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**A Biography Approach to**

**Theoretical Demography**

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## 0. Introduction

If the volume of research on generative behaviour — both in the Federal Republic of Germany and abroad — is used as a criterion it could be thought that the topic is exhausted, that all the fundamental aspects of the subject have been investigated and thus that at least all the more important questions have been answered. But this is not the case. Society is still confronted with the largely unresolved fact that the birth rate is steadily decreasing despite the — as it turned out isolated — encouraging figures from 1980 in Germany. Although nearly all the German experts were then of the opinion that the slightly increased birth rate occurring indicated the beginning of a much prophesied upwards trend, they were proved to be wrong.

The situation in the field of generative behaviour, therefore, is that every new piece of scientific research should not only add to previous knowledge but should also provide an answer as to why the previous knowledge proved to be inadequate. It could be that the matter of the inadequacy is relatively simple to explain in general: nearly all attempts at analysis of generative behaviour have been made from a specific disciplinary stand—point and have in common that their scope is inversely proportional to their depth of treatment. With a lack of scope the complexity of the topic remains largely concealed although — at least superficially — it is generally, recognized that an interdisciplinary approach is needed. In fact, however, hardly any of the previous work produced can justifiably be called "interdisciplinary". One can conjecture that every theory of generative behaviour derived from a specific disciplinary stand—point has its own specific "blind spot". But because the blind spots of differing disciplines are differently located aggregation and compromise of theories increases the level of "blindness" — it is not so that inadequacies can be compensated. It can be assumed that a decisive break—through in the analysis of generative behaviour will not arise from present research that is decidedly sociologically, economically, psychologically, historically, etc. inclined.

In the work presented here it was attempted as far as possible to avoid narrowing hypotheses and methods arising from specific disciplinary approaches. This was an

ambitious objective. In order to achieve it the investigation of the connections between the dynamics of the labour market, the evolution of the social phenomena of the family and generative behaviour (as formulated in the subhead) took precedence over the newly developed biography approach to demography proposed as a solution, even though the biographic theory developed can be regarded as a more general result of the research.

The theory developed is applicable to industrial societies as well as to post-industrial societies in which the service sector dominates, and it can be applied just as well to the societies of socialist countries as to those of the western world. The theory is applicable to every society whose development dynamics are being influenced by scientific, technical and social innovation and with which the society is inevitably changing. It is not easy to understand why the effects of economic change (in particular those on the labour market) on generative behaviour especially of men have not yet been researched when it is clear that these effects are at least an important if not the most important cause of change in generative behaviour. Perhaps this explains why the prophesis of a positive change in trend in the birth rate has not yet been realized and probably never will be realized.

In the last few years sociology and demography have discovered (or rediscovered) the research area of "biography". The concept of the curriculum vitae, perhaps more so than any other information vehicle, is suitable for the analysis of and developing hypothesis on generative behaviour within plausible frameworks. The research opportunity opened up by biographical work has, however, remained largely unused. M. KOHLI, editor of a book of significant articles on the theory of the curriculum vitae, points out the connection between research on generative behaviour and biographic research in his summarizing article but then only in the form of a comment that (2) "in view of the long tradition of the problems being discussed here it is not surprising that precisely those problem areas such as population theory and social policy, which were central to sociology at its beginning but which have been now long neglected, are important" (M. KOHLI 1978: 28; authors underlining). In a second collection of contributions to biographic theory (J. MATTHES et al. 1981)

there is not a single mention of the problems of generative behaviour in shaping the structure of biographies even though a majority of all men and women become parents in the course of their lives. The exclusion of this central theme can be perhaps explained in that because of the underlying complexity of both topics. In fact both research in "biography" and in "evolution of the family and generative behaviour" require interdisciplinary approaches for which the prerequisites are seldom available. The disciplinary restriction of biographic research to a "sociological" theory of the CV (M. KOHLI) or of biography in terms of "analysis of courses of action" (MATTHES et al.) leads to interesting and also important work, which, however, could not be adopted as a working basis for the topic at hand. It is probable that those phases or situations in a human life which have a considerable influence on the future cannot be adequately understood in terms of formulations or concepts either of "courses of action" or of "decision". In a contribution to biographic theory F. SCHÜTZE (1981) has made it clear how important situations of what can only be expressed as "emotional suffering" are for the future of the individual. From the point of view of this study it can be added that that sense of togetherness and unity with another person usually called "love" can hardly be explained by theories of courses of action or of decision but has — perhaps more than any other situation in life — important biographical and demographical consequences.

As a basis for the present research the adoption or adaptation of existing applicable theoretical biographic methods and/or hypotheses would certainly have been advantageous. However, a review of the literature revealed — somewhat surprisingly — that no assistance was available. It was discovered that not only that no previous research existed for the topic at hand (not even in the area of family cycle theory which will be taken up later here) but also that "... theoretical or pure methodological contributions .... do not exist" (M. KOHLI :8). This statement, although written in 1978, still applies today. Ch. BÜHLER's important work (1933 and 1969) which contributed so much to the extension and generalization of biographic theory has not been followed up. In the MATTHES et al. collection this work is not even mentioned in the list of references.



The research presented here contains several propositions and hypotheses which can be understood to be an attempt to establish a general biographic theory applicable to developed societies; primarily however, they were introduced for the task of building suitable models as frameworks for approaching the specific problems of this work. The theoretical biographic models which are presented here have the principal function of unifying isolated and sometimes diverging facts and hypotheses into a consistent framework of generative behaviour. This facilitates the discovery of new hypotheses which in turn enable already existing results to be better understood.

At present a certain conflict can be seen between biographic research dealing with concrete CV data on the one hand and that concentrating on more qualitative data on the other. But because experiences in life don't tend themselves readily to classification it's not sensible to restrict the data used to any one type. In the research being conducted information of all sorts is being used as raw material, which, however, in the end, has only the significance that the researcher can extract from it. This applies equally to both qualitative and quantitative data. What is important is not the type of data but the integration of information of all sorts into theoretically relevant statements. It is therefore necessary to approach the central questions from different sides. This means, for example, that hypotheses must be investigated both at the level of the individual as well as for groups of people (inhabitants of certain regions, the population of the Federal Republic as a whole, specific age groups, etc.). At the present stage of research emphasis has been placed on the individual and on the cohort approach. The construction of models at the macro- and mezzo-levels can then follow. For a cohort - and parity specific analysis of fertility in Germany see BIRG et al. 1984.

At the level of the individual differing models have been developed all of which, however, are orientated to a central theoretical concept within the general biographic framework, namely to that of biographic mobility. Biographic mobility, as will be seen, can be understood as an operational expression for two basic theoretical biographic concepts, namely those of biographic coherence and virtual biography. Biographic coherence refers to the inherent consistency of biographies, which occurs both

by virtue of the, as here considered, indivisible core of the transcendental unity of the subject as well as of the predetermining and distorting effects of the outside world of family and society on his biography. The expression "virtual biography" or "biographic universe" refers to the practically infinite number of combinations of biographic sequences or alternative courses of life which are possible, only one of which has been realized upon death. Using these biographic concepts and fundamental hypotheses the questions to whether – and if so, why – a given person marries and has children can then be re–formulated: it is then one of searching for the determinants of prevailing virtual biography (or biographic universe) and discovering the personal objectives and conditions which influenced the course of the individual through this biographic universe to the point of marriage and/or having children. One of the principal problem areas of this work – the question of the influence of the economy and labour market dynamics – as well as other related questions (the answers to some of which are already known) can thus be formulated as aspects of a more generalized biographic theme. It cannot be expected, however, that such a theme, even when once satisfactorily formulated, can be fully researched in a short period of time in particular when the already well established research area of "social mobility" has much less in common with biographic questions than the common use of the word "mobility" might suggest. Biographic mobility is a much more encompassing concept than social mobility. Every situation of social mobility is a situation of biographic mobility but not vice versa. One of the concerns of the biography approach is to show that there are connections between biographic mobility and generative behaviour and that it is not very probable that such a connection can be established in terms of the less encompassing concepts of social mobility alone. As an example of the consequences of narrowing the concept of mobility it can be pointed out that, on the one hand, the INED investigation (COURGEAU 1984), in which "mobility" was regarded simply as territorial mobility, was unable (or not yet able) to connect – as expected – fertility rates with mobility; on the other hand a study of regional differences in the birth rate in the Federal Republic was able to show that for the state of Nordrhein–Westfalen clear indications of a connection between generative behaviour and migration behaviour exist which should be carefully taken into consideration in future research (MÜLLER 1984: 591).

The hypotheses presented here are based on an theoretical biographic framework and combined into three micro-models including generative behaviour. For these models, a biographic "opportunity cost model", a "model of congruent biographic structures" and a "model of permutational sequences", the information bases are comprised principally of "hard" biographic data. The above order of the models represents the order of (increasing) difficulty in obtaining the data required for a thorough investigation of the models.

To obtain data a biographic questionnaire has been designed and a biographic survey is now being conducted (n = 1500). It is intended to collect data of different sorts (for the investigation of the above mentioned models and others), not only "hard" biographic facts but also evaluations; complicated scales for the description of attitudes and objectives in life will be employed. The questionnaire is so constructed that it should be self-correcting because the "hard" data in life cannot in fact be as occurrently recalled as one might suppose.

The models presented here differ from one another in the content of the hypotheses used for modeling the interdependency of the considered effects. The models complement one another, however, in two important respects:

(a) They all take into account the same basic relationships but consider hypotheses of differing complexity for the various interactions. The three models presented here use exclusively objective measurable biographic facts — further models developed (but not presented here) have evaluations as variables, for example, evaluations of attitudes and objectives in life.

(b) The hypotheses used in the differing models are mutually supporting. Generalized propositions and fundamental hypotheses can be distinguished from the derivative hypotheses used. It is certainly possible that certain fundamental hypotheses can be neither substantiated nor rejected on the basis of the available data. But if it later turns out to be possible to substantiate certain derivative hypotheses using other data

(e.g. the evaluation and attitude data already mentioned) than indirect substantiation or at least support for the fundamental hypotheses and propositions could be won.

On the basis of the theory formulated in the first part of this work it is possible to develop other models, operational forms and alternative transformations of the propositions and fundamental hypotheses, but these will not be discussed here. The work has to be regarded as an initiator for further research which can be developed from the fundamental hypotheses. The models presented, however, are considered to be those that offer the best access to the connection between labour market dynamics, the evolution of the family in society and generative behaviour.

# 1. Biographic Coherence and Generative Behaviour – A Biography Approach to Theoretical Demography

## 1.1 Biographic Coherence

Virtually all the occurrences in a normal lifespan can be related to basic structural patterns of life even if the relationships are not immediately obvious. As an example, the investigations of genetic codes have made it clear how an enormous multiplicity of life forms can result from the simplest principles of order of relatively few basic elements. A language, despite its inherent infinite potential for expression, is comprised of basic elements (letters, syllables and words) which are finite in number – all the written and as yet unwritten books are comprised of the 26 letters of the alphabet. Music can be regarded as another example; it is written in all its infinite variety using different orders and sequences of the relatively few basic elements of the musical notation. All three examples illustrate the complexity of phenomena that can result from differing orders of a finite number of basic elements.

If the life of a human being is documented in a particular way it can be seen to be composed of stages, circumstances, phases, states, situations and events and if these are considered as basic elements different life histories (CVs) can be constructed by ordering the basic elements in differing ways. Each sequence of elements constructed can represent the course of a life exactly as each sequence of letters of the alphabet (and gaps) can represent a word, a sentence or – if long enough – a classical work of literature. That the biography of an individual has to follow a certain pattern of logic does not make the analogies drawn invalid. Not all sequences of letters form words in a given, or any, language. The analogies are important as valid illustrations but do not help in determining the logic that has to be applied in constructing biographies from basic elements. One difficulty is that the individual has both an "inner" and "outer" life and his biography is the result of influences both from within himself as well as from the "outside" world.

The central assumption of the biographic approach presented here is that there is a connection and a relationship between the outer, observable, structure of an individual's life and his hidden, inner, personal experience. It could well be that there are relationships between the elements of the inner biography of an individual, for example, due to a realization of the intrinsic sense in living (or perhaps of the futility of life), which cannot be detected by analysis of the elements of his outer, observable, biography. Conversely, one could well detect statistically significant relationships between elements of the observable biography which in fact are purely pseudo correlated if there is no connection between the observed outer elements and the inner attitudes and experience. Nevertheless, a basic assumption of this paper is that the observable data for an individual are correlated with his inner, non-observable, biography, and vice versa. Three types of biographic relationships are postulated which are differentiated and designated as follows:

For the personal inner realization of the meaning of life which cannot be identified from the observable biography, the expression inner biographic coherence is used. Connection between the characteristics of the observable biography, which is not due to the inner coherence, is designated the outer biographic coherence. If the inner man, his realization and acceptance of himself and his role in society, and his actions, i.e. his observable outer biography, run in parallel then the term biographic coherence without qualification will be employed. The differentiation between the inner and outer worlds and their strong connection has been very well phrased by A. SCHOPENHAUER (1977: 299): "According to this, the observable, outer, biography in all its multiplicity is no more or less than the clockface belonging to the works inside, or the mirror in which each and everyone can intellectually see the nature of his own will, i.e. of his inner core."

## 1.2 Virtual Biography and the Biographic Universe

People are normally in the position to maintain a certain objectivity with respect to their own biography. It is so that reflection, composure, and moral/ethical behaviour are only possible when a certain distance to the events of life can be achieved, i.e. a

gap which the subject has to create before he can exercise his intellect. "The essence of thinking lies in reflection, i.e. in distinguishing between one's thoughts and oneself" (W. v. HUMBOLDT 1973: 1).

Even considering a relatively small number of basic biographic elements the number of possible biographic sequences that can be constructed by permutation is large – more than 3.6 million hypothetical biographies result from 10 basic elements. Against this background every person conscious of his freedoms of choice is confronted in every decision in life with the possibility of doing the wrong thing, of adopting inappropriate personal objectives, of taking the wrong course in achieving these objectives and of misjudging and so reaching false conclusions from past experience. Given a certain level of self-assurance (or of uncertainty) according to the personality of the individual, then it can be said that the level of potential uncertainty with which each decision is made increases with the number of alternatives that are open to him. One of the most restricting decisions for the future is certainly that of (marrying and) having children, so that it is clear that the reasons for deciding not to have children cannot be regarded as being independent of those biographic sequences which having children would close, even if some of the alternatives are not realistic. This simple but, for generative behaviour, significant argument has not received its due attention in the literature on decreasing birth rates or in theories of generative behaviour. Only few authors, e.g. H. LINDE (1984) with his theories and theses of increasing opportunities, of the consequent market orientated flexibility of personal options and of the aversion to irreversible long-term decisions, have produced work with ideas which can be related to those expressed here.

Fundamental for the development of the models that follow is the virtual biography and biographic universe which, together with the concept of biographic coherence, is the most important theoretical construction in this approach. It is assumed: every individual lives at every point in time "in" a virtual biography which is comprised of his factual curriculum vitae, his present situation and all his possible courses of action in the future, in particular of those alternatives of which he is conscious and regards as being relevant. The virtual biography is therefore dependent on, i.e.

changes with, time. For example, a young woman could be viewing the next 10 – 15 years in the following way; she sees as relevant and/or possible phases or occurrences:

1. Occupational training
2. Marriage
3. Setting up house together with partner
4. Consolidation of economic position by working
5. Having a child

Ignoring for the moment the temporal mutual exclusiveness or not of the elements on the above list, the five items offer  $5! = 120$  courses for the future, a number which can be hardly perceived by any individual. But once the first decision has been taken or course of action undertaken this number reduces considerably ( $4! = 24$ ). However, before this, the virtual biography of the young woman consists of her biography of the point of time of her present situation, all permutations of this listed five phases or occurrences permuted with all possible phases or occurrences of which she is not conscious or prepared to think about in her present situation (e.g. a serious illness and its consequences) together with all permutations of events that life will have to offer after the horizon of 10 – 15 years. It can be seen that the virtual biography is both manifold and – in terms of the number of possible sequences contained – extremely large.

In this simple example it has been implicitly assumed that the virtual biography includes all possible sequences of phases or events. However, if boundary conditions are imposed, e.g. children occur only after marriage, the number of sequences in the virtual biography is reduced. It should be noted that such a reduction is less significant than that effected either by an implemented decision ( $4! \ll 5!$ ) or by cancelling an item on the list, e.g. the young woman decides she will not have children.

