEX

	MALE	FEMALE
Medicine	75	55
Dentistry	80	35
Mathematics and physics	60	40
Arts	65	35
Geography	60	30
Law	75	50
Economics	50	30
Social science	50	30
Psychology	65	30
Technology	60	—
Veterinary science	70	35
Theology	70	60
Agriculture	60	50

Selected bibliography[1]

Statistical committee of the Universities' council :
" Number of university graduates up to 1980 ", Zeist, 1959.

" Report from the Grammar School Committee ", The Hague, 1955.

Netherlands Economic Institute : " Investigation into the need for university education in Rotterdam ", Rotterdam, 1954.

*H. Linneman : " Forecasting the demand for higher education in the Netherlands ". Netherlands Economic Institute, Rotterdam, 1962.

Central Bureau of Statistics :

" Calculations concerning the future number of students and graduates, 1956-1970 ", Zeist, 1956.

" Analysis of inter-regional differences in university enrolment " in " Statistische en econometrische onderzoekingen ", 1st quarterly bulletin 1958, Zeist, 1958.

Central Planning Bureau :

" Investigations into future economic growth in the Netherlands 1950-1970 ", The Hague, 1955.

" Number of students at the Leyden University up to 1980 ", 1960.

" Number of students at the Groningen university up to 1980 ", 1962.

R. Ruiter and M. Eisma : " The effect on the number of students of a more even distribution of universities throughout the country ", reprint series no. 74.

R. Ruiter and J. Passenier : " The first impact of the New Institute of Technology at Eindhoven ", reprint series no. 75.

R. Ruiter and J. Hoogenhout : " Enrolment in university education ", reprint series no. 84.

R. Ruiter and J. Passenier : " Number of students at the new Institute of Technology at Enschede up to 1980 ", in Economisch-Statistische Berichten, 1962.

1. Publications are in Dutch with the exception of*.