A Biographic Theory of Fertility and Empirical Findings from a German Biographical Survey*

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1. Introduction

The metaphorical phrase that "the history of philosophy is simply a chain of footnotes to Plato" can be applied in a parallel way to the importance of Malthus for the history of the theory of human reproduction.

This is rather astonishing since Malthus' theory corresponded not to the demographic reality in its trivial form, a critique levied not only by social theorists but also by the more mundane, e.g. by L. von Brentano. Nevertheless, Malthus' approach proved to be exceptionally fruitful. Even nowadays the effects of his theory can still be detected in international development policies; even modern, micro-economic, theory of human reproduction (G. Becker) is based on the Malthus postulate that – ceteris paribus – people have more children the better off they are. It is only recently that the most widely known population theory, the theory of demographic transition, has broken with the Malthus tradition in establishing a negative relationship between prosperity and the average number of children. Many social scientists, however, are of the opinion that the theory of demographic transition is not really a theory but only a description of demographic tendencies because it doesn't offer concrete explanations. This criticism is, partially, unjustified since G. Mackenroth's population theory, the most detailed transition theory variant to date, is considerably more than mere description of facts. Mackenroth's hypothesis ist that – in the long run – the level of fertility will not sink lower than the level of reproduction needed to maintain the population. This hypothesis is presently being implicitly rejected by developments in industrialized nations so that demographers now speak of "the second phase of demographic transition" (van de Kaa).

The history of human reproduction theory is certainly not a scientific success story. This is because the study of the phenomena of human reproduction, which since the beginning of the 19th century extracted from its origin, the philosophy, has been so increasingly and independently subdivided in the process of division of labour between the academic disciplines that a view of the forest as a whole is obscured by mulittudes of single trees. The process, however, could have taken a different turn. Charles Darwin read Malthus and founded – according to his own words – his theories of evolution and selection of the fittest on the same basis that Malthus had formulated his "principle of population". The common historical roots of Malthus' social scientific theory and Darwin's biological theory point the way towards fruitful interdisciplinary co-operation which for a theory of the complex phenomenon of human reproduction – and a more complex phenomenon is scarcely imaginable – is particulary important.

2. Biographic Theory and Biographic Survey

Any theory of human reproduction has to take account of the fact that an individual's behaviour and acting can be freely chosen from a number of alternatives but, on the other hand, that he is effectively not free to choose the alterantives that are available for selection. An analogy can be made with the structure of a tree; biographic decisions can only be made on the basis of the results of earlier decisions, just as a tree can only grow new branches out of those already existing. The same analogy can also be applied to the following aspect: just as a tree as a whole is made up of the sum of its trunk, branches and twigs, the biography of an individual is made up – in addition to his actual course through life – of the sum of all possible (but not realized) routes that have existed and still exist in his consciousness. On the basis of this analogy the following terms can be defined which are needed for the formulation of subsequent, operational, hypotheses. The term *"biographic element"* as the basic biographic unit is used to describe all the various stages, phases and points in the development of a biography. Biographic elements can be classified, for example, as the group of economic elements (professional or occupational training, the various stages of the working career, changes of job, changes of occupation, etc.) which in temporal sequence is called the *"occupational biography"*. The *"family biography"* consists of elements such as "marriage" or "birth of the first child", the *"social biography"* of elements like "leaving home", "establishing a household with a partner", "the beginning or end of an affair or friendship", etc. In an analogous way the various phases of development of the personality can be summarized as the *"psycho-biography"* (Ch. Bühler). According to the problem at hand, other sub–biographies can be created and examined. An important sub–biography, for example, is the *"migration biography"* which is understood as the chronologically ordered set of places of residence. Such a chronological order is termed a *"biographic sequence"*. For the set of all possible combinations and sequential permutations of biographic elements the expression *"biographic universe"* is introduced, and for its subset which, for a given individual, is both without logical contradiction (the second child cannot com before the first!) and relevant for his behaviour the term *"virtual biography"* is used.

The questions of which elements are contained in a biography, in which order these should occur (marriage always before the birth of a child?) and which types of biographies are open to which social groups, and which not, are those with which historical theory is confronted. The central hypothesis of the biographic approach has to be formulated at the personal level so that historical hypothesis which describe

relationships between phenomena on a macro-level are firmly achored at the level of the individual. The central hypothesis of the biographic approach postulates that the greater the freedom of biographic choice there is (measured by the number of alternatives in the biographic universe or in the virtual biography) the greater is the risk to be associated with an irreversible, long-term, decision in life, and thus the smaller the probability that such a decision will actually be made. The hypothesis is valid in a particularly pregnant way for the biographies of couples since, in addition to the problems occuring in each individual biography which has its own internal dynamics, synchronization problems and conflicts arise when the biographies of the man and the woman concerned do not conform.

The size of the biographic universe and the virtual biography depends essentially on the *region of habitance*; the actual occupational, social and cultural opportunities in life are determined by the conditions prevailing at concrete locations and not by those reflected by national averages. The risk associated with long-term decisions in life could well vary more for a given cohort from region to region than between cohorts separated by one to two decades in a given region. Spatially differentiated data is therefore necessary for an empirical examination of biographic theory.

The biographic survey to be described here was conceived and performed after the theory was developed. Consequently the survey sample (n = 1,576) contained two exactly defined cohorts (50% men and 50% women born in 1950 and 1955 and 10% couples) in eight chosen municipalities which in turn belonged to three regional types:

Regional type 1: the state capital cities of Düsseldorf and Hannover,
Regional type 2: Ruhr area cities of aging industrial structure, and
Regional type 3: peripheral rural communities.

The cohorts 1950 and 1955 were so chosen that these people had contrasting labour market opportunities at the age of 20. Therefore the cohorts were termed "labour market cohorts". The men and women of the 1950 cohort started their working life at a time of full empolyment, the 1955 cohorts at a time of mass unemploymnt. It is important that both the younger and the older cohort were acquainted with modern contraceptive methods, otherwise inter-cohort comparison would not be valid.

The interview techniques used did not follow the usual practise in which the curriculum vitae is repeatedly gone through with questions on the occupational biography and then again on the family biography, etc; the qustions to the various sub-biogra-

phies were posed together. Based on the job a person had at a particular time questions were asked on the personal situation at that time. For each job a separate questionaire was effectively gone through. In this way even the most complicated biography – with 27 different jobs – could be satisfactorally recorded. The average interview time was 124 minutes but large variations occurred in both directions depending on the individual level of complication. For single people with no partner the interview was much shorter than for a married person.

Although it was not the objective of the investigation to arrive at statements on generative behaviour for the nation as a whole, the arithmetic mean of the cohort fertility rates of the women *and* men in the eight municipalities proved to be representative for the Federal Republic; the difference between the number of children per woman for the sampled 1950 cohorts and for the nation as whole was only 0.4%.

3. Methods and Empirical Results

3.1 General Remarks

The empirical analysis methods used were chosen primarily from considerations of the biographic theory. Whether multiple regression analysis in classical form or whether as the so–called event history analysis should be used – such, and other similar questions, were decided upon the basis of the substance of the theory. This meant that the statistical analysis methods used were not previously determined and also not confined to partucular types but were freely chosen for each particular aspect of the investigation. It is in fact the case that all the usual multi–variate methods are not particularly well suited for the analysis of data to the *strictly longitudinal* orientated biographic theory. Nevertheless, they were used, but more suitable alternatives were also investigated – the dendrogram analysis, for example, proved to be particularly useful for investigating biographic branch models.

The multitudinous empirical results can be categorized as follows:

(I) Elementary descriptive facts,

(II) Results arisings from separate cohort analyses of the occupational biographies, the family biographies, the migration biographies and other sub–biographies,

(III) Results obtained from analysis of the relationships occurring between the occupational, family, migration and other sub-biographies, and

(IV) Results of the analysis of biographic sequences, for example, by means of dendrogram analysis of biographic branch models.

This presentation concentrates on summarizing the most important results arising in the areas (II), (III) and (IV). In the first area the most significant points to be made, are briefly the following:

(1) It was important in all analyses to differentiate between the "original" regional population (i.e. those born in the respective regions and without interruption always living there) and the regional population accumulated by in-migration. The original population differs significantly in its reproductive occupational and migration behaviour, just as the theory predicts.

(2) Generative behaviour can be differentiated according to connection with religious belief but not by religious confession.

(3) Marital status and nuptiality differ strongly according to regional type as do the number of children and their timing.

(4) The level of the acquired school education and of occupational qualifications correlate negatively with the number of children.

(5) A decisive factor for the number of children in all regions was the occupational status of the woman (fully employed or part-time, unemployed, etc.).

3.2 Partial Cohort Analyses of Biograpghic Processes

(a) Nuptiality

Marriage behaviour differs between the regions considerably more than between the cohorts. Men and women in the state capital cities (Regional type 1) marry considerably less frequently and later than those in the Ruhr cities and in the surveyed rural municipalities. The younger cohorts show lower nuptiality rates and more differentiated regional behaviour than those born in 1950.