The virtual biography is a subset of the set of sequences in the biographic universe which comprises all logically possible ways of forming sequences. But the individual cannot



be aware of each element of the biographic universe, i.e. biographic sequence, of the universal set of sequences. The above example of five basic elements leading to 120 alternatives at a given point of time for a given restricted future period illustrates this adequately; 10 basic elements lead to more than 3.6 million sequences and 20 basic elements to the astronomical order of  $10^{18}$  sequences in the biographic universe. For the study of behaviour such arithmetical exercises are of no direct relevance. Who can say exactly how many elements or courses of action are open to him at any given point in time, and how many of these are in some way restricted by convention, by the laws, rules and regulations of the society or simply by financial consideration. But the size of the universe that can be constructed mathematically still has effects on the consciousness, perception and emotions of the individual even if these effects cannot be isolated and described. The higher the cliff the more careful one is when nearing the edge without having had the experience of actually falling off any cliff; there is no need to measure a room to get an idea of its spaciousness. In just the same way there is no need for the individual to make calculations on his biographic universe for him to be conscious of and also influenced by it. The biographic universe affects the behaviour of the individual also when he cannot even imagine many of the sequences it contains.

The size of the biographic universe explodes as the number of basic elements, of which it is composed, increases. It also increases when the number of restricting conditions imposed on the sequences is reduced. Historically seen, the size of the biographic universe has increased steadily for nearly all the individuals of all classes in society. This has occurred because both the variety of basic elements has increased and financial, institutional, conventional and religious restrictions have been relaxed. The increase in the number of basic elements is the result of many differing developments, e.g. of the greater variety of employment available with the development of industry and the increase in urbanization as a result of the improvement in transportation, through better education and because of the increasing life expectancy. If the size of the biographic universe is regarded as an indicator for the degree of freedom which an individual can exercise in his life, then a means of differentiating this concept of freedom and of classifying periods in history and/or societies in a

way that has relevance for an explanation of the factual decrease in birth rates could be available. One can imagine that very different societies could exist in which the degree of biographic freedom in this sense is the same but for which this freedom in one case arises, for instance, from the availability of a large number of basic biographic elements although restricted by many conventional, institutional, religious and formal conditions, whereas in another case less basic elements are available but with far fewer restrictions. Life would probably be very different in these two societies. In the first case the atmosphere presumably would be much less agreeable than in the second with the corresponding consequences for behaviour in general and, in particular, for generative behaviour.

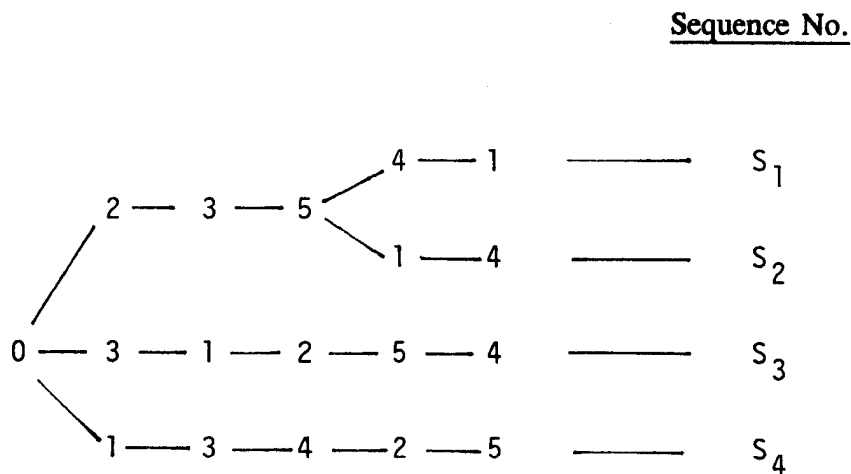
### 1.3 Biographic Mobility and Biographic Subspaces

In order to proceed, a concept of "biographic mobility" is necessary in addition to those of "biographic coherence" and "virtual biography" already introduced. A person's life is regarded again as a series of different phases or stages (the elements of sequence). A relevant biographic event in life can then be defined to be the point of change—over between two phases. Per definitionem a relevant biographic event in life then cannot take place within a phase. With this terminology it is possible to define biographic mobility as a change of phase within a sequence of the virtual biography (in the language of the natural sciences perhaps as "changes of state"). Of course, some phase changes can only occur if a specific event takes place, e.g. a phase of the "married state" can only follow that of "being single" by means of the intervening event "marriage". Phases can be of extremely short duration; for instance, the events "marriage" and "setting up house with partner" often — but certainly not always — occur more or less together.

To make this definition more precise two types of biographic mobility, the intersequential and intrasequential mobility, are specified. The previous example is used again as an illustration and basis for discussion. Consider the extremely simplified but now more precisely defined virtual biography of a young woman (which is

assumed to be identical with her biographic universe) comprising of all 120 possible sequences of the phases between the five biographic events listed on page 11, whereby the present situation (which it is not necessary to define precisely) is taken as a fixed starting point.

Of the virtual biography which contains 120 possible sequences four are chosen for illustrative purposes:



The four sequences have the same number of elements (phases) and therefore contain the same number of events but the probability of a birth (event no. 5) presumably is different for the sequences 1 (and 2), 3 and 4. The sequence no. 1 could be classified as "typical" for a woman for whom occupational training has little significance. It should be emphasized that virtual biographies are depicted and that for sequence no. 1 the event no. 1 coming at the end in reality would be seriously considered but usually not implemented.

Sequence no. 2 is a variant of sequence no. 1 in which occupational training appears as a prerequisite to obtaining satisfactory employment. Many people (usually men)

don't even consciously consider the order of "occupational training" (or "education") and "employment" since the one is automatically a prerequisite for the other, but for this example of a young woman both the sequences 1 and 2 are realistic since it often occurs that, having married and had children, the husband's income is too low to constitute the only means of family income. It should be noted that the four sequences are so ordered that the relative importance of occupational training increases from sequence to sequence.

Because the word "typical" has been used the question immediately arises as to whether there is, in fact, a "typical biography" among the considered 120 sequences for a young woman. If it is considered typical that event no. 1 comes before event no. 4, can it also be said that "typically" no. 2 precedes no. 3 and that it is usual nowadays that a sound financial basis (event no. 4) is achieved before the child arrives (event no. 5)? Only if all these points can be answered positively can one say that the sequence 1 - 2 - 3 - 4 - 5 is "typical". Unfortunately there are no statistics on this matter so that it is not possible to say how the biographies of young women are distributed over the 120 sequences of the considered biographic universe. Without entering into further speculation it can be nevertheless pointed out that even if it should turn out that the sequence 1 - 2 - 3 - 4 - 5 is the most frequent this does not mean that those concerned (namely young women) would also evaluate this sequence as "typical". It could well be that the sequence often occurs involuntarily through force of circumstances. If one can believe the polls taken, the majority of women do not opt for distinct phases of employment and then housework as a mother, but for a combination of both. It isn't profitable to continue the discussion at this stage because all the concepts necessary for analysis have not yet been presented. The example being discussed simply serves to illustrate that a biography approach can be used to typify sequences in life in a way relevant to the question of high and low birth rates.

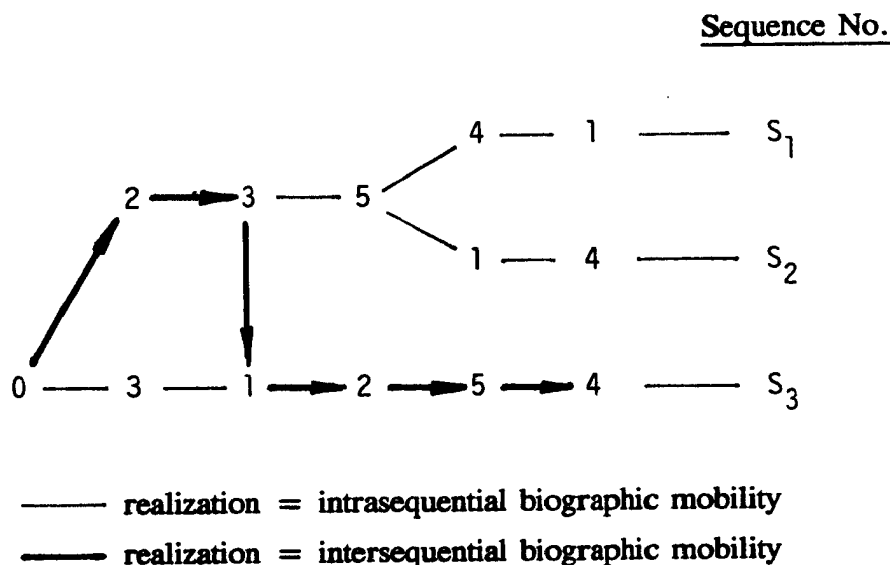
The third and fourth sequences shown represent biographies which can be supposed to be more "modern", certainly biographies which can be observed nowadays with increasing frequency. Occupational training and/or education is increasing in signifi-

cance (or has absolute priority – sequence no. 4), marriage and children not only actually come later but are also considered to be relatively less important. Whereas occupational training for the sequences 1 and 2 of the virtual biography is not often realized in practice because it occurs towards the end of the hypothetical sequences, the same is true for the event no. 5 in the third and fourth sequences: having a child is discussed, considered for decision, but delayed, and the most suitable point of time often simply slips past without result. Before this particular point the question of the "desirability" of a child probably would be negatively answered, after it, positively. It is therefore important in designing a questionnaire to pay particular attention to age, accuracy to one year would appear to be a minimum for biographic analysis of birth incidence.

The four biographic sequences selected for discussion compare well with the types discussed by URDZE and RERRICH (1981: 98). However, the similarity should not be taken to imply that the analysis of generative behaviour found here is also similar. As opposed to URDZE/RERRICH an explanation on the basis of classification of sequences will not be attempted: in this work explicitly theoretical assumptions are used from which hypotheses on behaviour are derived. The differing types of generative behaviour arising from the theoretical assumptions can, if so wished, be classified, but classification is neither the basis nor the objective of the theory, it is a by-product derivable from the theory. This is not to say that classifications are not useful, as above, for presentation purposes.

The main objective in introducing the for sequences of the example is to illustrate the definition of intra- and intersequential biographic mobility. Intrasequential biographic mobility is simply the stepwise realization or partial realization of a particular sequence in the virtual biography; thus (sequence no. 3) the young woman actually sets up house with her friend, starts occupational training, marries, has a child and, lastly, takes a job – she actually "moves" along the sequence of phases lying between these events. Intersequential biographic mobility occurs when an individual leaves a sequence in the virtual biography in order to join another sequence of the same virtual biography (intersequential mobility of type A) or indeed to go over to a

sequence in another, different, virtual biography (type B). Leaving a sequence and not joining any other sequence is a special case for intersequential mobility — drop-outs from society can be characterized as people whose virtual biography cannot be defined.



The above diagram illustrates both types of biographic mobility. Realizing the phases between events in a given sequence of the virtual biography (sequences beginning 0 — 2 — 3 — 1 ..... are not numbered in the example but are nevertheless elements of the simple biographic universe being considered) is denoted as intrasequential biographic mobility. The sequence 0 — 2 — 3 — 1 — 2 — 5 — 4, which is assumed to be not an element of the virtual biography being considered, is depicted above as a change of sequence within this virtual biography (= intersequential mobility of type A). One could, however, easily regard this sequence as representing intersequential mobility of type B since before marrying again a divorce must be obtained, which has to be considered as a relevant biographic event, and so the young woman following this course in fact has "jumped" into another virtual biography. Which of the two interpretations of this sequence is more "correct" depends entirely on the methods and informations available for analysing the effects of such a

sequence on the probability of the young woman having a child. In the models presented in chapter 3 it is precisely the differentiation of such effects on generative behaviour and therefore the birth rate that are important. In the example it is clear that both intra- and intersequential mobility affect the realization of the event no. 5, "having a child". How biographic mobility and the birth rate are connected cannot be discussed at this point — the concept of biographic sequences first has to be examined in more detail.

The fundamental elements of a sequence, whether these are regarded as phases or events, are first separated into groups. All those elements which effect the occupation of an individual are placed in one group. These could be "occupational training", "first job", "second qualification", "second job", "change of job in the company", "change of companies", "promotion", "dismissal because company folds up", "change of occupation", "change of industrial branch" or "change of job and location", etc. Sequences of such elements which belong to, and are therefore subspaces of, the virtual biography of an individual are collectively called the virtual occupational biography or the occupational biography (according to context).

Secondly, all sequences of elements of the virtual biography which are important for the social life of an individual are placed together in a group. Different stages of education, family experience, relevant friendships (their beginning and end), acquaintances, colleagues, and those occurrences and experiences connected with them which are relevant for social life can be included in such a group. For those employed, colleagues are often socially important. The occupational biography of an individual is therefore, but not only in this single respect, often closely connected with his social biography, a further subspace of the biographic universe.

The terms family biography or generative biography are used to designate a subspace of elements which can be connected with the sequence of changes of phase which take place in the family history of an individual, i.e. — excluding childhood — those changes which have a bearing on generative behaviour. The biographic events marking such changes could be "marriage", "birth of first child", "birth of second

child", "divorce", "re—marriage", "loss of husband/ wife", "first child leaves home", etc. In addition, many people are conscious of continuity in the family, of the continuity of the generations. The existence of such a sense of continuity ranging from mother and father (and perhaps even further back) over themselves to their own children might justify the inclusion of events affecting the continuity of the family, such as "sister's marriage", "death of father" or "divorce of parents" as relevant biographic events for the family biography. The partition of the family cycle into a "lifetime family career" and a "lineage family cycle" over the generations of FELDMAN and FELDMAN (1975) is an attempt to develop this idea.

The succession of phases and events important for the development of the personality is designated in the development/psychological literature the developmental biography, the "psychobiography" or the "psychological curriculum vitae" (CH. BÜHLER 1969, RUNYAN 1982). The course of development of the individual in this sense can be further partitioned, in particular into the identity formation biography and the individuality formation biography. Psychological research on the question of development is, however, only considered here in as far as it contains hypotheses on the determinants of generative behaviour. In this respect CH. BÜHLER (1933 and 1969) and E. H. ERIKSON (1959 and 1966) are relevant. For the construction of biographic theory as such, i.e. of theory in which the interdependency of biographic subspaces is the primary concern, the above sources provide some important fundamentals but only such of a psychological nature. Neither in work in the area of development psychology nor in sociological or demographic treatments of biography can anything be found really relevant to the effects of interdependency between biographic subspace on the probability of a birth. The contention here, however, is that the development biography the family or generative biography, the social biography and the occupational biography are so closely related that isolated analysis of any one particular subspace cannot lead to a satisfactory explanation of generative behaviour.

BÜHLER's voluminous earlier work, therefore, cannot be regarded as all that relevant especially in that it basically deals with the exceptional biographies of famous people — at least this is the initial direction. The 1933 publication analyses the



biographies of great artists, authors, musicians and philosophers. The biographies of ordinary people, the centre of interest here, are hardly mentioned. Her collection of articles (with MASSARIK) from 1968, however, does contain a significant attempt to construct a general theory but the proposed "ten basic properties of the life cycle" are related almost exclusively to the "psychological curriculum vitae". BÜHLER states that "there are no exact parallel between biological and psychological development" (p. 14) and she avoids integrated approaches as far as possible. But the BÜHLER/MASSARIK collection is nevertheless of considerable value for the implications of biographic mobility on generative behaviour, as will be seen later. Suffice it to comment at this point that BÜHLER recognizes a polarity between two principal objectives in life which can be briefly described as "maintaining standards and/or prosperity" and "creating change toward producing new potentialities". The objective "achievement" is recognized as a "basic organic tendency"; to the more important "creations of an individual (must be counted — author) ... first of all his children who, to many people, are not only part of their present lives but also of the future (p. 25)."

ERIKSON concentrates primarily on psychological elements. In his publication "Identity and the Life Cycle" from 1959 he postulates a particular state of development of an individual which he characterizes as "generativity": "Sexual mates who find, or are on the way to finding, true genitality in their relations will soon wish (if, indeed, developments wait for the express wish) to combine their personalities and energies in the production and care of common offspring. The pervasive development underlying this wish I have termed generativity, because it concerns the establishment (by way of genitality and genes) of the next generation. No other fashionable term, such as creativity or productivity, seems to me to convey the necessary idea. The same is true of 'parenthood' — an all too concrete term which, in quotations from this paper, is often used as a replacement for the seemingly more obscure word 'generativity'" (ERIKSON 1959: 97).

Both BÜHLER and ERIKSON come to distinguishing sequential phases in life, BÜHLER has 5 principal phases and ERIKSON 8. The two systems have very little

in common. This approach is not adopted; here the virtual biography is structured by considering on the one hand the personality structure of the individual and, on the other, structures in society. It will also not be attempted to analyse the family cycle because family cycles can hardly be imagined that are independent of the structure of personalities or of society. Nevertheless the demographic literature on the family cycle (GLICK 1977, CUISENIER 1977) has to be examined since it could be expected that theories of the family cycle are based on theories of the life cycle. But apparently some authors would like to see this connection the other way round. Others are unsure and want to have both in parallel.