(b) Fertility

Generative behaviour changed significantly in the five years that separate the 1950 and 1955 cohorts. An inter-cohort comparison of those 31 years old showed that the average number of children sank from 1.30 to 1.09 for the women and from 0.91 to 0.85 for men. The proportion of childless women of 31 years of age climbed from 25% to 33%, for men from 40 to 47%. In the state capitals the proportion of childless women rose from 34 to 49%; in the rural areas the proportion doubled although here it was the lowest of all the regions examined (increase from 10% to 20%).

(c) Economic Activity

The "activity rate" measures the age specific proportion of those occupationally active among all those belonging to a certain regional labour market cohort. The differences occurring between the cohorts and regional types were considerably less for men than for women. The cohort comparison showed that the proportion of women with the intermediate school examination increased from 20 to 28%, of those with university entrance qualifications from 14 to 23% and of those with a university or technical college degree from 13 to 20%. The differences in the activity rate between the female cohorts exists principally for those under 30 years old. The maximum activity rate occurring for the older cohort was 72%, for the younger 65%, but for those above 30 the activity rate for both cohorts decreases by approcimately 50%.

Strong regional differences existed in the activity rate structures for women. The principal difference was in the decrease in the activity rate that occurs when they enter the family phase of life. The largest decreases were registered in the regional types 2 and 3. In the Ruhr Cities the activity rate fell from 79% at the age of 19 to 45% at 28 years old, in the rural areas from 73% at the age of 21 to 30% at 27. In the state capitals surveyed the decrease is less and the final level achieved was considerably higher at 60%.

(d) Spatial Mobility

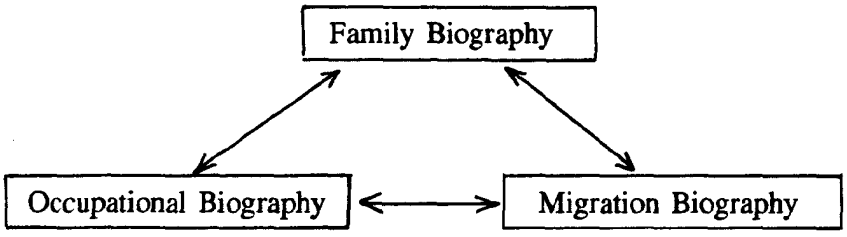
An examination of spatial mobility was carried out on the basis of indicators, in particular the number of places of residence occurring in the biography and the resulting *coefficient of transition*, which is a measure for the dynamics of the migration sequence defined as the relative frequency of change in settlement type to which

the place of residence belongs; a change of place of residence either involves a change of settlement type (e.g. from a village to a city) or not (e.g. migration from one city to another).

The principal result of the analysis was that the regional differences in migration behaviour were considerably greater than differences between the cohorts, or between the sexes. The number of changes of residence was highest in the state capitals and lowest in the Ruhr cities. In the rural areas it was nearly as high as in the state capitals. The dynamics of the migration process in terms of the coefficient of transition decreased steadily from the capital cities through to the rural areas. In all regional types the mobility correlates positively with educational level and with the number of different jobs held. The unemployed were more mobile than those economically employed.

3.3 Simultaneous Analysis of Biographic Processes

As the biographic theory postulates, strong relationships exist between the sub-biographies, in particular between the occupational, family and migration biographies:



Relationships were investigated using multiple linear regresion analysis whereby it was necessary to differentiate the functions fitted according to regional type, cohort and sex. The regional differences were again dominant.

(a) Dependence of the Occupational Biography on the Family and Migration Biographies

The dependent variable investigated was the "total length of time of the different phases of occupation" in the biography. The dependent variables were:

Occupational biography:	number of occupational training courses, amount of time at school, length of period of occupation training/ education
Unemployment:	number of periods of unemployment, total time of the periods of unemployment
Family biography:	number of children, age at marriage.

The regressions performed for the women in the two state capital cities were dominated by the number of children and the length of occupational training ($r^2 = 0.58$). Women in the Ruhr area cities have lower activity rates and the period of economic activity is relatively short. The dominant factor here was the number of occupational phases. The occupational training times are short and have little significance; the same applies for the periods of unemployment. The negative influence of the number of children on the total period of employment is significant but smaller than in regional type 1; the positive effect of the age at marriage is also significant and larger than that for regional type 1 but the coefficient of determination is only half as much as for region 1 ($r^2 = 0.29$).

The function obtained for the regional type 3 had a different structure. It was only in this type that the total amount of time spent at school had a significant positive influence on the period at occupation. In contrast to region 2 are here the total period and number of phases of unemployment of significance. The explanation was relatively good ($r^2 = 0.51$). The influence of the migration biography (number of places of residence after the age of 16) is negatively significant in regional types 2 and 3, for region 1 no significant effect could be found.

(b) Dependence of the Family Biography on the Occupational and Migration Biographies

The dependent variable of this investigation was the number of children per woman (and per man) up to the time of the survey. For the females of the 1950 cohort three variables had a significantly negative influence, the period of occupational training, the total period of economic activity and the age at marriage. The women of the 1955 cohort proved additionally to have negative effects from the length of time at school, number of phases of unemployment and the length of time at the present (surveyed) place of residence. The differences to the cohorts of 1950 are explicable

in that the younger cohorts had more difficulty in unifying their occupational an family objectives as a result of the more unfavourable labour market.

The men of the 1950 cohort proved to have only their age at marriage as a significantly negative influence on the number of children: for the 1955 cohort the number of periods of unemployment was also significant.

(c) Dependence of the Migration Biography on the Occupational and Family Biographies

The dependent variable in this case was the number of places of residence from the ages at 16 to 36 (1950 cohort) or 16 to 31 for the 1955 cohort. In the regional type 1 the number of occupational phases, the total time spent in the school systems, the total period of occupational training and the number of children had positive influence. In regional type 2 the number of occupational training phases and the number of phases of unemployment were additional significant positive factors, and the total period of economic activity a negative factor. In the rural areas surveyed only three independent variables turned out to be significant, the number of occupational training phases (positive), the total period of unemployment (positive) and the total period of economic activity (negative). Thus in this category it was also confirmed that the various relationships are regionally specific.

3.4 Sequence Analyses and Dendrogram Analyses of Biographic Processes

The analysis of biographic sequences and biographic branch models required more particular statistical methods than those of multiple regression. Dendrogram analysis is a suitable method. Other methods based on Markov processes are also suitable for analysing the relationships between biographic processes. The application of these analyses and models provided the results described below.

(a) Family Biography and Migration Biography

Investigation of the separate probabilities for the first to fifth change of location of habitation shows that these all have a very high level between the ages of 18 and 30. Above the age of 30 the probabilities of a further move decline, and the reduction is higher for the first and second moves than for the third, fourth and fifth. From the age 26 the probability of a second (after the first) change is even higher than that for

a first move for those who – until then – had not changed their place of residence at all. It can therefore be seen that a polarization of the population occurs into a group with higher and a group with lower spatial mobility. This separation also re-occurs in an analogous way in that two sub-groups emerge for those with higher mobility since the probability for a third move is smaller than that for a fourth move, three having already taken place.

Moving house generally occurs *before* the birth of a child. The fact that the child is there, however, appears to influence the migratory behaviour. The relationship is u-shaped; after the first child the probability of moving the nth time to the (n+1)th residential location falls, after the second child it decreases further but only slightly, and after the third child it increases considerably. The relationship found between fertility and migration were, however, specific for each of the three regional types investigated.

(b) Family Biography and Occupational Biography

If the simple differentiation into three phases:

L = professional, occupational, vocational training
E = phase of work
F = family phase

is made then 86% of all women start their life after school with training, 13% go immediately to work and only 1.4% enter a family phase. For women 60% of all biographies start with the sequence LE... and only later – but by no means in all sequences – does a family phase occur.

Women who have acquired a high level of education frequently have had two periods of occupational training (LEL), those at lower levels mostly have sequences of the type LE or LEF. The most frequent combination is that of poor educational/occupational training level and the sequence LEF as well as longer sequences based initially on LEF... The actual type of occupational training and the biographic sequence are related but differently in each of the regional type investigated, because of regional differences in living conditions and on the labour market.

Women with average levels of education have the fewest children, women with poor qualifications have the highest number of children. The relationship between educa-

tional level and the number of children, however, ist more complicated than previously assumed – it also depends on the type of biographic sequence being considered. Sequences of the type LE demonstrate an average number of children with the usual U–form, the number first decreases with increasing levels of education but climbs again at above average levels. The relationship for sequences of the type LEF, however, is linear, the higher the level of education, the lower the number of children. The sequence LEFE shows a reverse trend to the sequence LE; the average number of children first increases with educational level but decreases again from average to high levels of education. The three different relationship types, U–form, linear and inverse U–form, are in their trend the same in all three regional types investigated but have regionally specific levels and first derivatives.

For those women who re–enter the labour market after having a child the average number of children is approximately 30% lower (comparison of the sequences LEFE and LEF). This effect is the most noticable in Düsseldorf and Hannover and the least in the Ruhr cities investigated.

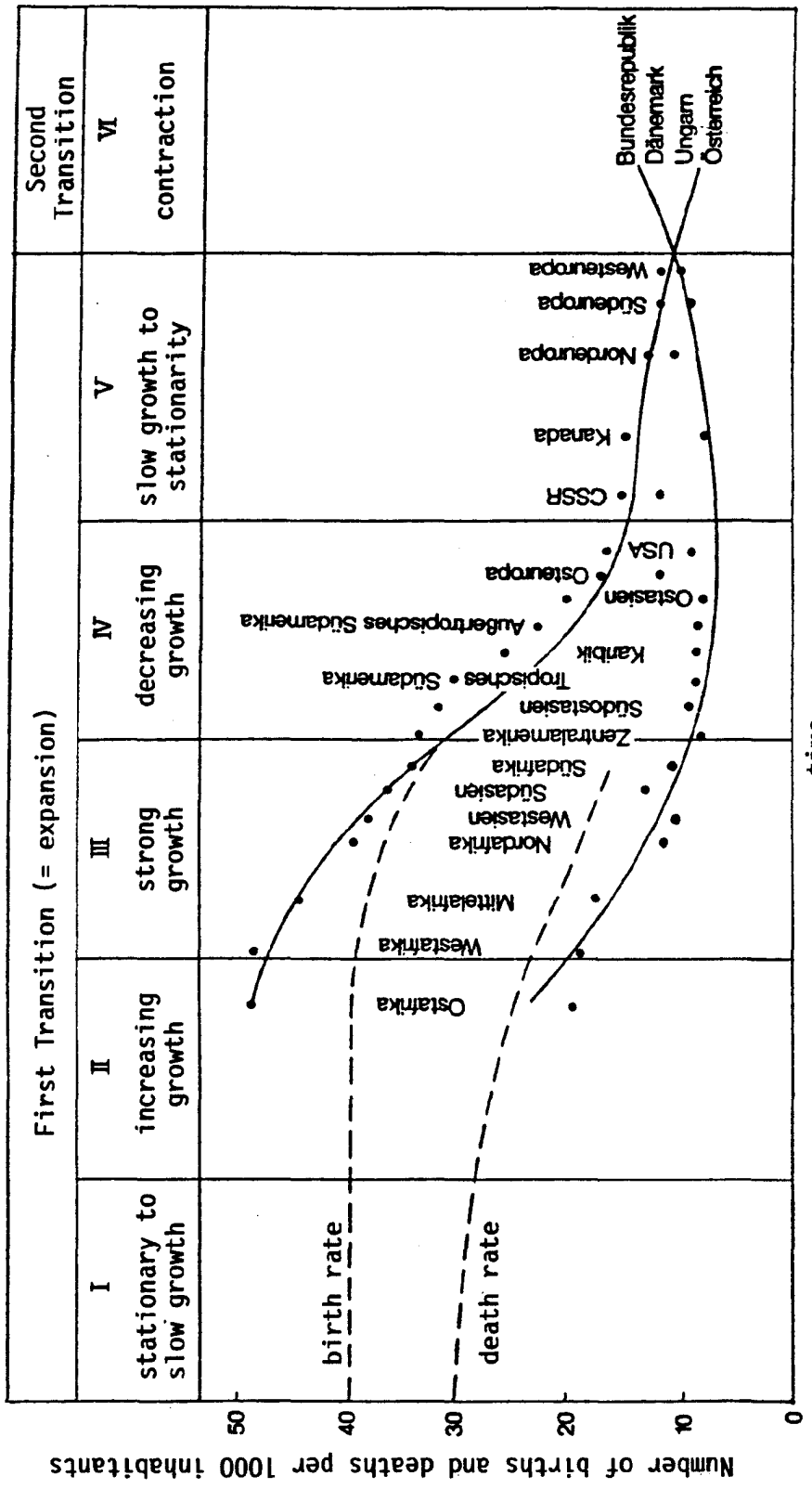
4. Conclusions

The hypotheses of the biographic theory of human reproduction, which postulate that the virtual biography is significantly affected by the regional circumstances of life, allow therefore the conclusion that there must occur considerable regional differences in the reproduction rate, at least for the long–standing regional inhabitants. The survey performed fonfirms this theoretical conclusion. The regional differences occurring in fertility, and also in age at marriage, the level of economic activity of women, their educational levels and migration behaviour, are larger than those occurring between the two cohorts surveyed. But the differences in behaviour between the cohorts also followed theoretical expectation. Further statistical analysis of the data collected should provide additional confirmation. It is important to note that the whole area of values, personal attitudes and individual objectives, on which a large volume of information was also obtained, has not yet been included in the empirical analysis, but that nevertheless satisfactory results with respect to the theory have still been achieved. This fact raises the question as to whether the sphere of personal values is more affected by regional economic and other circumstances than normally assumed.

In the social sciences, as opposed to the natural sciences, it is usually not possible to perform experiments. But because people actually do live under widely differing regional conditions, it is possible to observe and regard regional phenomena as the result of parallel development processes occuring under different conditions, and to analyse them exactly as experiments performed in the course of time. The empirical analysis of the regional experiments described in this paper provides extremely good evidence of confirmation of the biographic theory.

Figure 1

Phases of Demographic Transition 1987, Including the Phase of Contraction

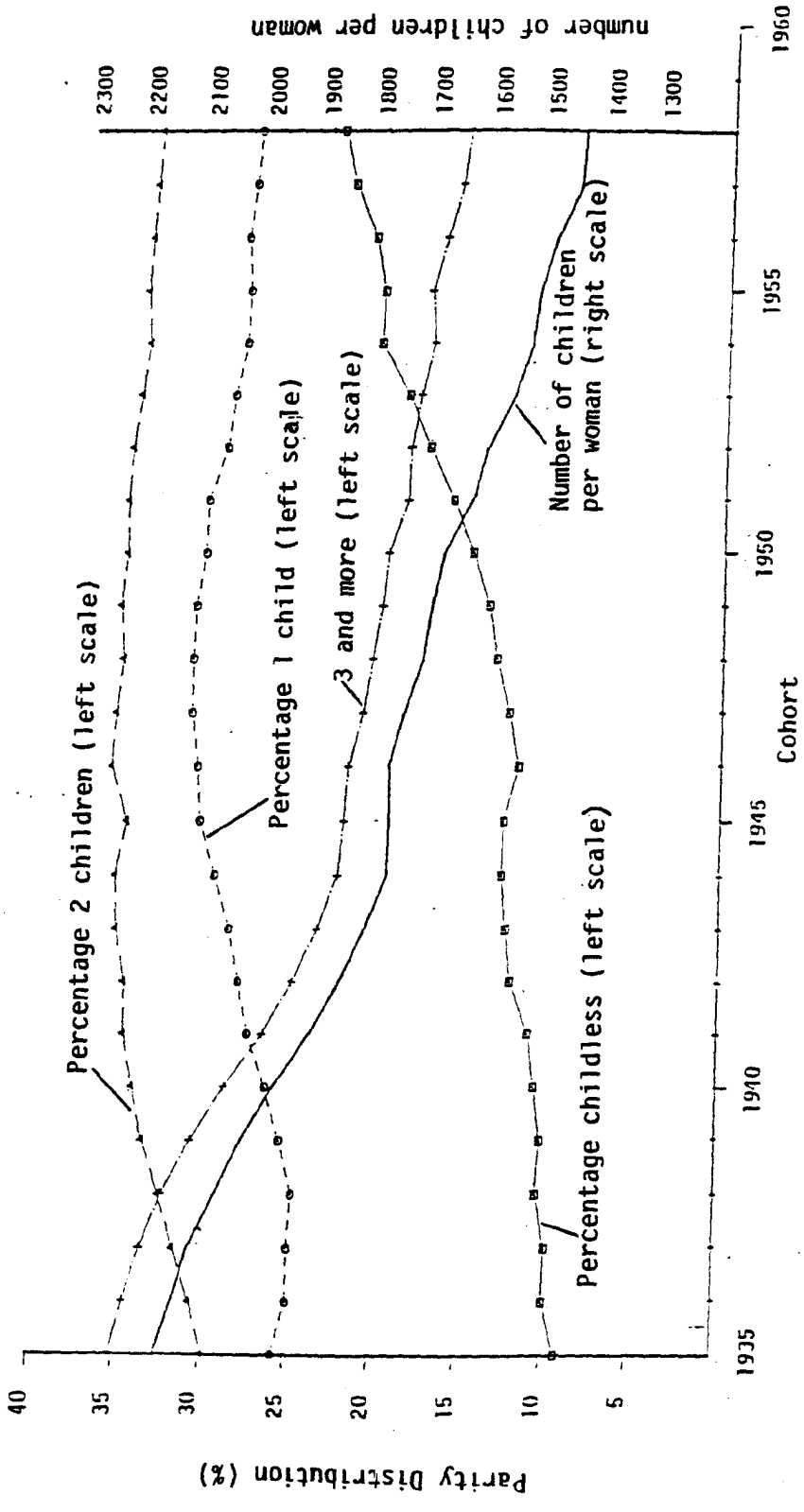


----- Europe from 1820 to 1920

Source: H. Birg: Die demographische Zeitenwende. In: Spektrum der Wissenschaft, German Issue of Scientific American, January 1989.