In the empirically orientated, demographic case studies nearly every author puts forward his own system of phases of family life. Nevertheless only few general hypotheses on the laws governing the structure of biographies in developed societies have been proposed in this literature. Even less points are found as to whether and how these laws (or, better, regularities) are systematically related to the probabilities of procreation. The same applies to the sociological literature on the curriculum vitae. In KOHLI's collection the following sentence can be found: "It (a large part of the sociological biographic literature: author) more probably can be seen as ... a new characterization of what has always been done, rather than as an indication of the emergence of a new, theoretical, general concept." It won't be attempted here to give a critical appraisal of the contributions in this collection but doubts must arise as to whether the course adopted has any hope of success when the "... basis for a sociology of the curriculum vitae (is seen as: author) ... an analysis of the implications of age as a dimension of the social structure" (M. KOHLI 1978: 11). In one of the models developed in this study I introduced the concept of "biographic age" (page 85f.) in order to replace the variable "age" by alternative indicators which make it quite clear why the normal calendar age is so very important for demography and for the sociological explanation of the curriculum vitae.

The very cyclical property of a life cycle reduces in significance once the concept of "life cycle" is understood to be much more than the simple fact that to every birth belongs a death. The family cycle is in fact becoming less cyclic than before.

Systems of phases of family life usually rely on descriptions based on age, for example, the average age with which one becomes father or mother, has a second child, is divorced perhaps, the average age of retirement and, finally, death. Such age data, as well as those for the various postulated phases, are, of course, statistical values which, falsely, tend to give the impression that statements on the family cycle including them actually apply to a large part, if not to a majority, of the population. In fact the number of those that follow all phases of an average, standardized, family cycle is very small, as the following argument shows: Let it be assumed that five age groups come into question for the event of "leaving home", five for the "first marriage", five for having the first and again five for the second child. With this simple structure – even assuming that the events take place in the given order – 625 different family cycles are possible. Combining these for the woman with the corresponding 625 for the man and taking into account that different generations marry and have children at different times of life then several millions of possible family cycles result, possibly more potential cycles than the number of families being studied. Under these conditions it is extremely improbable that 30, 40 or even 50 % of the cases fall in a single family cycle category; quite logically there is going to be a large dispersion about any sort of mean family cycle that can be constructed. Many authors support this view, e.g. UHLENBERG (1969: 408): "By concentrating on median and mean ages at events, it does not indicate the distribution of women on these variables nor the proportion of women who actually experience such a family cycle. It is quite possible that very few women in fact follow the pattern that is described by the averages."

There is no other way than to start analysis at the level of the individual. Theories of life or family cycles which avoid this initial step must rely on classification and the description of aggregated effects. This will lead nowhere. The objective has to be to extract that which is common to individual biographies and not to assign to individual biographies averages obtained from aggregated classes, since average "values" in this sense have little to do with typical situations or cases. For instance, it is typical to be either male or female, not something inbetween.

But how should one proceed if classifications and average values are to be abandoned? Of course, the individual biography, as already made clear, is just as frighteningly complicated and varied as the economic, social, family and psychological backgrounds out of which its elements, phases and occurrences, are drawn. The total of all possible sequences of elements out of this background, of which each individual case is only one, has been called the biographic universe. Does the "individual case" as such then have any analytic value? Surely so, for the individual case is always a result of general rules existing for the universe (all articles in the English language are comprised of the 26 letters of the alphabet combined by means of rules which the authors have more or less learnt). Without such rules not even individual biographies could exist.

## 2. Basic Assumptions and Theory

The structure of the life of a human being can be characterized as being dominated by two processes which are essentially different in nature: Whereas the biological process of growth, stagnation of capabilities and degeneration is cyclic in structure, the maturing process is linear developing not only during the lifetime of an individual but also advancing with scientific and cultural heritage over the generations. This intrinsic structural difference has fundamental consequences for the consciousness of an individual as well as for the organization of his life. Everyone has to develop his own form of perception of time in order to reconcile the cyclic biological changes occurring with the linear development of his mental processes (1). All forms of awareness, however, have in common that "time" is perceived in its entirety which is important in the context of this paper because an individual's perception and awareness of his own biography must fall in the same category (2); biographies are perceived as sequences (of phases and/or occurrences) and not as unstructured cumulations of events.

The perceptual completeness of biographies has the implication that bringing influence to bear on biographies, either by means of education, through the influence of social structures, or by means of the planned (or mis-planned) measures of a society, is an extremely complex matter. The level of complexity is probably the reason why "... theoretical or purely methodological articles ..." have not been produced by biographic research (M. KOHLI : 8). Nevertheless, on the basis of the various aspects of what has been written here it is possible to put forward the following hypotheses on generative behaviour:

Hypothesis: Generative behaviour depends on factors arising from the personality of an individual (called here "direct factors") as well as on indirect factors (i.e. factors not depending on the personality) acting through the virtual biography of the individual.

The following indirect influences on the virtual biography can be recognized:

I. Formation of the Virtual Biography

- (a) Formation by the parents and through the social milieu of the parents and the rest of the family.

Parents exercise considerable influence on the education of their children and, later, over decisions as to occupation. The occupational biography, in particular its early stages, depends largely on the family biography (3). Family also plays a not inconsiderable role in the choice of husband or wife thus again indirectly influencing the course of life after adolescence.

- (b) Formation through the legal and norm systems of a society.

Quite apart from the more obvious influences, in this category can be counted the activities, requirements and prohibitions of confession, the attitudes of those propagating philosophies of life in the society and those adopted by the mass media. The ideals of parents, friends and acquaintances and regional particularities and styles of life also contribute as formation factors.

- (c) Formation through the economic system of a society.

The particular regional, sectoral and occupational segmentation of the labour market and of the systems of advancement in the professions in a society lead to structures in the individual virtual biography which are just as important as the influences of the prevailing distributions of income and wealth, and probably more important than all taxation and other governmental measures intended to influence the formation and structure of families (4).

- (d) Formation through social factors.

The virtual biography is also formed by macro—social factors, in particular by the class and generation environment in which an individual lives. The role

played by the specific generation and its style of life (K. MANNHEIM 1928) together with the gender of the individual are factors which cannot be neglected (5).

## II. Deformation of the Virtual Biography

Certain indirect and exceptional factors have effects which can be regarded as deforming or distorting the virtual biography. Psychical set-backs, severe disappointments and everything that can be regarded as strokes of fate at the personal level fall in this category. Also disappointments and plans unrealized as a result of economic crises, unemployment, a shortage of housing or other "outer" circumstances contribute towards an individual's financial or social pessimism in the future (6).

## III. Structure of the Virtual Biography

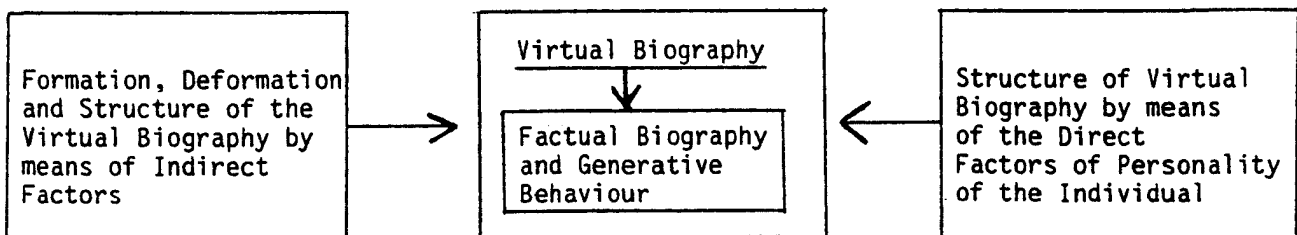
The virtual biography gains its structure from the instruments of a society with the aid of which the individual can plan his economic and social life. Among the very important instruments in this sense is the availability of modern contraceptives. The pill had and has great importance as an effective instrument of personal planning. It has also had another important effect, namely upon the attitude of the employers to the employment of women; the reliability of female employees in the production process has increased and this has probably had a positive effect on the availability of jobs for women. Other positive examples are the availability of kindergartens and the increasingly flexible regulation of working hours, both of which allow more freedom in planning working life and therefore encourage individual planning of the future in general. As already implied, the principle employed in this work is that the influence of indirect factors on generative behaviour is so considered that effects are produced primarily indirectly on the virtual biography and the virtual biography (or the actual biography – according to context) in turn determines generative behaviour. With this approach it is possible to avoid the characterization of indirect

factors as macro—variables, a characterization predominant in the literature. Partitioning factors into micro— and macro—areas of influence usually indicates analytic helplessness since factors cannot be uniquely ordered to the one or to the other, in particular when exact knowledge of dependencies and the hierarchy of effect doesn't exist.

Fig. 1 summarizes in simple form the connection between external influence on the individual and the structural effects of his personality on the virtual biography. It is within this framework that the following basic hypotheses are formulated, with the explicit aim of explaining generative behaviour. Some of these hypotheses — presented below in the form of propositions — are supported by empirical research already completed, others still have to be investigated.

Figure 1

Structure of the Virtual Biography  
and Generative Behaviour





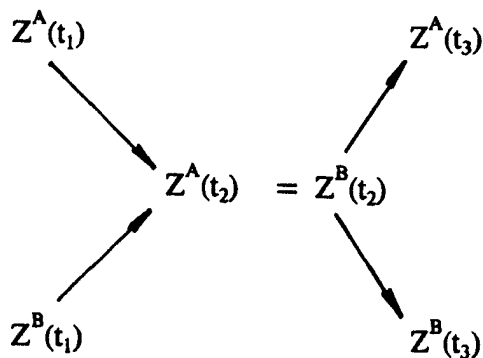
## 2.1 Proposition 1: Cumulative Experience Results in Predetermination

Biographies have to be regarded as processes which – at least partially – determine behaviour. The behaviour of an individual at a point in time  $t$  depends on three factors:

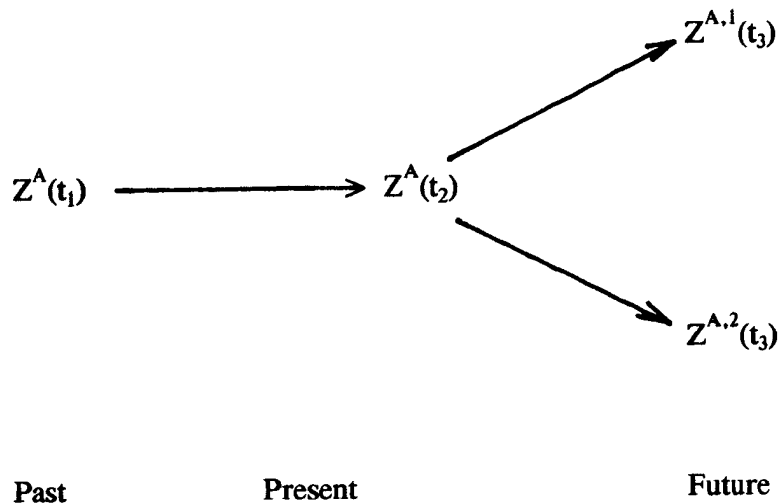
- (a) on the sequence of relevant biographic events and phases up to time  $t$ ,
- (b) on the biographic status quo at time  $t$ , and
- (c) on the sequence regarded as desirable for the future.

The assumption (a) implies that Markoff processes cannot be employed for analysis. This is perhaps the most important consequence of all the hypotheses. It means that model construction is made much more difficult, but there is no alternative: "Biography implies ... dominance of the past over the present" (M. KOHLI 1978: 27 – author's translation). Because everything in the present is converted automatically with time into the past KOHLI's observation can be extended to: Biography implies ... dominance of the past over the present and the formation of the future. When the model of permutational sequences is presented in chapter 3.3 it will be shown that the predetermining effect of the past on the future increases with age (page 85).

The assumptions (a), (b) and (c) can be made clear formally as follows: Let  $Z^A$ ,  $Z^B$  be vectors of variables describing the situations of persons A and B. The vectors are time dependent. Consider the points in time  $t_1$ ,  $t_2$ , and  $t_3$  as examples, then it could happen that the following diagram symbolized the connection between past, present and future for A and B:



Even if the situations of A and B are identical at a given point in time ( $t = t_2$ ) differences in past history and personality generally lead to divergent evaluations of the present situation and so to different courses in the future. Further (assumption (c)), a common present situation and a common past history, as certainly occurs when the individuals A and B are considered as identical, still does not imply that there is one and only one possible future if decisions as to this future have not yet been taken. For example, upon marriage ( $t = t_2$ , see below) the possibility that child will arrive in the next 5 years (or even at all!) depends on the still outstanding decision as to whether the woman's planned occupational training is undertaken or not.



The question of the means by which the "past obtains a dominance over the present" (M. KOHL) can be re-formulated in the language of biographic model building as: For a given set of past events at time  $t$ , how does it occur that the order of these events also determines behaviour at  $t$ ? The dominance of the past occurs for two reasons, both of them of a nature which justifies the use of the expression "dominance": (1) all new experience is seen in the light of the old, (2) experience gained tends to confirm opinions and the set of values already existing. It is for this reason that most people contend that — given the choice — they would live the same life

again, a contention expressed with increasing positiveness with age and remarkable in that it seems to apply to all biographies no matter how extremely different.

Those demographers who are now advocating government policies aimed at increasing the birth rate are emphasizing the implications of values for generative behaviour. H. SCHUBNELL (1984: 138) recommends policies directed towards changing values, "... a population policy has to include means to change values". M. WINGEN (1938: 24) suggests that it might be appropriate "... to change the fundamental motivation for generative behaviour" (author's translation). These opinions have both a normative and substantial dimension. The normative implications will not be taken up here, but the substantial core is of interest since it is in essential agreement with the theoretical biographic approach of this work; consider the following example: The two sequences

Sequence 1: Marriage —————> Housewife —————> 1st Child  
 Sequence 2: Occupation —————> Marriage —————> 1st Child

have differing consequences for the probability of a second child. The negative experience gained in sequence no. 2 in exercising a full-time occupation and bringing up a child at the same time usually leads to a lower probability, i.e. leads — in general — to behaviour orientated towards reducing the conflicts arising and not to multiplying them. Thus differences in content and sequence of *curriculae vitae* presumably have numerous implications for the orientation of values or, indeed, for the very acquisition of values. Values belong to another ontological sphere than facts, or statistical data on facts, but values don't grow on trees and so it would seem reasonable to suppose that the two ontological spheres are connected and even influence each other. This view corresponds to that of plural ontology, in particular with that propagated by POPPER (1973). In other words: Identifying values and their changes is not enough, research has to be directed towards investigating the formation of values and why they change, i.e. it has to be investigated why values exist at all.

## 2.2 Proposition 2: Biographic Mobility has a Dual Role

The phenomenon of biographic mobility will be regarded as a means of working with the concept of biographic coherence in analysis. There are other ways of bringing the concept of biographic coherence into operation without lending any great significance to biographic mobility but, at the present time, it is thought that the approach using mobility is the most promising.

Biographic mobility, in particular intersequential biographic mobility, is an important characteristic of life closely related to generative behaviour. However, (at least) two large categories of biographic mobility have to be distinguished with respect to the causes of mobility and so according to the relationship of mobility to generative behaviour. The categories arise from the theory of development of the personality as formulated by CH. BÜHLER (1968: 17): "It is generally acknowledged that man, like all other living beings, is never in complete balance and that this partial or total imbalance is the cause of development. But there are two viewpoints as to what this development represents. Some believe it is a continuous drive to establish and maintain such an equilibrium or homeostasis, while others contend that there is a second aspect, that of 'creating a change toward producing new potentialities'."

Biographic mobility is an ambivalent phenomenon which can be regarded both as an expression of "adaptation" as a result of loss of homeostacy as well as "decision" as an expression of the urge for "achievement". Both interpretations are considered to be valid. Two propositions are therefore necessary for the connection between biographic mobility and generative behaviour:

### Proposition 2a:

Proposition 2a accounts for the case that mobility is an expression of biographic adjustment (adaptation) to a loss of mental balance, also to external deformation of the virtual biography. Mobility in this case is an adjustment reaction and not a positive resource.

The probability of the birth of a child varies cet. par. inversely proportional to the intensity of the biographic mobility.

Proposition 2b:

Proposition 2b accounts for the case that mobility is an expression of a direct wish for biographic change, i.e. is a positive action and not a reaction. Mobility in this case is a positive resource and not merely adjustment.

The probability of the birth of a child varies cet. par. directly proportional to the intensity of the biographic mobility.

The two propositions can be combined in two ways: (I) At first the probability of a child increases with mobility thereby reacting a certain maximum value (Prop. 2b), and then decreases (Prop. 2a). (II) A second plausible form of combination can be constructed by assuming that Prop. 2a is valid for a certain group of individuals and Prop. 2b for another group. The two groups have a differing personality structure and exist side-by-side in the society under consideration. The members of the first group are characterized by their essentially "reactive" behaviour – behaviour is orientated towards the maintenance of standards –, the members of the second group by behaviour that can be characterized as "active", orientated towards "achievement".