Figure 2

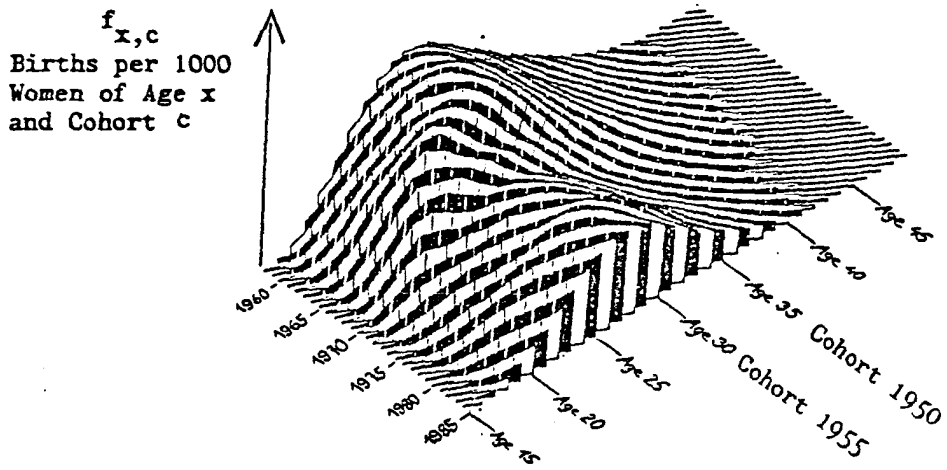
Number of Children per Woman and Parity Distribution of the Cohorts in the Federal Republic of Germany after the 2nd World War



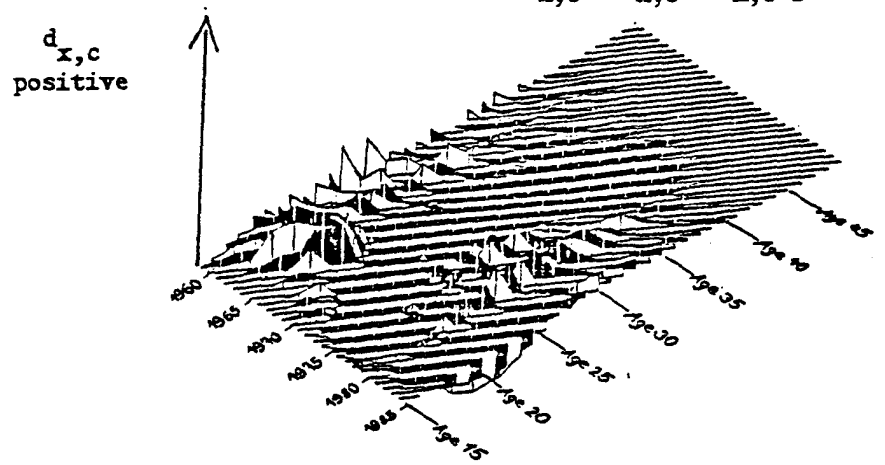
Source: H. Birg, D. Filip, E.-J. Flöthmann: Paritätsspezifische Kohortenanalyse des generativen Verhaltens in der Bundesrepublik Deutschland nach dem 2. Weltkrieg. Materialien of the Institute for Population Research and Social Policy, University of Bielefeld, Vol. 30, Bielefeld 1990.

Figure 3

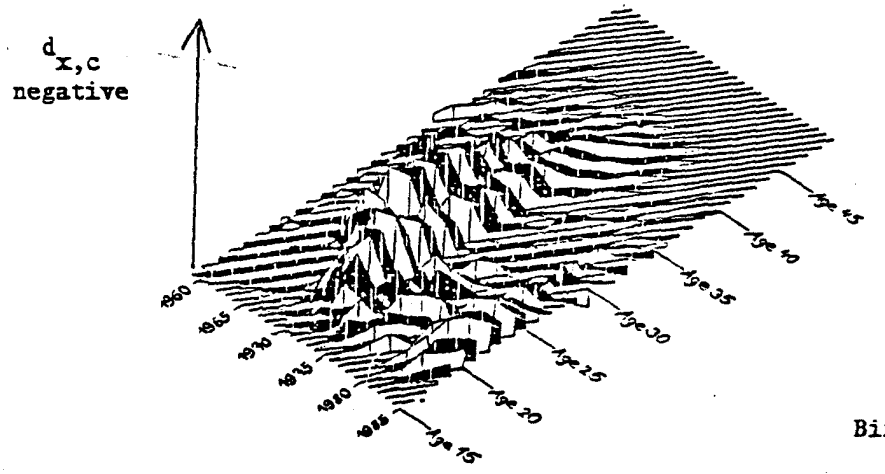
(a) Age and Cohort-Specific Birth Rates ($f_{x,c}$) of the Cohorts in West Germany in the Lexis-Space



(b) Positive Differences Between the Age Specific Birth Rates of two Successive Cohorts ($d_{x,c} = f_{x,c} - f_{x,c-1}$)



(c) Negative Differences Between the Age Specific Birth Rates of two Successive Cohorts



Birg and Filip 1989

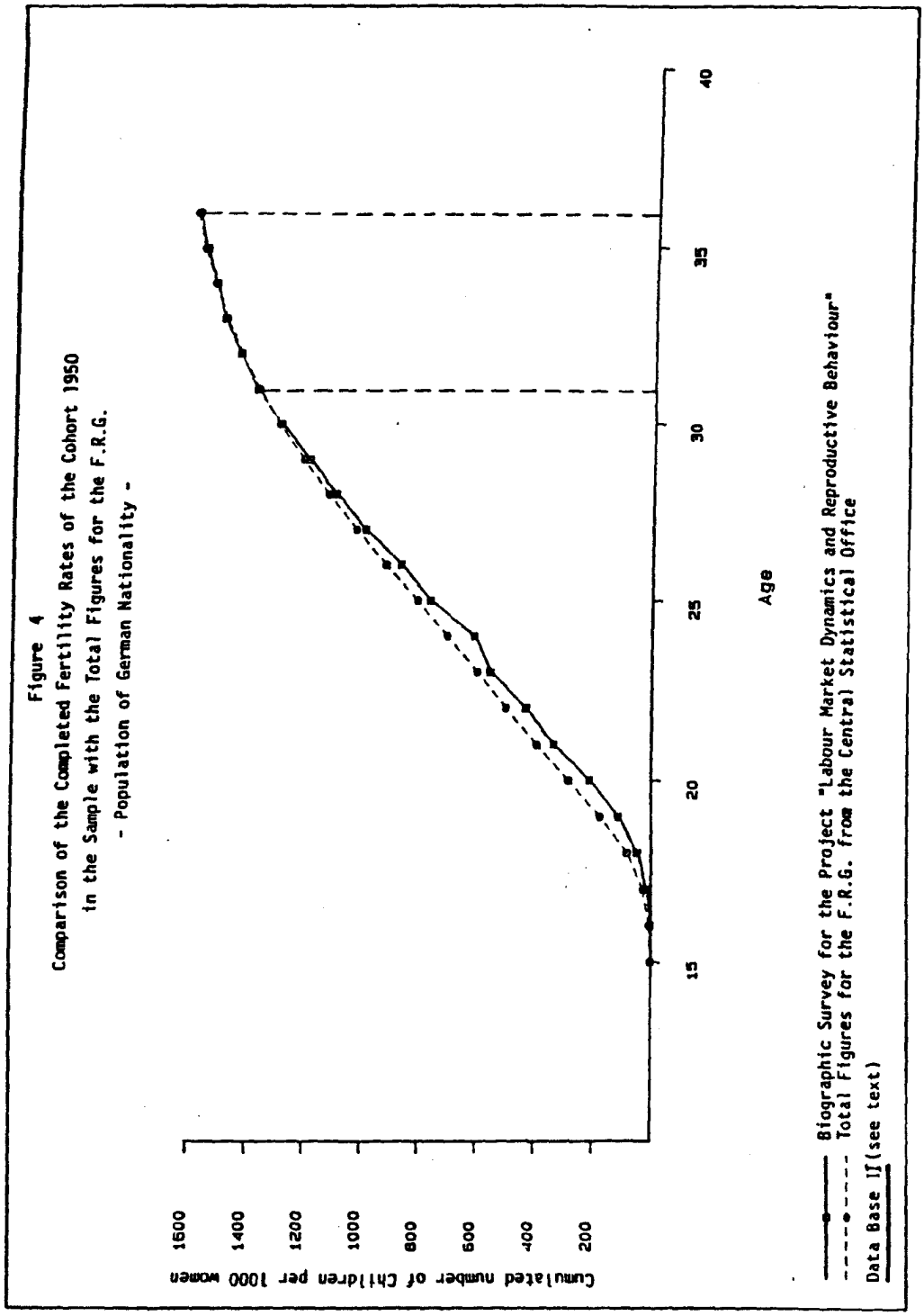
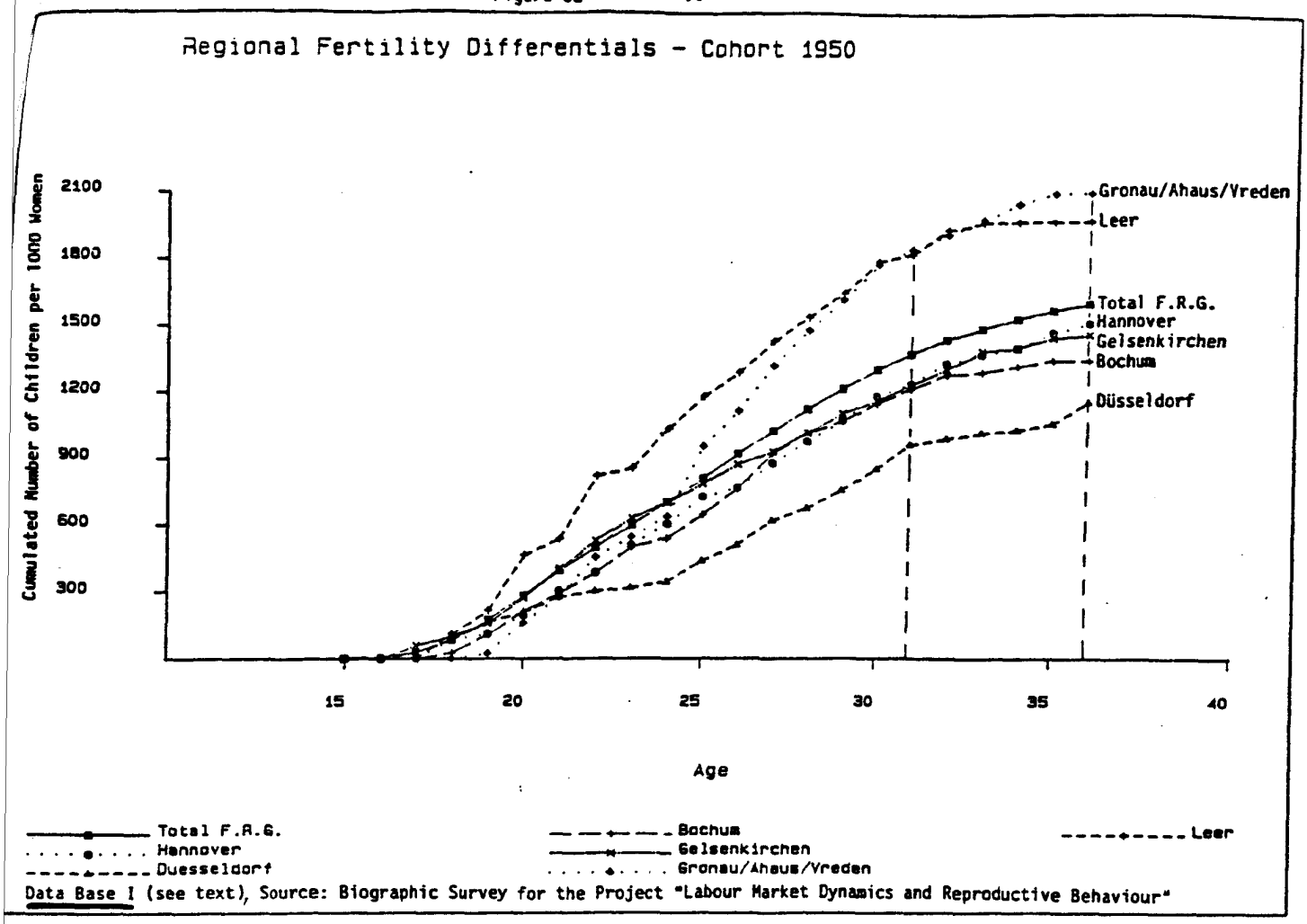