Which of the combinations (I) or (II) corresponds better (or at all) to reality cannot be determined without empirical analysis. Initial evaluation of the 30,000 occupational biographies of German men and women already mentioned (ALEX et al. 1979) shows that the interpretation (I) corresponds to reality. This result is illustrated by Fig. 2 in which the trends presented all show the postulated combined generative

Figure 2

Number of Children and Occupational Mobility

Explanation: Among the 30,000 occupational biographies considered were those of 1054 men of 31 to 33 years old. This group is subdivided here according to residence into the following 4 settlement size classes defined by the lowest, i.e. communal, administrative level:

<u>Occupational Biography</u>	<u>No. of Cases</u>
(1) in settlements of under 20,000 inhabitants	477
(2) in settlements with 20,000 to 100,000 inhabitants	215
(3) in settlements with 100,000 to 500,000 inhabitants	194
(4) in settlements of over 500,000 inhabitants	168

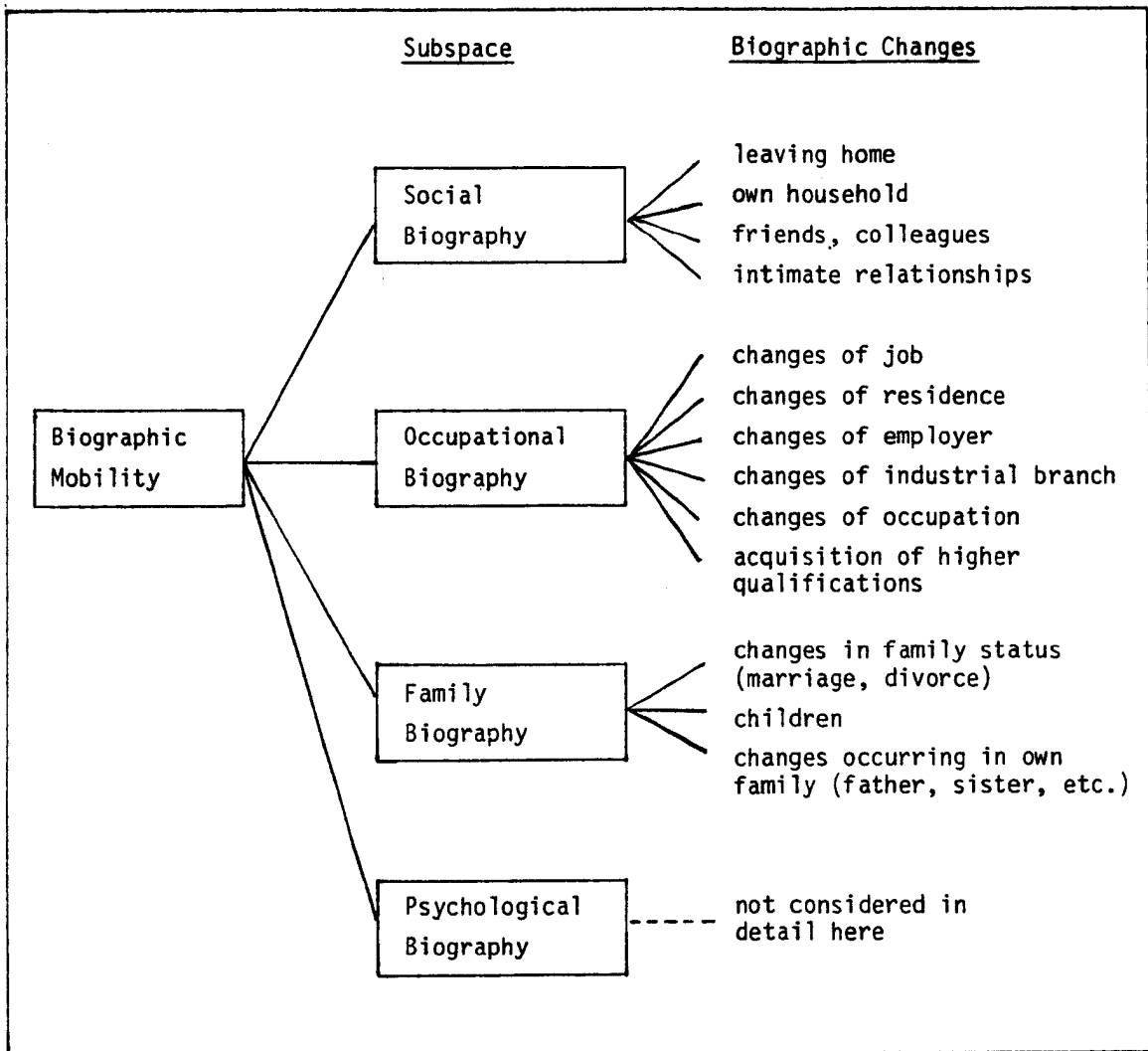
behaviour (I) and this without any attempt being made to separate the samples considered into two personality groups (which was not possible anyway on the basis of the data collected). The trends seen suggest quite plausibly that the portions of positive slope could be explained — in the case of the males considered — by mobility associated with the initial phases of a career, the portions of negative slope by mobility associated with career consolidation or even decline. MÜLLER (1979) has shown that of the economically active population a surprisingly large proportion of certain age groups has an occupational biography in a phase of de-qualification, i.e. of occupational decline. According to MÜLLER's calculations approx. 30% are in a situation of occupational decline, this also applies in particular to those under 30, i.e. to those in the best age for starting a family (7).

The parts of the curves of Fig. 2 with positive slope presumably represent intrasequential mobility. If this is in fact the case, then it can be deduced that an upper bound for the intrasequential mobility frequency in the career building phase exists and that the intersequential mobility frequency in general has a higher value in the phase of occupational decline (ref. the opportunity cost model of chapter 3.1).

The clarity with which the propositions 2a and 2b are illustrated by Fig. 2 is surprising, for biographic mobility includes many more factors influencing generative behaviour than just changes of job. Fig. 3 shows some of these other factors for three of the four postulated biographic subspaces, and it can be clearly seen that occupational mobility is only one — although perhaps an important — contributor to mobility in general. Nevertheless, plotted against this one factor (job mobility) the trends of Fig. 2 still have the postulated phases of positive and negative slope. The differences to be seen in generative behaviour with settlement size substantiates (once again !) the conjecture that generative behaviour is strongly influenced by regional circumstances and life styles. The higher level of the trends shown for the lower settlement sizes could be interpreted to be a result of the factually lower opportunity for promotion by means of change of job in such areas as opposed to that found in the bigger cities, where, because of the relatively large demand for labour (e.g. in terms of the number of changes of personnel per 1000 jobs), it is easier to further a career.

Figure 3

Forms of Biographic Mobility





Regression analysis of data on the labour office areas in the state of Nordrhein Westfalen shows that the number of changes of job per 1000 employees increases with the size of labour market (BIRG 1987). However, it is equally possible to interpret the higher levels for smaller communities as a reaction of the individual to the lack of opportunity in life, i.e. to the perceived phenomena of (relative) deprivation (8). From the information for the 30.000 occupational careers it was not possible to investigate and deduce the actual motivation. An important part of the new questionnaire discussed in chapter 5 concerns the additional information necessary on personal objectives and motivation. Decisive, however, is the facility the new questionnaire provides for linking objectives and motivation with profession or occupation, for nearly all occupations demonstrate typical career and motivation patterns.

For all the models of generative behaviour to be developed it is, of course, essential that the concept of biographic mobility has the function of a common theoretical basis. It is the first group of (three) models that is presented here in chapter 3. These models will be used for empirical investigation of the viability of the postulated concept of biographic mobility using objectively quantifiable curriculum vitae data. In a second group of models (not presented here) the investigations will be intensified and refined by including subjective data on mobility. A third group of models is contemplated with which the effects of personal objectives in life, the important determinants of the social biography and the relationship between the biographies of man and wife can be included. Because the degree of explanation of generative behaviour that can be achieved by the various groups of models is not yet known the necessity of including all three groups in a research programme cannot be questioned at the present time.

### 2.3 Proposition 3: Personal Reactions Conformal with the Dynamics of the Labour Market Reduce the Probability of Births

The changes that occur in the various sequences of the occupational biography, the social biography and the family biography place demands on the co-ordination capability, the organizational flexibility as well as on the financial resources of the

individual. In the case of couples living together and those married, in particular those with children, the additional difficulty arises of achieving agreement among the members of the household in the event of change:

Proposition 3:

Structural change in the economy and therefore in the labour market has the effect of exercising continual pressure on the flexibility of the labour force which is stimulated to adjust with changes of job, of occupation, of residence and other forms of biographic mobility. The dynamics of the labour market are an extremely important determinant of intra- and intersequential mobility.

The opinion that "... continuous social change ... (makes even) more individual adjustment necessary ..." (M. KOHLI 1978: 27) is presumably correct. The effects of the business cycle and rapid change in specific sectors together with the more long-term general structural change add to the demands on the flexibility of the individuals employed in specific occupations and/or branches of industry, or living in certain regions, to adjust (ref. KNEPEL, SCHULTE and SURLAGE 1983, FILIP and KRENGEL 1981). The processes of adjustment that result when the capital stock (number of jobs) on the one hand and the labour force on the other are renewed at differing rates must be regarded as particularly important, especially when the capital stock ages because of decreasing investment activity and, at the same time, the labour force is increasing due to particularly strong age groups entering working life without the corresponding retirement taking place at the other end of the age scale (ref. BIRG 1984).

Surprisingly few authors have paid attention to the connection between family status and/or number of children and occupational and biographic mobility, although background research in the area of economic and social mobility is plentiful — as evidenced by the contributions to the workshop "Micro-analytic Fundamentals of Social Policy" held in Mannheim at the end of 1983 (9). This research provides supporting material for the propositions presented here. Only few authors have pointed out this connection, i.g. M. WERTH (1974) wrote in the preface to his (10) "Analysis of Factors Inhibiting Mobility" that when he started his work in 1971 and looked at the

existing contributions of sociological research on the question of changes of job and occupation, two aspects became clear, firstly (11) "... the degree to which innumerable families are put under socio-economic pressure to be mobile and to what little extent they are capable of withstanding this pressure ... and (secondly - author) the astonishing realization that sociological theory and empirical sociological research, although responsible for vast amounts of literature on the problems of vertical mobility and social classes, had conducted hardly any well-founded empirical or theoretical studies on the currently relevant and, indeed, more important problems connected with changes of job and occupation. The demand for a higher level of mobility on the part of employees arises quite quickly. It fits into the picture of a dynamic economic system and can be accommodated without contradiction by modern theories of social change in a society. But the consequences that result for certain groups in this society and for the society as a whole, and the conditions that enable mobility to take place, do not appear to have interested sociological research to any great extent."

Unfortunately WERTH did not follow up the ideas expressed in his preface. Following the objectives of his research he investigated family conditions as possible determinants of immobility whereas here mobility is seen as a determining factor for the development of the family. The above quoted passage remained an appeal to others.

SCHUMPETER also has to be mentioned in this connection since his basic theme in "Capitalism, Socialism and Democracy" essentially corresponds with the views represented here. SCHUMPETER contends that the capitalist system derives its momentum from sources which are not of a "capitalistic" nature and that capitalistic development thus inevitably destroys these - its own - sources. One consequence of the process of self-destruction is seen as the decline of the importance of the family: "As soon as men and women learn the utilitarian lesson and refuse to take for granted the traditional arrangements that their social environment makes for them, as soon as they acquire the habit of weighing the individual advantages and disadvantages of any prospective course of action - or, as we might also put it, as soon as they introduce into their private life a sort of inarticulate system of cost accounting - they cannot fail to become aware of the heavy personal sacrifices that family ties and especially parenthood entail under modern conditions and of the fact that at the

same time, excepting the cases of farmers and peasants, children cease to be economic assets. These sacrifices do not consist only of the items that come within the reach of the measuring rod of money but comprise in addition an indefinite amount of loss of comfort, of freedom from care, and opportunity to enjoy alternatives of increasing attractiveness and variety ... The implication of this is not weakened but strengthened by the fact that the balance sheet is likely to be complete, perhaps even fundamentally wrong" (SCHUMPETER 1942: 157/158 – author's underlining).

The theory developed here has much in common with SCHUMPETER's views. The arguments used here, however, are somewhat different in that ethical and moral considerations are not brought forward. Instead argument is based on the interaction of effects that can be observed in both capitalist and socialist societies. The result of the propositions of this chapter – at this point introduced in advance –, namely, that the birth rate will not stabilize out at its present (or at a higher) level but will continue to fall, therefore also applies to socialist countries.

#### 2.4 Proposition 4: The Occupational Biography Dominates over the Family and Social Biographies

Here three principal biographic subspaces are considered, the occupational, the family and the social biography. The physical unit of time is the same for all three biographic types but the temporal organization of the sequences in each subspace has its own specific character. The sequences are determined not only by the individual himself (leaving home, taking employment for the first time, change of job, marriage, etc.) but also by the external relevant biographic events with which the individual finds himself confronted. The structure of the course of life in sequences occurring as a result of decisions of the individual can be sub-divided into parts which are reversible and parts which are irreversible. Further, if the number of biographic changes that take place per unit of time ("mobility frequency") in the various subspaces is given the symbol  $F_n$  for subspace  $n$ , a ranking or hierarchy

$$F_n > F_{n-1} > \dots > F_1$$

can simply be constructed. With this nomenclature two propositions can be put forward:

Proposition 4a:

For decisions made with reversible consequences in a certain biographic subspace the prevailing conditions in subspaces of lower mobility frequency are, in general, regarded as given. The decision is determined by the biographic subspaces of lower rank. This form of domination of the subspaces of lower mobility frequency over those of higher frequency will be called static domination. An example of a "reversible" decision in accordance with Proposition 4a might be that of the dependence of the decision to rent flat A or flat B on the location of the place of work. In this example the choice of a workplace is regarded to be given when the choice of the flat takes place.

Proposition 4b:

Decisions made with irreversible consequences, usually taken at the lower levels of the mobility frequency hierarchy of biographic spaces, are – in general – determined by the prevailing conditions and the sequences that have led to these conditions in the subspace of equal and higher mobility frequency. Such domination of subspaces with higher rank over those with lower will be called dynamic domination. An example of an "irreversible" decision on the basis of proposition B might be the decision of a young woman to marry (or not) which can be assumed to be dependent on the following conditions and events belonging to subspaces of higher mobility frequency: Her investment in terms of time and money in her education and professional training, her acquired levels of financial independence and social autonomy.

**2.5 Proposition 5: The Change in Generative Behaviour in the Federal Republic of Germany between 1965 and 1975 was Accompanied by Increasing Domination by the Occupational Biography**

The increase in social and occupational mobility as recorded in the literature can be attributed not only to a fluctuation in employment, or to an increasing "mobility" as such, but also to a change in the hierarchy of domination of biographic subspaces. Six hierarchies or schemes of domination are possible for the three subspaces  $E \equiv$  occupational biography,  $S \equiv$  social biography and  $F \equiv$  family biography, namely:

- (1)  $F > S > E$
- (2)  $F > E > S$
- (3)  $S > F > E$
- (4)  $S > E > F$
- (5)  $E > S > F$
- (6)  $E > F > S$

The form of domination varies with social class, regional particularities as well as historically but the following general scheme of change of domination can be observed in the Federal Republic since the time of serious decrease in the birth rate:

$F > S > E$	1960	} Principal Phase of Change in Generative Behaviour
$F > E > S$	1965	
$E > F > S$	1970	
$E > S > F$	1975	
$S > E > F$	1980	} Speculative Forecast
$S > F > E$	1985	
$F > S > E$	1990	

The scheme is an extremely simplified illustration or interpretation of the changes in domination of the three biographic subspaces from 1960 to the present time together with speculative extrapolation to the end of this decade. It shows the increasing domination of the occupational biography in the period of the German economic boom, 1960 to 1970, succeeded by a period of increasing importance of the social

biography in the time of "changing values" that followed. The extrapolation from 1980, in which the family biography gains significance, is pure speculation based on an assumption of cyclic change — not much is known on the chances of such a change occurring.

The various aspects of the labour market affect family decisions in all phases of the above process. If decisions concerning the occupational biography dominate those of the subspace of the family biography then family orientated decisions will accommodate occupational decisions, but not without the penalty that a long-term family policy and planning then becomes impossible. In such a situation the virtual biography is so altered that certain biographic sequences with long-term consequences disappear as viable alternatives in life. The drastic decrease in the number of marriages and in the birth rate are consequences of such an alternative. An explanation of the alternation in domination is possible on the basis of a process of socio-historic change without employing any accusation of hedonism. The driving force behind the change lies in the scientific and technical innovation occurring on the one hand and in the innovation of social behaviour and social structure on the other; both effect continuous change on the tempo and structure of the economy. The resulting dynamics of the labour market lead to changes in the occupational biography which, in particular with respect to their effects on the family biography, are then often rationalized as demonstrating a "change in values".