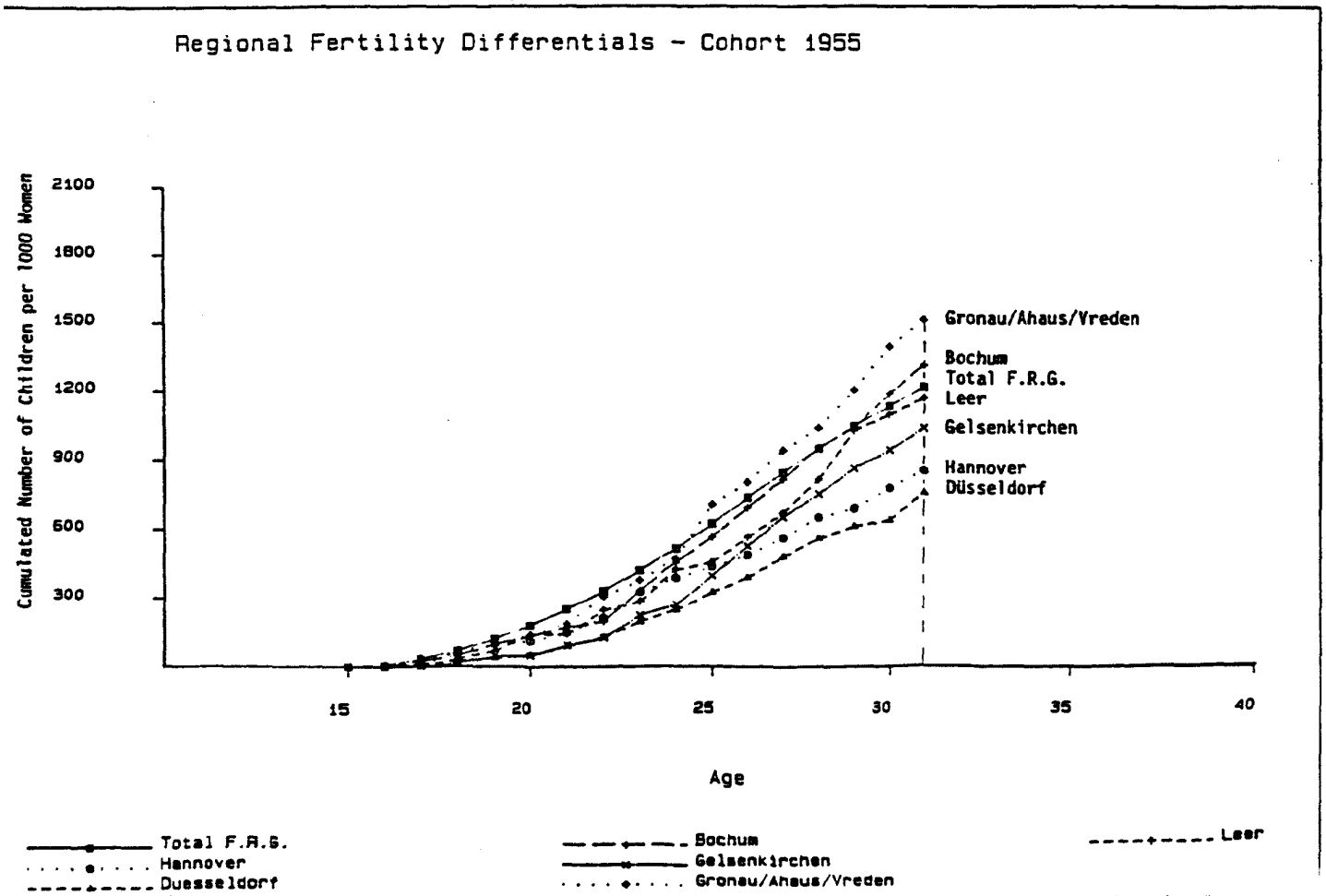
Figure 4
Comparison of the Completed Fertility Rates of the Cohort 1950
in the Sample with the Total Figures for the F.R.G.
- Population of German Nationality -
Cumulated number of Children per 1000 women
1600
1400
1200
1000
800
600
400
200
15
20
25
30
35
40
Age
Biographic Survey for the Project "Labour Market Dynamics and Reproductive Behaviour"
Total Figures for the F.R.G. from the Central Statistical Office
Data Base II (see text)

Figure 5a



Data Base I (see text), Source: Biographic Survey for the Project "Labour Market Dynamics and Reproductive Behaviour"

Figure 5b



Data Base I (see text), Source: Biographic Survey for the Project "Labour Market Dynamics and Reproductive Behaviour"