### 3. Three Biographic Models

#### Introductory Remarks

Coherence in a biography can be comprised of many different elements and can be exhibited in various ways. The first model, in this chapter, the opportunity cost model, is constructed upon the assumption that biographic coherence is given when one of the considered three biographic subspaces (Fig. 3) dominates the other two. In this model changes in the family and social biographies are considered to be dependent upon the changes of state occurring in the occupational biography. A second model (the model of congruent biographic structures) is developed on the simple basis that coherence in the biography of an individual is given if it exhibits structural similarity with the "typical" biography of the age group, social class and/or occupational level to which he belongs. A third model (a model of permutational sequences) considers coherence within the framework of the virtual biography which has the typical structure of a decision tree.

Each model typifies a whole class of models. The particular models presented are designed for intensive study of specific aspects of human behaviour. The primary concern is to investigate whether and how structural change in the economy and the resulting changes on the demand side of the labour market affect the probability of births. The considerations of the previous chapters enable this question to be placed within a broad and consistent theoretical framework. The model of permutational sequences, for example, includes generalized demographic equations which facilitate explanation not only of generative behaviour but also of other demographic phenomena such as that of marriage.

The models presented can also be understood as examples of how a generalized – mostly verbal – theoretical framework can find concrete – mathematical – expression by adopting specific hypotheses. Confrontation of the models so formulated from theory and various alternative hypotheses with the empirical evidence should then indicate the most promising route towards an explanation of generative behaviour.



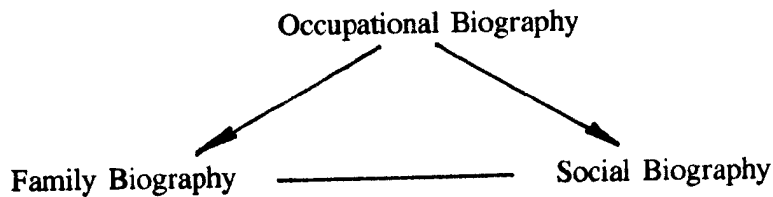
### 3.1 A Biographic Opportunity Cost Model

#### 3.1.1 The Model

An empirical observation and a conjecture provide the starting point for the construction of the model. The observation is that the sharp decrease in the birth rate was accompanied by an extreme increase in the activity rate of married women (12). The conjecture concerns the length of the expectation or planning period of economically active men and women; formulated as a hypothesis: The various professions and occupations are affected to a differing extent by structural change in the economy and by the subsequent structural change on the labour market because of the differing reaction of the various branches to business and growth cycles, because of their differing prospects for development in the future, and hence because of the differing degrees of security available to their employees, i.e. to the various occupations. The consequence is that the length of time that an economically active person can effectively plan in his life is heavily dependent on his occupation, on his type of job and on the business situation of his employer. An example of an employee with a high level of security is a government official (13).

Employees in contracting and stagnating branches, or in those that are susceptible to economic crises (steel, certain areas of textile manufacturing, etc.), have a shorter personal planning horizon than those engaged in areas of expanding economic activity. An indicator for the extent of the personal planning horizon is the frequency of change of occupation, job and area of activity for which extensive statistics are available and which varies considerably from occupation to occupation (ref. HOFBAUER and KÖNIG 1973, HOFBAUER 1978, ALEX et al. 1979, BLASCHKE 1982, HELBERGER and RAUSCHER 1983).

The model is designed for those economically active for which the usually to be expected interdependence of changes in the occupational, social and family biographies is completely dominated by the events and changes in the occupational biography, i.e. in their working life:



The following outlines the further assumptions made and the areas of application of the model:

Assumption 1:

(a) The model is valid for a specific class of people with an identical demographic background. It could be assumed, for instance, that the class consists of married couples, all married for the first time and equally long, that all pairs have the same age combination (e.g. the woman 22 and the man 26 years old) and that all marriages are, as yet, childless; further identical background could be that the couples have an identical occupational combination and are employed in the same economic branches, and that they live in a similar regional/cultural environment. All couples should have the same conditions for estimating (correctly or incorrectly) their future opportunities and/or formulating their expectations for the future.

Thus, superficially, the model is extremely restrictive – but if the dependencies can be modelled with the correct structure for one specific class of married couples then for others, e.g. of different ages or married for a different length of time, the analogous model simply with different values for the parameters should also be valid. The relatively restrictive definition of the class of people considered by one set of parameters does not restrict the application of the model, it means, however, that it has to be applied more often in order to cover a significant proportion of the population.

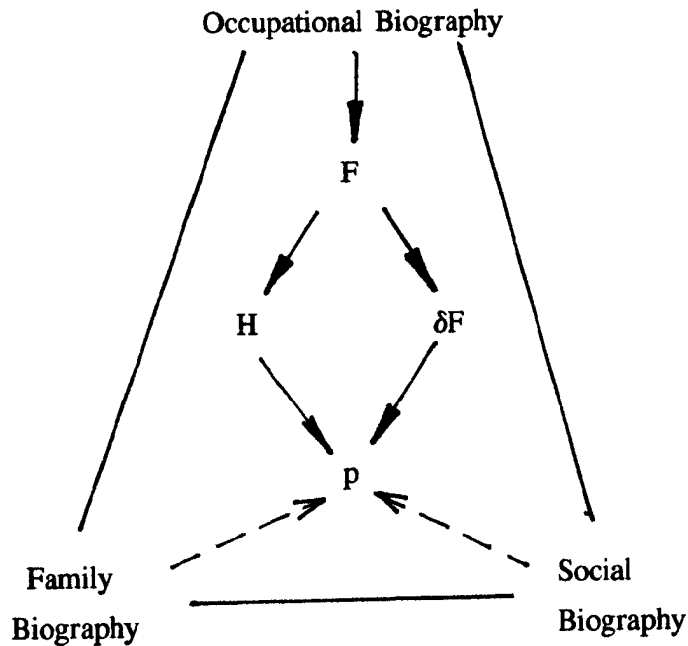
(b) It is assumed that the probability that a couple has a child within a given period of time (T), usually dependent on the occurrences in all three biographic subspaces,

is dependent only on the influence of the occupational biography regarded here as dominant. Four variables are defined as follows:

<u>Variable</u>	<u>Dimension</u>
H $\equiv$ extent of planning horizon of a married couple in the given class	unit of time (months or years)
F $\equiv$ occupational mobility frequency of the man or woman (or of the couple) expected within the planning horizon (alternatively, the overall biographic mobility, to which the occupational mobility contributes, could be taken here)	number of changes of state in occupational biography (alternatively, in all 3 biographic sub-spaces)
$\delta F$ $\equiv$ biographic opportunity costs of having a child	reduction in F which a child would imply
p $\equiv$ probability of having a child within period T	$0 \leq p \leq 1$

The above variables apply to the case where the married couple is considered as the unit – other versions of the model can be constructed with variables defined separately for husband and wife.

The assumptions on the dependencies of the four variables can be seen in the following diagram of the model structure:



Assumption 2a:

The greater the planned or expected mobility is in the subspace of the occupational biography (mobility frequency  $F$ ) the shorter appears the planning horizon  $H$ :

$$(1) \quad H \equiv H(F)$$

where the function  $H$  is monotone decreasing (Assumption 2aa) or first increases with  $F$  to a certain maximum value and then is monotone decreasing (Assumption 2ab).

In chapters 2.2 and 2.4 the direct connection between the probability of births  $p$  and the biographic mobility  $F$  was discussed whereby the assumption of a first increasing and then decreasing function  $p(F)$  was postulated and justified. Here the intermediate variable  $H$  (planning or expectation horizon) has been introduced and it could be quite reasonable to assume – alternatively – such a form again since low mobility can be interpreted as an expression of inhibition towards personal advancement (making a career) or of a lack of opportunity for occupational advancement, which

could easily result in a somewhat shorter planning horizon. In the discussion of the dual role of biographic mobility in chapter 2.2 both the increasing and decreasing interpretations were regarded as valid and it was shown that (at least) two approaches to integration of the interpretations are possible. Thus in the model at hand both the assumptions 2aa and 2ab will be considered. Firstly, the case of a monotone decreasing function  $H(F)$  will be discussed with its implications, later the initially increasing but eventually decreasing function.

Assumption 2b:

Biographic opportunity cost are defined as the number of those alternative sequences in the virtual biography which would be implicitly closed upon having a child. The opportunity costs will be measured (initially) in terms of loss of occupational mobility since this seems to be both a plausible and easy way for starting to test the model. It is assumed that the loss of mobility  $\delta F$  is higher the higher the expected or planned mobility in the considered time – span  $T$ , i.e. that:

$$(2) \quad \delta F = \delta F(F)$$

where the function  $\delta F$  is monotone increasing.

The concept of "biographic opportunity costs" differs in several ways from the concept of opportunity costs existing in the economic theory of the family (ref. BECKER 1965 u. 1981). The most important difference is that the economic definition is usually restricted to income aspects or to "benefit" although even with the economic definition a much wider operational interpretation is possible. In family economics, for example, the opportunity costs of a child are often defined as the loss of income of the mother resulting from her giving up her job or reducing her occupational activity. The concept of biographic opportunity costs used here is much more encompassing. It refers to all lost alternative sequences in life, not only those related to income, in particular to the "freedom" to choose one's own individual style of life. A loss of freedom in this context can be directly associated with reduced in-

come, although this is not necessarily so, and indeed it is by no means certain that a loss of freedom and a reduction in income correlate in any significant way. Thus the economic concept of the opportunity costs of having a child is a specialized version of the concept of biographic opportunity costs in which "freedom" is given a monetary value in terms of loss of income. It is clear without further discussion that this is usually not viable (14).

The essential difference between the economic and biographic definitions of opportunity costs lies in the much wider scope of the biographic concept and not so much in that the units of measurement are different as a result of regarding income as the relevant biographic factor. Income is certainly important, but in terms of biographic theory is only one factor among others. The same can be said of the "utility" concept. Although the concept of utility is much wider in scope than that of income it still appears to be less useful for explaining generative behaviour than the concept of biographic opportunity costs. This can be demonstrated with a simple example. Assume that a married couple finds itself in the situation that the husband's career is going so well (or badly) that it is clear that an important occupational decision is pending. The decision alternatives, which could also seriously affect the family life, are, however, not exactly known at the present time. Even if, at the point of time of decision, factors in the economic category such as income or utility in the wider sense are known to be equivalent for all decisions, there would still exist uncertainty in the future, which would delay or cause revision of the long-standing family planning. In other words, future decisions on equivalent economic situations, whether expressed in terms of income or as utility in a broader sense, have the tendency to delay children (perhaps indefinitely) in order that the pending occupational decision is not influenced by new events in family life.

Assumption 2c:

The greater the extent of the personal planning horizon, the higher (cet. par.) is the probability of having a child:

$$(3) \quad p \equiv p(H)$$

whereby the function  $p(H)$  is monotone increasing.

Conclusion 1:

The assumptions 2a, 2b and 2c lead to a fourth relationship:

$$(4) \quad p \equiv p(\delta F)$$

which is called the "biographic opportunity cost function". The function  $p(\delta F)$  is monotone decreasing by deduction from the three other relationships. This opposition of trend between the probability of a child and the biographic opportunity costs constitutes the core of the model. If the three assumptions 2a, 2b and 2c are valid, then so is this relationship. An example with simple functions illustrates the connections between the variables whereby, however, the logic of the monotone senses of the relationships is valid for all correspondingly orientated functions no matter how complex or simple:

$$(1.1) \quad H = F^{-a}; \quad a > 0, \text{ monotone decreasing}$$

$$(2.1) \quad \delta F = F^{\beta}; \quad \beta > 0, \text{ monotone increasing}$$

$$(3.1) \quad p = H^{\gamma}; \quad \gamma > 0, \text{ monotone increasing}$$

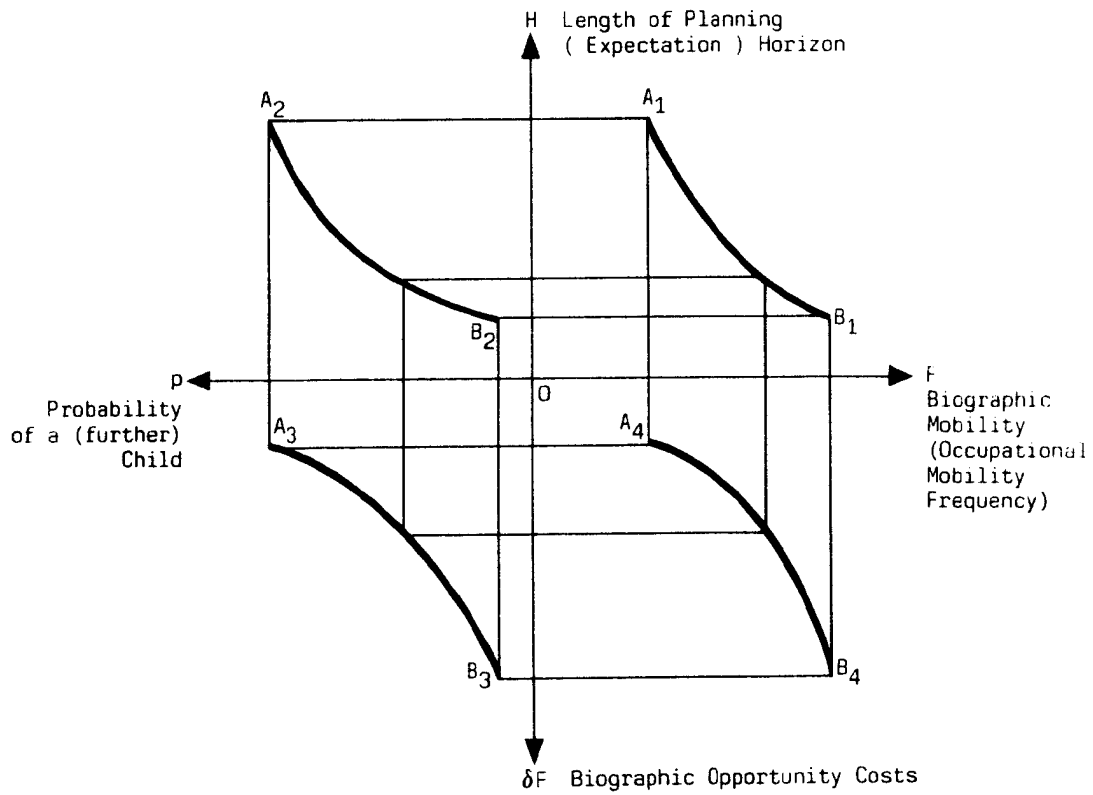
Solving for  $p$  in terms of  $\delta F$  results in the biographic opportunity cost function

$$(4.1) \quad p = \delta F^{-\frac{\alpha\gamma}{\beta}} \quad ; \quad \frac{\alpha\gamma}{\beta} > 0, \text{ monotone decreasing}$$

It should be remembered that the assumption 2aa has been used in the argument so far, i.e. that the function  $H(F)$  is monotone decreasing and this leads to the result that higher biographic opportunity costs cause a reduction in the probability of births.

Figure 4

The Relationships between Probability of Births, Biographic Mobility, Biographic Opportunity Costs and the Personal Planning Horizon (Biographic Opportunity Cost Model)





The same result is obtained if the model is made more complicated by bringing further variables into the function (1) in order to make it more realistic. For instance, if the planning horizon is made dependent not only on the absolute level of the biographic mobility frequency but also on the biographic opportunity costs, e.g.

$$(1.2) \quad H = F^{-\alpha} \delta F^{-\epsilon}, \quad \epsilon > 0$$

then solving for  $p$  in terms of  $\delta F$  gives

$$(4.2) \quad p = \delta F^{-\frac{\alpha\gamma}{\beta} - \epsilon\gamma} \quad ; \quad \frac{\alpha\gamma}{\beta} + \epsilon\gamma > 0, \text{ monotone decreasing}$$

and the same interpretation is obtained, namely that

$$\frac{dp}{d\delta F} < 0 \quad \forall \alpha, \beta, \gamma, \epsilon > 0.$$

Finally, a third version is presented in which the probability of a child is assumed to be much more complicated than before. It is assumed that equations (1) and (2) still hold good but that the probability of a child is directly a function of and positively related to the extent of the planning horizon (as before) as well as negatively related (cet. par.) to the occupational mobility frequency and the biographic opportunity costs (as in the second version), thus:

$$(1.3) \quad H = F^{-\alpha} \quad ; \quad \alpha > 0$$

$$(2.3) \quad \delta F = F^{\beta} \quad ; \quad \beta > 0$$

$$(3.3) \quad p = H^{\gamma} F^{-\mu} \delta F^{-\epsilon} \quad ; \quad \gamma, \epsilon, \mu > 0$$

This leads to

$$(4.3) \quad p = \delta F^{\frac{-(\alpha\gamma + \mu) - \beta\epsilon}{\beta}}$$

which is monotone decreasing. Despite the much more flexible assumptions the result is the same: increasing biographic opportunity costs result in lower probabilities for children.

### Conclusion 2:

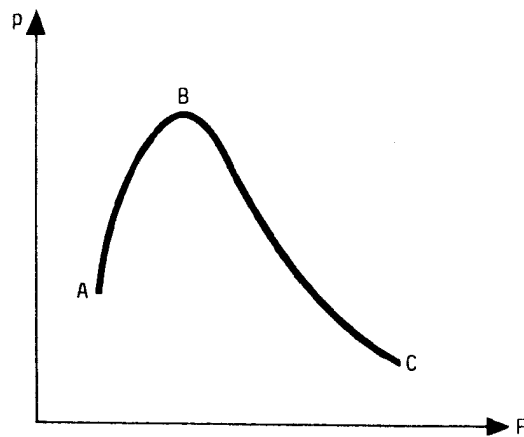
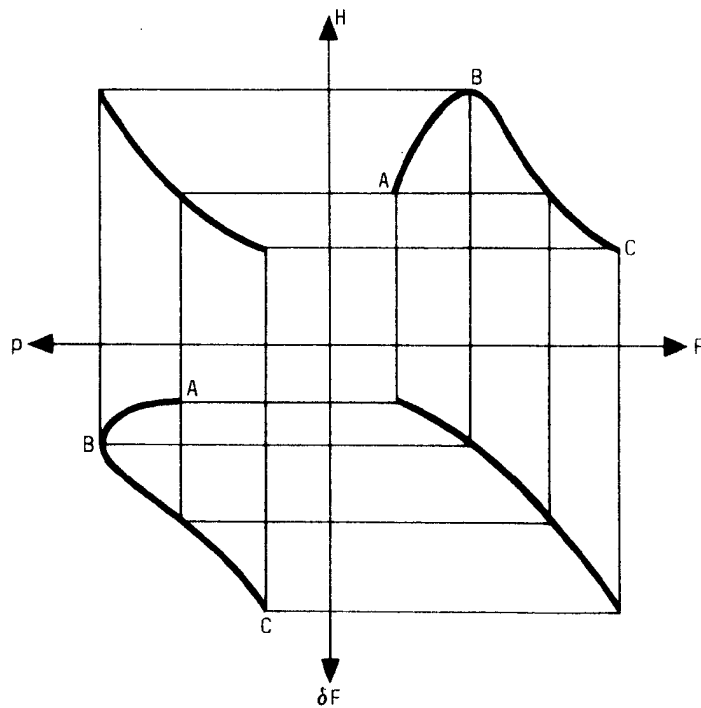
If in Fig. 4 an initially increasing and – with further increases in mobility – later decreasing relationship between the planning horizon and biographic mobility is considered (instead of the original monotone decreasing function, i.e. assumption 2ab instead of 2aa), then a relationship between the probability of births and biographic opportunity costs results (ref. Fig. 5) which has the same form as the assumed  $H(F)$ , i.e. at low levels of mobility and therefore of opportunity costs increases in opportunity costs are accompanied by an increased probability of a child, at higher levels of mobility and therefore of opportunity costs increases in mobility and so opportunity costs reduce the probability of a child. This theoretical result corresponds with empirical evidence as already discussed (ref. Fig. 2).

### 3.1.2 The Influence of Labour Market Dynamics

Structural change in the economy – as a macro-phenomenon – is linked with generative behaviour (as analysed here at the level of the individual) by several processes. The change in the total sum of scientific knowledge and the technical and economic innovation resulting from it are dynamic economic factors presently exogenous to the model which cause continuous revision of products and production processes and therefore of the level and structure of the demand for labour. A second area of significance also exogenous to the model is that of innovative change in behavioural patterns in general to which can be counted the changing pattern of demand for consumer goods and services as well as other recent forms of behaviour, for instance the trend that couples live more or less permanently together without

Figure 5

Probability of Births and Biographic Mobility  
(Theoretical Structure)



getting married. Scientific and technical innovation and social innovation contribute to the situation that the economy is in a permanent state of structural change and adjustment which in turn affects the market for goods and services and the labour market. In a social environment in which most people are dependent upon employment personal plans for the future (long or short-term) are inevitably affected by the risks involved in this dependency or, positively, by the prospects for occupational advancement available within the economy. The individual reacts to the risks and his perceived opportunities and the reaction affects not only the occupational biography but also other biographic subspaces, in particular the family biography. His generative behaviour, which is part of the family biography, is therefore embedded in the general process of structural economic change. The change in generative behaviour in the last 30 years as exhibited by the long-term decrease in the birth rate occurring for all age groups can be only properly understood and analysed in connection with the processes of economic and social structural change.

Fig. 6 depicts this connection schematically. Fig. 7 illustrates in more detail one aspect of Fig. 6, namely the relationship between the dynamics of the labour market and the adjustment processes in individual biographies – the effects of the labour market on biographies are summarized as "adjustment of individual and family biographies to the labour market situation". The connection between the birth rate and the economy, in fact, is being increasingly recognized by researchers and so the way is being opened towards an integration of (economic) labour market research and sociological mobility research on the one hand with demographic research on the other. The framework of biographic theory could prove to be a valid concept of integration. Regional mobility, social mobility, occupational mobility and changing demographic behaviour are aspects of the same basic biographic phenomenon, namely that of a decreasing structural constancy in biographies, or, alternatively, that of an increasing biographic structural change. The macro-phenomena of economic and social change can be regarded as reactions to changes at the level of the individual which in turn affect the behaviour of the individual, whereby the initiating process for some phenomena has to be sought at the macro-level, for others at the level of the individual.

Figure 6

The Connection between Structural Economic Change  
and Generative Behaviour

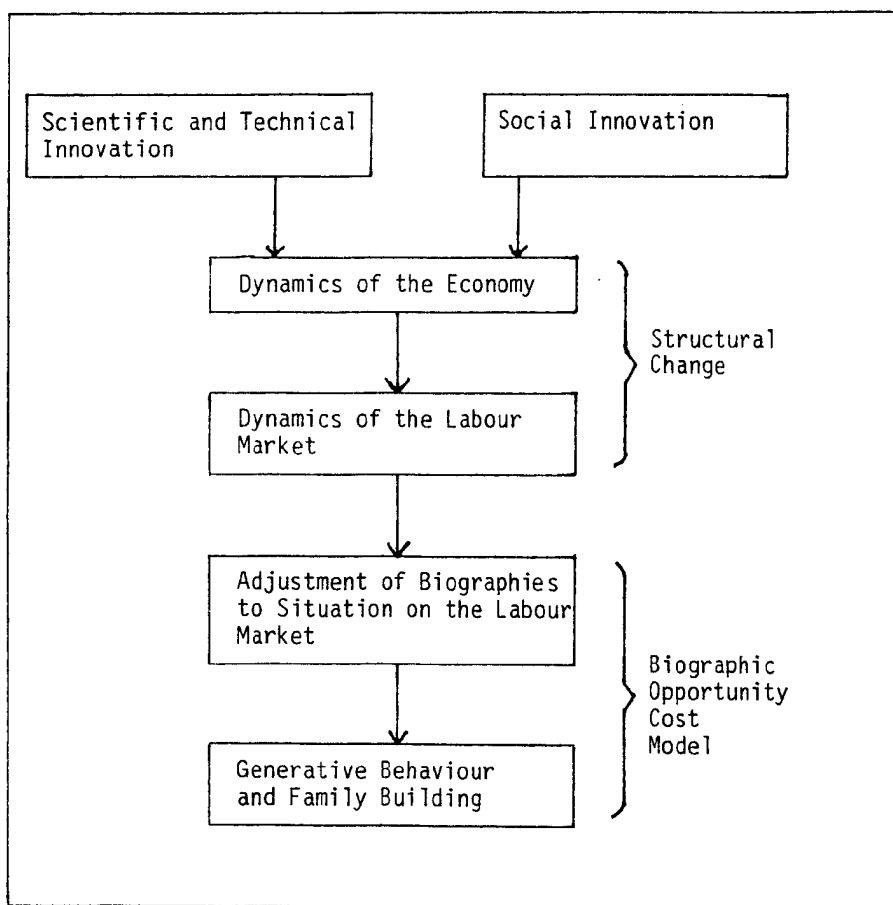
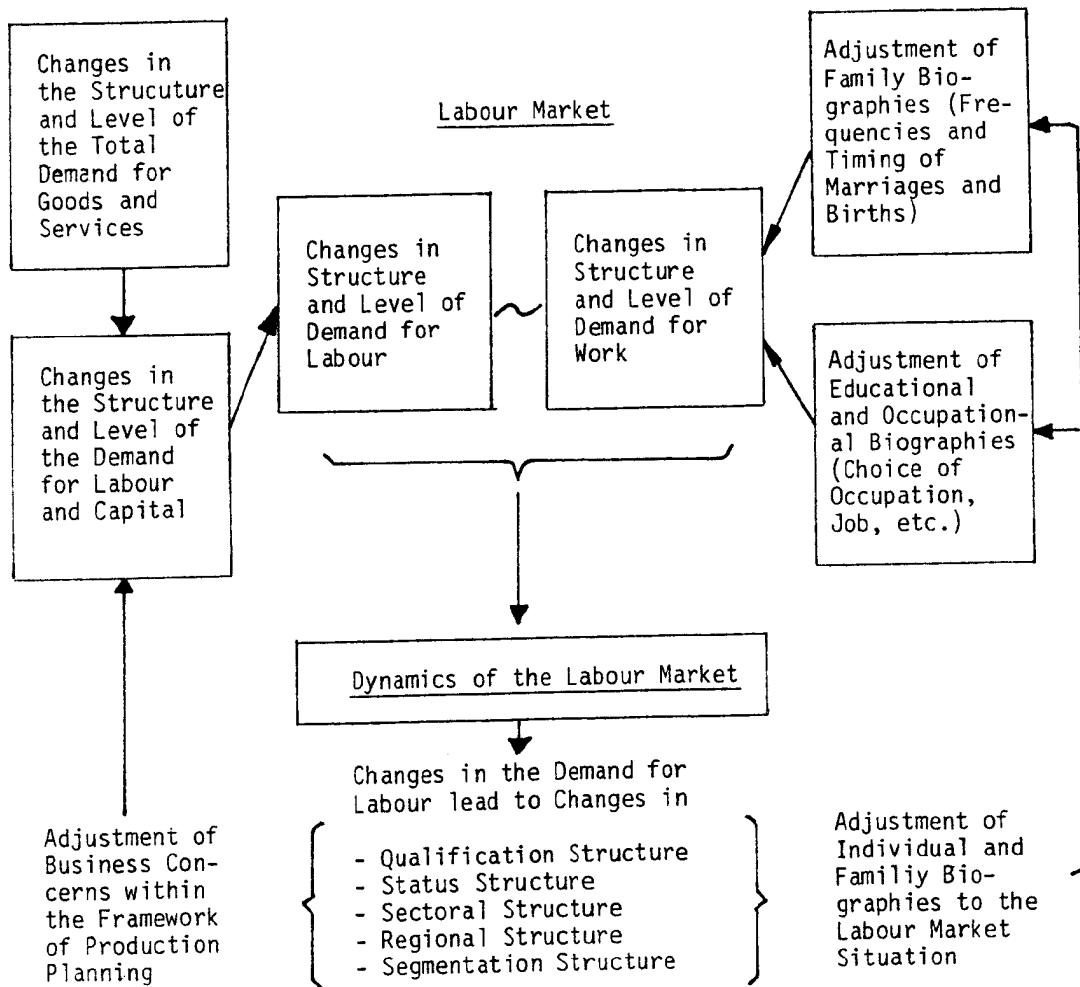


Figure 7

Structural Economic Change, Dynamics of the Labour Market  
and Processes of Biographic Adjustment



The regular reports of the recent years on economic structural change prepared for the government by the leading economic research institutes in the Federal Republic have stimulated research in this area and much has been learnt about the form and intensity of sectoral change. The changes occurring in the

- qualification structure
- status structure
- sectoral structure
- regional structure, and the
- segmentation structure

as listed in Fig. 7 have been the subjects of many empirical research projects (15). Although the major economic research institutes have been preparing structural analyses principally for policy purposes their results have important implications for demographic research. In the publications on structural change on the labour market there is sometimes astonishing agreement with the views presented here, in particular with respect to the adjustments that have to be made by the economically active population and their families: "The described changes in the structure of employees according to economic sector and qualifications ... indicate that there is a considerable necessity for adjustment on the part of the labour force. A prerequisite that the processes outlined do not lead to a structural imbalance between the supply of and the demand for jobs is a high level of both regional and occupational mobility ... All told, the results show ... that – as a result of structural change – the labour market has made considerable demands on the occupational mobility of those employed" (H. KNEPEL and R. ZUR SURLAGE 1983, p. 20 and p. 26 – author's underlining).

The effect of structural change, in particular of an accelerating structural change, on the birth rate can be simulated as follows by the opportunity cost model:

Case A

Structural change shortens the personal planning and expectation horizon because individuals see themselves compelled to adjust in an unplanned way to changes on the labour market. The reactions occurring can be accounted for in two ways in the model, either by a shift of the function  $H(F)$  or by a movement along the curve of  $H(F)$  in the direction of a higher  $F$  value, i.e. by an increase in mobility frequency (ref. Fig. 8). These two possibilities can be further classified to give a total of four separate reactions:

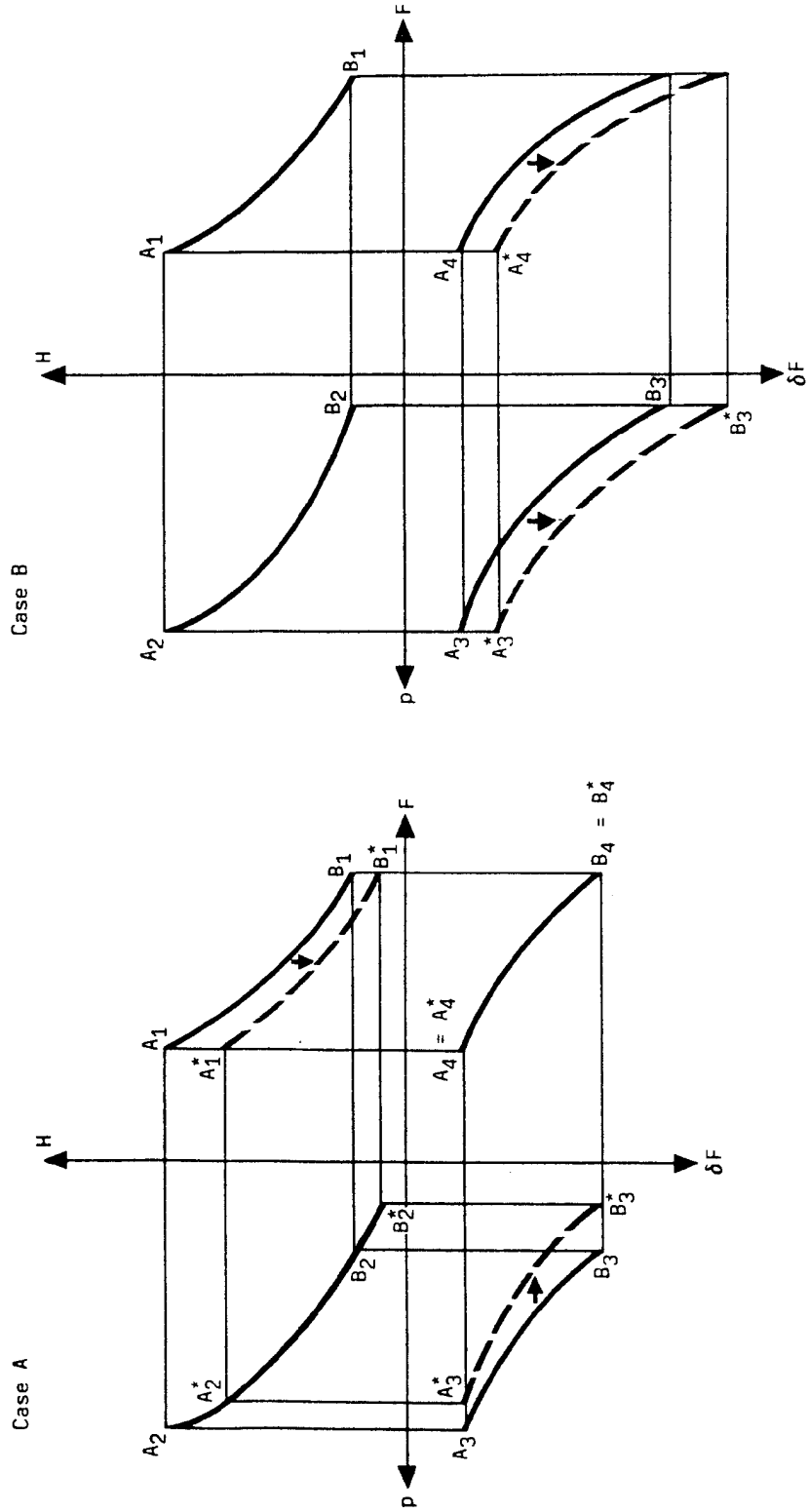
- A 1: Increased mobility frequency  $F$  with unchanged dependency of the planning horizon on it (movement along the curve of  $H(F)$ ).
- A 2: Increased mobility frequency  $F$  with — simultaneously — a vertical shift of the  $H(F)$  relationship in the direction of the origin.
- A 3: Both the mobility frequency  $F$  and the relationship  $H(F)$  remain unchanged. This reaction is introduced for the sake of completeness; both  $H$  and  $F$  normally adjust in a situation of intensive structural change.
- A 4: The mobility frequency  $F$  remains unchanged but the relationship  $H(F)$  is shifted vertically in the direction of the origin.