Figure 6a

Regional and Birth-Order Specific Fertility Differentials

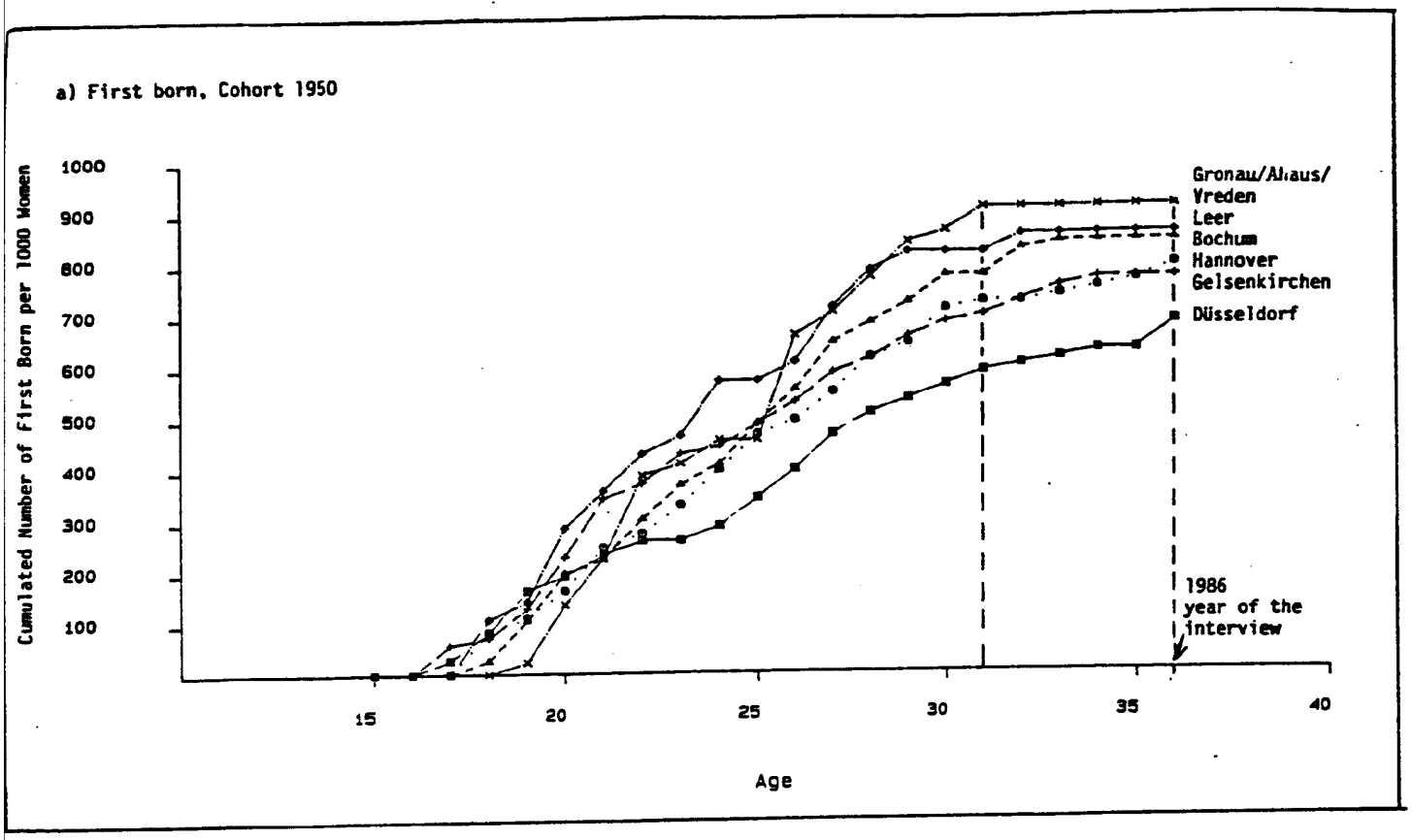


Figure 6b

Regional and Birth-Order Specific Fertility Differentials

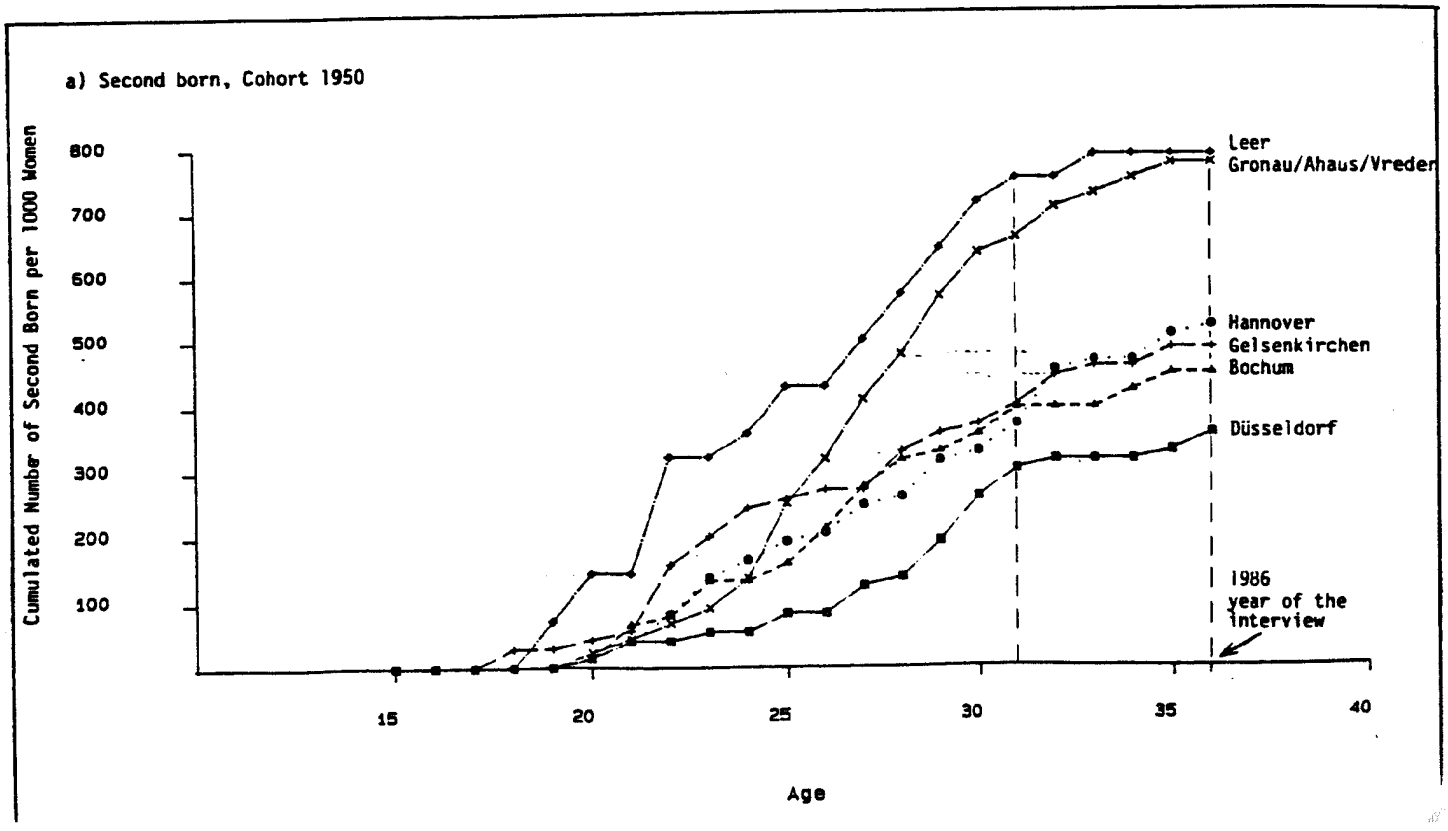
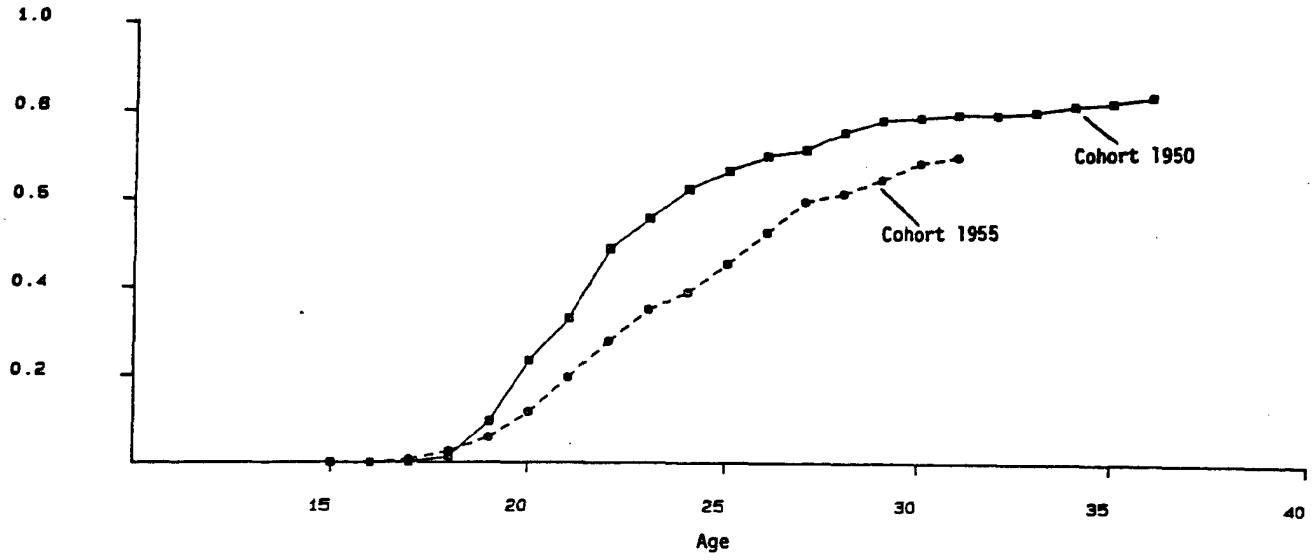


Figure 7

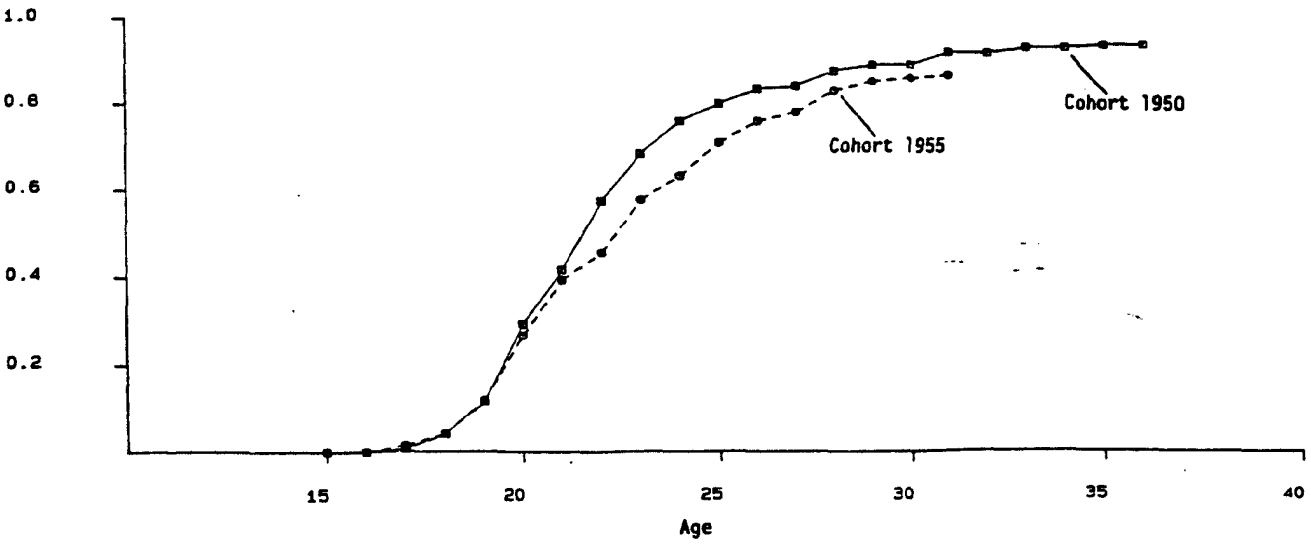
Regional Nuptiality Differentials

(a) Cumulated Number of Married Women (First Marriage), Cohorts 1950 and 1955 in the Cities of Düsseldorf and Hannover



Cohort 1950 (n=146) Median = 22.20
Cohort 1955 (n=155) Median = 25.68

(b) Cumulated Number of Married Women (First Marriage), Cohorts 1950 and 1955, in the Cities of Bochum and Gelsenkirchen



Cohort 1950 (n=146) Median = 21.52
Cohort 1955 (n=142) Median = 22.35

Source: Biographic Survey for the Project "Labour Market Dynamics and Reproductive Behaviour"

Table 1
Age and Birth Order Specific Fertility Rates
Cumulated up to the Age of 31*
- per 1000 Women -

	first born	second born	third born	total
		- Cohort 1950 -		
Region 1	658	336	82	1096
Region 2	740	397	75	1219
Region 3	875	694	208	1833
Total	734	431	104	1291
		- Cohort 1955 -		
Region 1	516	252	45	813
Region 2	754	366	77	1204
Region 3	786	414	171	1386
Total	659	327	82	1074

* Age and birth order specific fertility rate = number of births of order n per woman of age x

Table 2

Number of Children per Woman, *Cohort 1955*, Age 31

	Natives	In-Migrants [1]	Total
Düsseldorf	0.765	0.807	0.797
Hannover	0.808	0.907	0.875
Bochum	1.364	1.378	1.372
Gelsenkirchen	0.944	1.222	1.064
Region 3	1.259	1.535	1.429
F.R.G. (German population)	--	--	*1.228*

Table 3

Number of Children, *Cohort 1950*, Age 36

	Natives	In-Migrants [1]	Total
Düsseldorf	1.235	1.161	1.178
Hannover	2.053	1.370	1.548
Bochum	1.300	1.472	1.425
Gelsenkirchen	1.423	1.674	1.583
Region 3	2.235	2.245	2.243
F.R.G. (German population)	--	--	*1.594*

1) Internal Migration

Table 4

Transition Rates in Processes of Fertility and Mobility of Young Women belonging to Birth Cohort 1950 in the State Capitals Düsseldorf and Hannover (n=130)

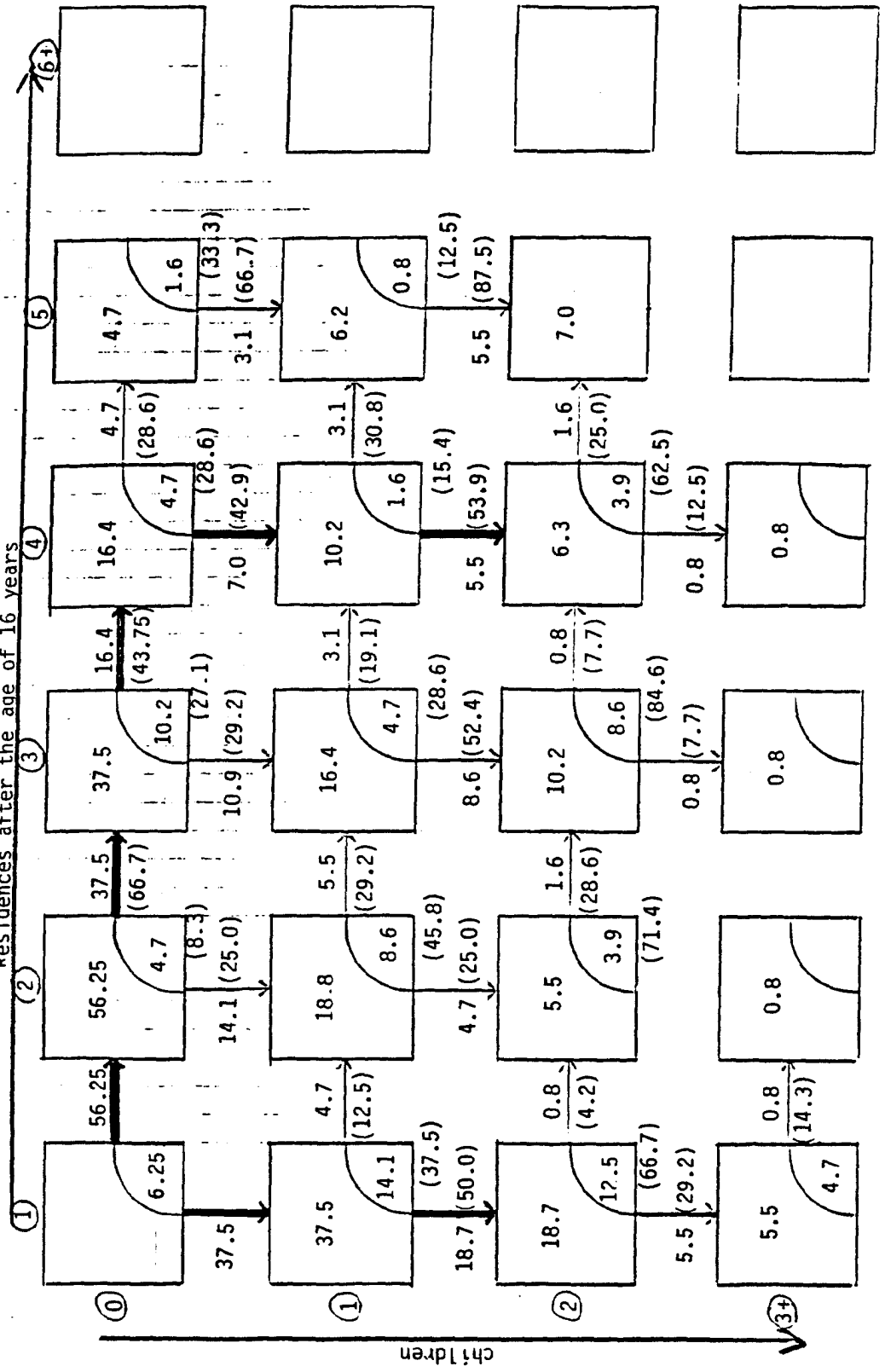


Table 5

The 10 most frequent processes of fertility/mobility for women of birth cohort 1950 in the sample of the project "Labour Market Dynamics and Reproductive Behaviour"

	Region 1		Region 2		Region 3	
	percentage	process path	percentage	process path	percentage	process path
1	13.8	F	21.3	FF	14.8	FF
2	12.3	FF	18.4	F	11.5	MFF
3	10.0	MM	8.1	-	6.6	F
4	6.2	-	5.1	MMF	6.6	MMFF
5	6.2	MF	5.1	MFF	4.9	MMF
6	4.6	FFF	4.4	MMFF	4.9	MFMFF
7	4.6	MM	3.7	FFF	3.3	FFF
8	4.6	MMM	3.7	M	3.3	MMM
9	4.6	MMFF	3.7	MFM	3.3	MFFM
10	3.1	MMF	2.9	MF	3.3	MMMMFF
total	70.0		76.4		62.5	