Case B

Structural change leads to both increased (occupational) mobility  $F$  and biographic opportunity costs  $\delta F$ . This implies that a rejection of occupational mobility on the part of an economically active individual has to be paid for with a loss of occupational and possibly other biographic alternatives in the course of his life. In the model increased mobility and biographic opportunity costs can be accounted for in a way analogous to Case A either with a shift of the function  $\delta F(F)$ , by a movement along  $\delta F(F)$  in the direction of increasing  $F$ , or by a combination of both (Fig. 8). As for Case A four reactions can be simulated:



Figure 8  
Influence of Labour Market Dynamics on the Connection between Biographic Mobility  
and the Probability of Births



- B 1: Increased mobility  $F$  and increased biographic opportunity costs with an unchanged relationship  $\delta F(F)$  – i.e. a simple movement along the curve of  $\delta F(F)$ .
- B 2: Increased mobility  $F$  and increased biographic opportunity costs  $\delta F$  with a simultaneous vertical shift of  $\delta F(F)$  away from the origin.
- B 3:  $F$ ,  $\delta F$  and their relationship  $\delta F(F)$  remain the same. This reaction is introduced for the sake of completeness, normally  $F$  and  $\delta F$  do not remain constant under conditions of intensive structural economic change.
- B 4: The occupational mobility frequency  $F$  remains constant but the function  $\delta F(F)$  is subject to a displacement away from the origin.

The influence of the dynamics of the labour market on the probability of births has to be investigated for each of the 16 cases arising from the combinations of reactions in Cases A and B. But not all combinations are logically consistent, of the 16 combinations 8 need not be considered (Fig. 9). From analysis of the other 8 combinations six lead to the conclusion that the probability of births must fall and two to a constant birth rate. But the result of a constant probability of births is only obtained if at least one of the relationships  $H(F)$  and  $\delta F(F)$  remains constant under conditions of structural economic change. This assumption is unrealistic. Realistic are the six cases for which the probability of births decreases; an increase cannot occur.

The above analytic deductions are valid only when the assumptions of the model are valid, but all of these are highly plausible. The conclusion must therefore be that structural economic change and the resulting dynamics of the labour market with the induced adjustments in personal and family biographies lead to increased biographic opportunity costs in the sense of the model and so to an unavoidable decrease in the birth rate.

Figure 9

Influence of Labour Market Dynamics on the Probability of Births in the Biographic Opportunity Cost Model

		A 1		A 2		A 3		A 4		
		increasing mobility frequency F				constant mobility frequency F				
		function H(F) constant		function H(F) displaced		function H(F) constant		function H(F) displaced		
B 1	increasing mobility frequency F	function F(F) constant	the probability of births <u>decreases</u>				combinations not compatible			
B 2		function F(F) displaced								
B 3	constant mobility frequency F	function F(F) constant	combinations not compatible				the probability of births <u>decreases</u>		the probability of births <u>remains constant</u>	
B 4		function F(F) displaced								

### 3.2 Models of Congruent Biographic Structures

#### Initial Remarks

As a basis for the construction of the two models to be presented in this section the hypotheses of chapter 2 are used, that biographies are both predetermined and formed as well as being deformed by the family within which an individual grows up and by the prevailing social environment. One consequence of making such assumptions is that it is unlikely that an actual biographic sequence can be found in which the various phases, both from the point of view of their content and of their order, can be regarded as being "optimal" among all the possible and/or desired alternatives that could have realistically arisen for a given person. The difference between what could have been and what is, between objective and real situations (or their temporal orders), however, determines the level of contentment of an individual, and there is a lot to be said in favour of the point of view that the degree of contentment has direct influence on the frequency of occurrence of the desire to have children. In their biographic study URDZE and RERRICH (1981: 126) came to this same conclusion: "The happier women are with their situation, ... the more frequently they would like to have another child and this independently of whether they are gainfully employed or housewives." This result seems to be reasonable even though it is a little surprising that the "independence" mentioned can exist. The result itself is not surprising since "contentment" is such a general term that it includes evaluation of the two situations "employed" and "housewife" with the consequence that the implications of being employed, by definition cannot be considered as being independent of the reasons for contentment. Surprising is simply how definitive URDZE and RERRICH are in presenting this result since its validity has to be subject to the same doubts that URDZE and RERRICH themselves have on standardized surveys (1981: 93): "... the structure of the survey is reflected in the substance of the results: ... (it appears to us that) ... the reasons a mother can have for or against having another child are too complicated to be established simply by means of a questionnaire". One can only agree.

In the two models to be developed it will be attempted to avoid the difficulty of having to measure and operate with a variable "contentment". In this connection the

work of CHR. HELBERGER and M. RAUSCHER (1983), whose results, in the same way as those of URDZE and RERRICH, could be used to support the hypotheses contained in the models, can be briefly mentioned. The work, on the welfare effects of occupational mobility, "... comes to the conclusion that occupational mobility in general leads to a clear increase in contentment of those mobile with their work". The effects of occupational mobility in general leads to a clear increase in contentment of those mobile with their work". The effects of occupational mobility on individual welfare or for the individual's degree of contentment are measured in the research performed by means of 4 variables, material advantages, job security, psycho-social working conditions and physical working conditions.

The objective here is not to quantify "contentment" in any way. Instead, the basis of the models presented lies in the simple observation that everyone is put to a greater or lesser extent under stress by the organizational and practical problems that arise in trying to accommodate personal objectives with the factual conditions and restrictions of everyday life, and that the resulting depreciation of mental and economic resources is instrumental for the decision as to which and how much biographic flexibility an individual (or a couple) has, or can afford. The principal hypothesis here is therefore: the greater the personal biographic effort required (a) to reconcile and balance an individual's often contradictory personal objectives in life and (b) to realize these objectives in the face of the external difficulties usually occurring, the lower (cet.par.) is the probability that the wish to have children arises, or, indeed, is realized. This hypothesis is not conditional upon the existence of M. KOHLI's already quoted trend towards "... more individual biographic control ...", but if it should be that this trend is actually taking place, then there could exist an important opportunity to connect the hypothesis into an explanation of the occurring trend towards decrease in the birth rate for certain age groups. In the following, two cases of biographic congruence are distinguished: firstly, the congruence existing (or not) between the temporal structures of the different biographic levels for a given individual in direct comparison (intra-personal congruence); secondly the congruence existing (or not) between the structure of the personal biography and the impersonal requirements on the personal biography set by the social and economic environment in which the individual lives, e.g. social conventions (age of marriage, age combination of husband

and wife, etc.), or established socio-economic systems (education, standard career profiles), and other predetermining or deforming influences on the personal biography (inter-personal congruence). For each case a separate model will be developed.

(a) A Model of Intra-Personal Congruent Structures

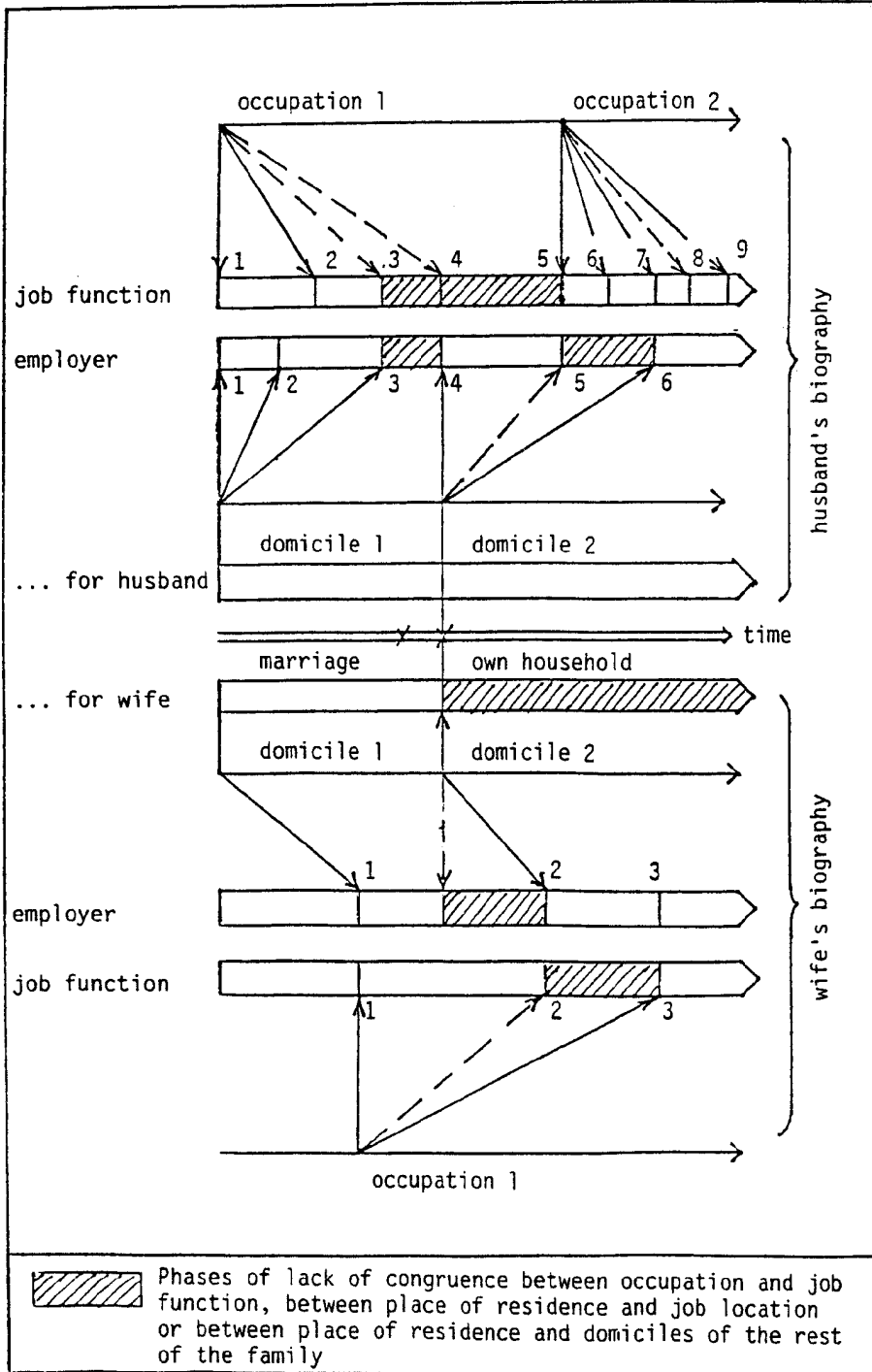
Consider initially the schematic example presented in Figure 10. The biographies of a man and woman are symbolically illustrated for both the periods before and after their marriage. For both husband and wife the more relevant aspects of their occupational and social biographies are shown at different sub-levels: the occupational biography has sub-levels comprising the profession or occupation being exercised, the nature of activity within the profession and the firm at which employed. The social biography is comprised of sub-levels indicating place of residence and location of occupational activity. By means of the location of residence and its proximity to the homes of the immediate family the possibility of maintaining close contact with the family can be implicitly evaluated. The proximity of residential and job locations is important for establishing and maintaining social contact with colleagues.

Irritation and tension can occur in the occupational biography when the job occupied does not really correspond with the acquired professional or occupational training or if job location and residential location are too far apart. Other examples of lack of harmony in the occupational biography are readily available. Let  $j = 1, \dots, E$  different biographic levels or sub-levels be distinguishable, then it can be assumed that every married couple  $i = 1, \dots, N$  at every point in time  $t$  finds itself in situations in which harmony, or congruence, between factual and objective positions only exists to varying degrees, formally:

$$(1) \quad B_j^{hmi}(t) = \sum_{t=t^*}^t d_j^{hmi}(t) a_j^{mi}(t)$$

Figure 10

Schematic Example of Congruent Structures (and not) on Different Biographic Sub-levels for a Married Couple



$h$	index of group to which married couple belongs (e.g. a certain age combination, a specific age group, a group defined by age of marriage, etc.)
$t^*$	point of time of marriage
$B_j^{hmi}(t)$	quantitative evaluation of the biographic situation $j$ at timepoint $t$ of the husband ( $m$ ) in marriage $i$
$d_j^{hmi}(t)$	if objective and actual situations $j$ co—incide at point in time $t$ (i.e. earlier lack of congruence doesn't count any more)
$1$	otherwise
$a_j^{mi}(t)$	quantitative evaluation of the extent of the lack of congruence existing at $t$ for situation $j$

Evaluations for the wife ( $w$ ) and for the married couple ( $i$ ) as a single entity can be defined in an analogous manner:

$$(2) \quad B_j^{hwi}(t) = \sum_{t=t^*}^t d_j^{hwi}(t) a_j^{wi}(t)$$

$$(3) \quad B_j^{hi}(t) = \sum_{t=t^*}^t d_j^{hi}(t) a_j^i(t)$$



The question as to whether it is necessary to introduce an evaluation for the married couple (as a "unit") in addition to those of the individual members of the marriage, namely man and wife, will be left open for the meanwhile. As a rule an evaluation made by a group of individuals implies that independent evaluations of the individuals also exist. An aggregation or a transformation of the individual assessments  $B_j^{mi}$  and  $B_j^{wi}$  to an evaluation  $B_j^i$  would lead to more homogeneous, and so less differentiated, results. Whether such a process is useful, as said, will not be decided here, for in the meanwhile it will simply be assumed that all three evaluations for each situation  $j$  are arguments of the function defining the probability of a child occurring in the marriage. The underlying hypothesis of the function is that the probability of having a child decreases as the level of lack of harmony, or congruence, between factual and objective situations in life increases:

$$(4) \quad p^{hi}(t) \equiv p^{hi}(B_j^{hmi}(t), B_j^{hwi}(t), B_j^{hi}(t)) \quad \forall j$$

whereby

$$(5.1) \quad \partial p^h / \partial B_j^{hmi} < 0$$

$$(5.2) \quad \partial p^h / \partial B_j^{hwi} < 0$$

$$(5.3) \quad \partial p^h / \partial B_j^{hi} < 0$$

for all  $h, j$  and  $t$ .

Realistically it can be assumed that lack of congruence at differing sub-levels  $j$  has amplifying feedback effects so that the aggregated function  $p^{hi}$  over  $j$  should be rather more than a linear combination of its individual  $j$ -components  $p_j^{hi}$ .

The number of children in a marriage is a discrete integer variable 0, 1, 2 .... But since married couples are considered in groups  $h$ , a group probability, e.g. the proportion of women in the group who have had (at least) one child, can be used as a proxy – variable for  $p^{hi}$ , i.e. for the individual marriages in the group.

(b) A Model of Inter – Personal Congruent Structures

In every social group of a given society there exist norms and conventions on, or, at least, accepted structures of the times in life at which biographic relevant events should occur. Family cycle research registers and describes the ages at which certain biographic events normally occur with the objective of determining and differentiating life and family cycle types and examining their stability. The resulting explanations of temporal structures and – in some cases – their occurring relatively stable age patterns involves some interesting problems which will not be discussed here at length. However, it has to be pointed out that it is not too important which structures or patterns of behaviour occur, but that it is important that structures or patterns exist at all. For example, it is not important whether vehicles drive on the left or on the right, but it is important that there is a unique rule which is recognized and observed by everybody. The same sort of remark can be made with respect to the standard number of weekly or daily working hours – as well as for many other conventions – for which simple pragmatic consideration is sufficient. In this connection H. LEIBENSTEIN (1981) has some interesting explanations for superficially illogical or seemingly by irrelevant conventions in society in his attempt to explain certain regularities in generative behaviour which can – usually – be ascribed to pure convention. However, it should not be forgotten that the acts of will that are necessary in the observance of conventions do not exist by chance and are not results of exercising discretion. The relatively new discipline of synergetics provides a range of attempts at explanation of a similar nature in socio – economic areas which could also prove to be useful for the explanation of the role of conventions in demographically relevant behaviour (H. HAKEN, 1981).