F - Birth of a child
M - Moves after the age of 16 years

Region 1 - State capitals Düsseldorf und Hannover
Region 2 - old industrial cities Bochum und Gelsenkirchen
Region 3 - rural communities of Gronau, Ahaus, Vreden, Leer

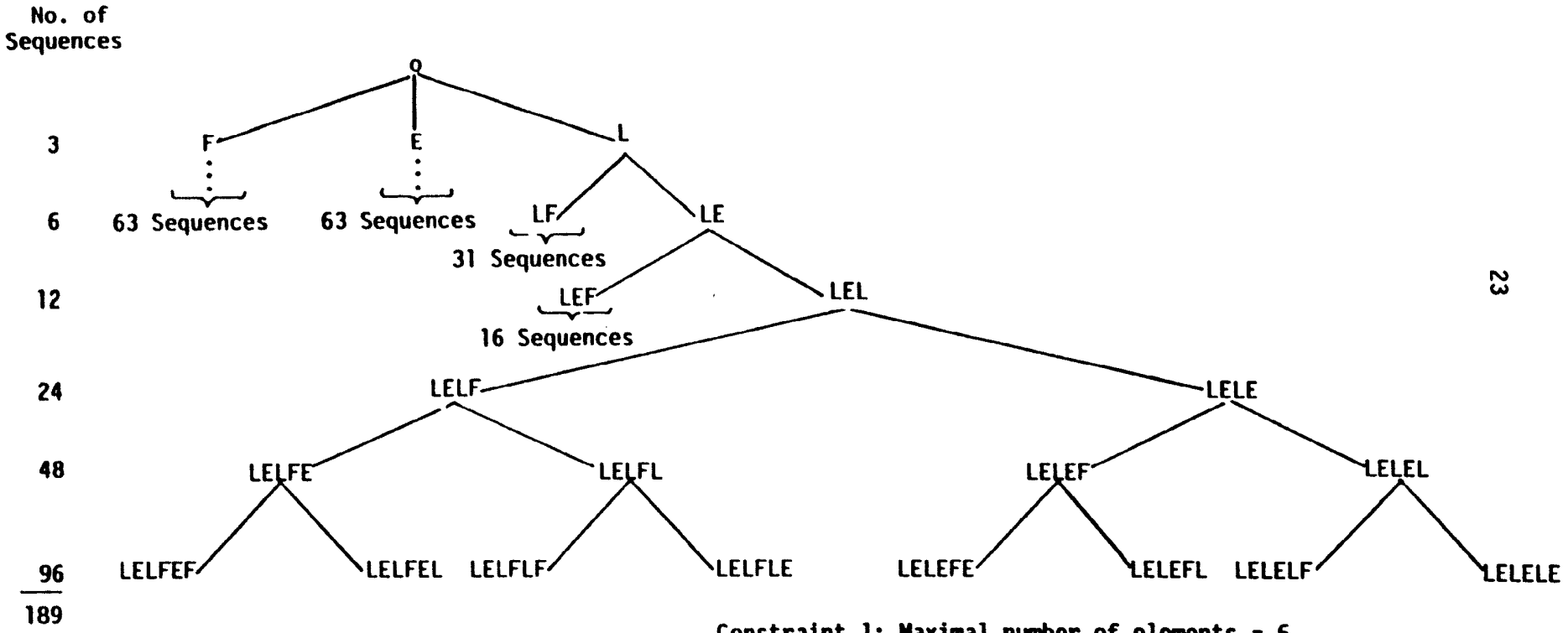
Tabel 6

Relative Frequencies of the most important sequences for cohort 1950

Type of sequence	Women Cohort 1950			Men Cohort 1950		
	Region 1	Region 2	Region 3	Region 1	Region 2	Region 3
LELE	5.5	4.8	--	26.8	21.2	23.1
LELEF	3.4	2.8	4.3	--	--	--
LE	24.0	17.2	21.4	61.3	65.8	53.8
LEF	22.6	26.2	35.7	--	--	--
LEFE	14.4	13.8	5.7	--	--	--
LEFEF	2.1	7.6	4.3	--	--	--
LEFEFE	3.4	6.2	2.9	--	--	--
LFE	2.7	--	1.4	--	--	--
LLE	2.7	0.7	2.9	5.6	4.1	7.7
E	4.8	0.7	--	0.7	1.4	3.1
Others	14.4	20.0	21.4	5.6	7.5	12.3
Total	100.0	100.0	100.0	100.0	100.0	100.0

Figure 8

Biographic Universe of the Model of 189 Variational Sequences with Constraints

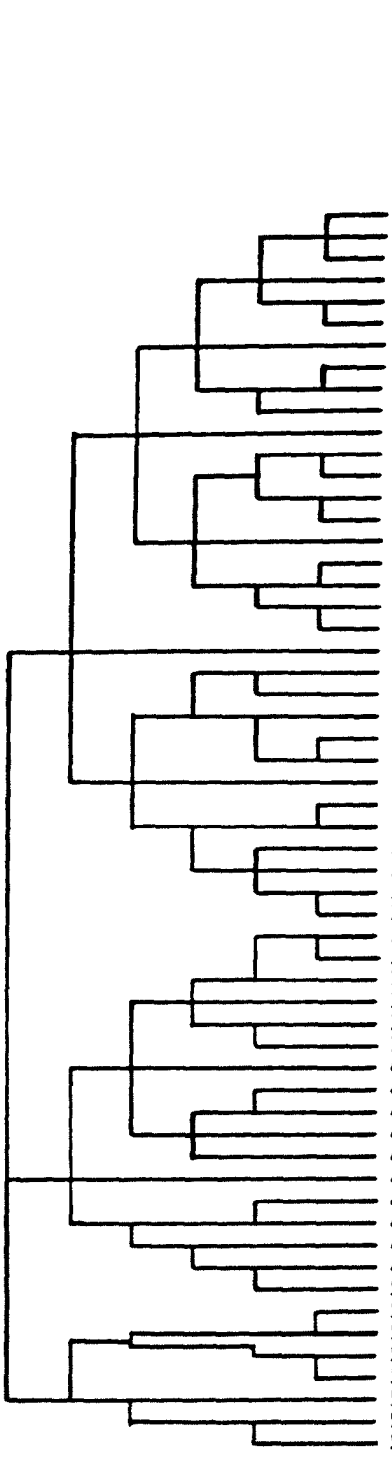


Definitions: L = occupational training
E = working phase
F = family phase

Constraint 1: Maximal number of elements = 6
Constraint 2: No repetition of the same element in two successive positions

Figure 9

Dendrogram of the Biographic Sequences of Women of Cohort 1950 in Region 1, 2, and Region 3



No.	Type of Sequence	Frequency of Sequence Region 1	Region 2	Region 3	% Region 1	% Region 2	% Region 3
1	LELELE	3	3		2.1	2.1	
2	LELEL	1	2		0.7	1.4	
3	LELELF						
4	LELE	8	7		5.5	4.8	
5	LELEF	5	4	3	3.4	2.8	4.3
6	LELEFE	2	2		1.4	1.4	
7	LEL	3			2.1		
8	LELFLF						
9	LELF	2			1.4		
10	LELFE	2			1.4		
11	LE	35	25	15	24.0	17.2	21.4
12	LEFLE						
13	LEFLEF			1			1.4
14	LEFLF						
15	LEFLFE		1			0.7	
16	LEF	33	38	25	22.6	26.2	35.7
17	LEFELE						
18	LEFE	21	20	4	14.4	13.8	5.7
19	LEFEF	3	11	3	2.1	7.6	4.3
20	LEFEFE	5	9	2	3.4	6.2	2.9
21	L						
22	LFLE	2			1.4		
23	LFLEF	1			0.7		
24	LFL						
25	LFLFLE			1			1.4
26	LFLFL						
27	LF		3	2		2.1	2.9
28	LFELEL						
29	LFE	4		1	2.7		1.4
30	LFEFL						
31	LFEF						
32	LFEFE			1			1.4
33	LFEFEF			1			1.4
34	ELELE		1			0.7	
35	ELELEF			1			1.4
36	ELEL						
37	ELE	4	1	2	2.7	0.7	2.9
38	ELEF	2			1.4		
39	ELEFE	1			0.7		
40	EL						
41	ELFLE						
42	ELFL						
43	ELF						
44	ELFE						
45	E	7	1			4.8	0.7
46	EFLFE						
47	EF	2	6	3	1.4	4.1	4.3
48	EFE		5	2		3.4	2.9
49	EFEF		1	1		0.7	1.4
50	EFEFE		2			1.4	
51	FLELEF			1			1.4
52	FLE						
53	FLFEF			1			1.4
54	FLFEFE		1			0.7	
55	F		1			0.7	
56	FEF		1			0.7	
57	FEFEF						
	Total	146	145	70	100.0	100.0	100.0

L = professional training, E = phase of work and F = family phase
About 40-50% of the elements E are combined with F

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