It is assumed here that certain practical, normative or even historically acquired conceptions of the age and time structures of biographic events exist which are fol-

lowed to a greater or lesser extent — either consciously or unconsciously — by the majority of individuals. Whether such collective conceptions are strong enough to influence individual biographies to such an extent that the expression "standard biography" (URDZE and RERRICH, 1981: 33) can be employed, is not relevant here. Principally relevant is the most important consequence of biographic conventions that disadvantages arise for those individuals who do not adhere to convention. Convention plays an especially important role in working life: a career cannot be interrupted as often or as long or for as conventionally trivial reasons as the individual may wish without this having serious consequences when trying to obtain a (new) job. Those who marry late, or not at all, mostly have good reasons for their divergent behaviour but these reasons remain either unknown to the majority of acquaintances and colleagues or are evaluated as if they are directed against the conventions. Neither unmarried mothers nor married women without children fit into the pattern of a "typical" biography and such deviations from the norm have their price. The state influences this price in many ways, for example, through the structure of income taxes or by approving and/or forbidding numerous institutional benefits, and through such measures a certain pressure is exerted in favour of, and so towards the establishment of, a conventional unified biographic pattern. This does not exclude the possibility that such pressure can be accompanied by a parallel but voluntary adjustment of individual biographies to accepted norms if the necessity for orientation in life is increasingly felt by the individuals concerned.

In order to measure the lack of congruence between the individual biography and the norms set by the society, or by the class of society to which the individual belongs, several difference indicators are employed, e.g. the difference between the actual individual age and the age usual in the society at which professional or occupational training is completed. Other critical points, which determine the temporal structure of the course of life, are e.g. the age or point in time of finally leaving home and establishing a separate household, of starting the first job, of the first change of job, of marriage, etc.

Let such points in time be designated by  $X$  and let  $j = 1, \dots, E$  be the various relevant biographic occurrences. If, as before,  $i$  indicates the particular marriage and  $h$  the group to which the married couple belongs, then for the husband ( $m$ ) and the

wife (w) the following measures of differences can be defined, where  $\bar{X}$  indicates a norm value in society or the arithmetical mean value of a considered sample:

$$(6) \quad D^{hmi} = \sqrt{\sum_j (x_j^{hmi} - \bar{x}_j^{hmi})^2}$$

$$(7) \quad D^{hwi} = \sqrt{\sum_j (x_j^{hwi} - \bar{x}_j^{hwi})^2}$$

In addition, an aggregated difference for the entity "the married couple" can be designed by considering those events directly connected with the marriage, e.g. the point of time of and ages at marriage, the same for the birth of the first child, etc.

$$(8) \quad D^{hi} = \sqrt{\sum_j (x_j^{hi} - \bar{x}_j^{hi})^2}$$

The hypothesis is, that the probability of having a child decreases with increase in the divergence between the temporal development and structure of the biography of the husband, of the wife and of the entity "the marriage" from the respective accepted norms of the society or class of society in which the marriage exists:

$$(9) \quad p^{hi} \equiv p^{hi}(D^{hmi}, D^{hwi}, D^{hi})$$

whereby

$$(10.1) \quad \partial p^{hi} / \partial D^{hmi} < 0$$

$$(10.2) \quad \partial p^{hi} / \partial D^{hwi} < 0$$

$$(10.3) \quad \partial p^{hi} / \partial D^{hi} < 0$$

$p^{hi}$  is the probability that in marriage  $i$  belonging to the defined group  $h$  of marriages a first (or  $n$ th) child will be born up to the timepoint of analysis. The function  $p$  is, again, probably non-linear.

The fact that inter-personal congruence is lacking does not imply that intra-personal congruence cannot exist, and vice versa. By considering the different combinations of congruence (or not) that can arise, differentiated hypotheses can be formulated. However, it would seem to be a reasonable assumption that the probability of having a child is the smallest where a lack of both intra- and inter-personal congruence is found.

### 3.3 A Model of Permutational Sequences

#### 3.3.1 Concepts and Definitions

Fundamental to this model is the idea that the practically infinite number of distinct potential sequences in the life of an individual can be so arranged that every sequence can be regarded as a particular "branch" in the virtual biography when depicted as a "tree" of potential alternatives. A tree in nature changes its appearance in the course of time. The virtual biography is also subject to continual change. But there is an important difference between the changes occurring for a natural tree and those in the virtual biography. The course of growth of a tree is governed by the laws of nature, which do not change with time. The biographic development of a human being is characterized by the fact that planning for the future can change. This implies that the order of the various planned phases in life, as well as their number and character, are not fixed but are subject to sudden alteration. New branches on a natural tree grow out of the old but in virtual biographies drastic changes in order can occur which are not possible in nature.

In the definitions that follow the dimension time is implicitly eliminated from the considerations by viewing, and analysing, the virtual biography at a particular point in time. The first concern is to define a frame of reference for the almost innumerable variety of possible virtual biographies and their sequences. Every biography will be regarded as consisting of  $n$  separate phases:

$$E_1, E_2, E_3 \dots\dots\dots, E_n$$

– the expressions phases, states or levels will also be used. Within each level alternative dimensions or positions are possible. The number of possible positions can be different at each phase – let their number be  $s_1, s_2, \dots, s_n$  for the levels  $E_1, E_2, \dots, E_n$ ; then the maximum number of biographic sequences contained in the frame of reference is:

$$(1) \quad B = n! s_1, s_2 \dots s_n = n! \prod_{i=1}^n s_i$$

As a rule the virtual biography of an individual is comprised of only a subset (= virtual biography) of all possible sequences (= biographic universe) since even with small numbers of phases and positions the total number of possibilities for conscious consideration and for decision becomes very large. Four phases alone lead to  $4! = 24$  different sequences (Fig. 11). But if every phase has two possible positions this number climbs to 384:

$$B = 4!2^4 = 384$$

Fig. 11 illustrates the situation for four phases (without alternative positions within the phases) and Fig. 12 shows the alternative positional sequences that can arise for a given sequence of phases, namely for:

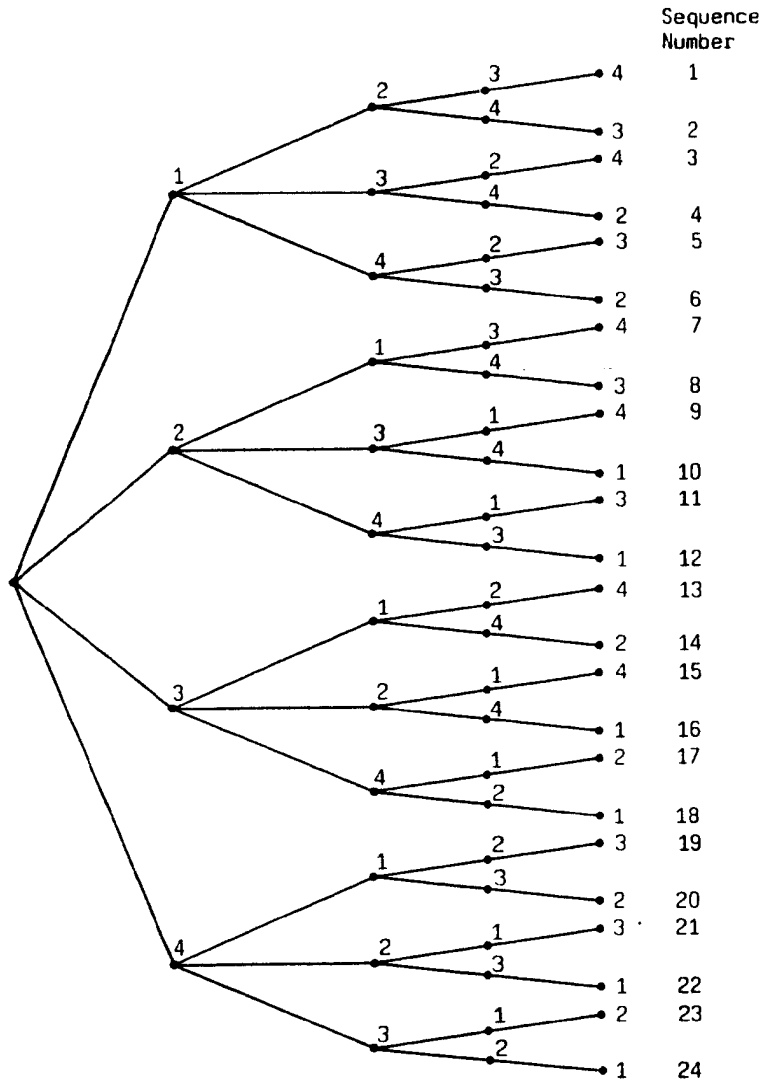
$$E_2, E_4, E_3, E_1$$

if two positions A and B are possible within each phase.

The organization of the virtual biography into different phases and – within each phase – different positions is structurally analogous to virtual biographies in reality. The sequence of phases determines the basic structure of a virtual biography. Once this basic structure is fixed the number of variations that are possible is rather limited. For most people the order of the phases, at least up to the end of occupational training, is determined by various institutional regulations and strongly influenced by the parents, but also after occupational training observance of the conventions and norms of a society leads to a situation favouring specific sequences. The question as to which basic elements or phases belong to the favoured sequences considered by the individual, and which not, is – at least partially – determined in the same way. The choice of position within a given phase is subject to the same influences but it is assumed here that the individual has more freedom of choice in this secondary area. However, one of the key questions to which every biographic model should try to provide an answer is that of the extent to which the choice of position is influenced by the sequence of previous phases. Also the problem in reverse, namely whether

Figure 11

Biographic Sequences Arising from Permutations of Four Levels





and to what extent future phases in life are influenced by the positions adopted beforehand is central to biographic model building. The model of permutational sequences presented here does not attempt to provide solutions to these important problems. The model has to be understood as a framework within which certain biographic regularities find expression, all of which have to receive consideration in the specific, more concrete models that can be constructed within the framework. It is only when specific models are constructed that the central questions of the connections between the choice of positions and the choice of levels can be – specifically – resolved. It is not likely that a general answer will ever be found.

(a) Definition of Biographic Separation between Sequences

For a given number of biographic phases in a virtual biography the biographic separation  $\overline{S_i S_j}$  between two sequences  $S_i$  and  $S_j$  contained in it is defined as the number of phases that must be traversed in the reverse direction (of the order of sequences) until (the rest of)  $S_i$  and  $S_j$  become identical. The definition is symmetrical, so that:

$$(2) \quad \overline{S_i S_j} = \overline{S_j S_i}$$

Example: Considering the first two sequences of Fig. 11, i.e.  $S_1 = [E_1, E_2, E_3, E_4]$  and  $S_2 = [E_1, E_2, E_4, E_3]$ , two levels have to be traversed until the common sequence  $S_1 \cap S_2 = [E_1, E_2]$  is found, so that

$$(3) \quad \overline{S_1 S_2} = \overline{S_2 S_1} = 2$$

Further examples are:

$$(4) \quad \overline{S_1 S_3} = \overline{S_1 S_4} = \overline{S_1 S_5} = \overline{S_1 S_6} = 3$$

$$\overline{S_1 S_7} = \dots = \overline{S_1 S_{24}} = 4$$

There is only one sequence with a separation of 2 from  $S_1$  but five sequences with a separation of 3 (or less) and 18 sequences with a separation 4 :

<u>Biographic Separation</u> <u>from Sequence 1</u>	<u>Frequency</u>
0	1
1	0
2	1
3	4
4	18
	<u>24</u>

The structure of the separation matrix for all  $S_i$  and  $S_j$  ( $i, j = 1, 2, \dots, 24$ ) for a virtual biography with four levels is given in Table 1.

It is clear that the number of separations (and so their magnitudes) depends on the number of levels being considered. The distribution of separations for the general case with  $n$  levels is given in Table 2.

(b) Definition of Biographic Separation between Sequences of Positions

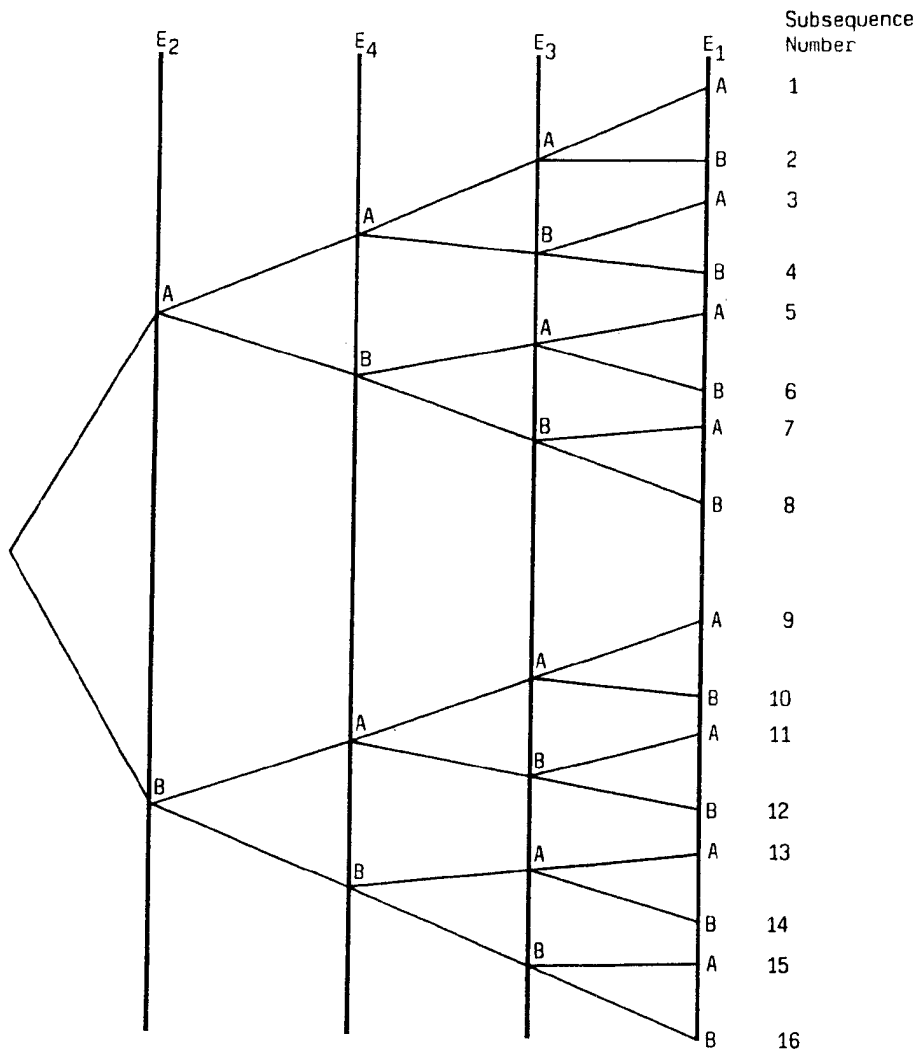
For a given sequence of biographic phases  $S_i$  where different positions can be adopted within each phase there exist – internal to the basic structure  $S_i$  – various sequences  $S_{ij}$ ,  $S_{ik}$ , ... of positions (ref. Fig. 12). For the sequences of positions a separation can be defined analogous to that for the phases: The biographic separation  $\overline{S_{ij}S_{ik}}$  between sequences of positions is the number of positions that must be traversed in the reverse direction (of the order of positions) until (the rest of)  $S_{ij}$  and  $S_{ik}$  become identical. Examples from Fig. 12 are:

$$\begin{aligned}
 S_i &= [E_2, E_4, E_3, E_1] \\
 S_{i1} &= [A, A, A, A] & \overline{S_{i1}S_{i2}} &= 1 \\
 S_{i2} &= [A, A, A, B] \\
 \overline{S_{i1}S_{i3}} &= \overline{S_{i1}S_{i4}} = 2 \\
 \overline{S_{i1}S_{i9}} &= \dots & = \overline{S_{i1}S_{i16}} &= 4
 \end{aligned}$$

As before, the definition is symmetrical, i.e.  $\overline{S_{ij}S_{ik}} = \overline{S_{ik}S_{ij}}$ . A table of separations analogous to that of Table 2 is difficult to construct since, in general, the number of

Figure 12

Biographic Subsequences Arising from the Choice of Two Alternative Positions  
Alternative Positions within Each Level of a Given Basic Structure of Four Phases



positions that can be adopted within the different levels is variable.

The objective of the model of permutational sequences is to construct a framework of argumentation which in specific, — for generative behavior—relevant, areas has structural similarity with reality. For the sake of simplicity and brevity the argument will be restricted to the primary area of the permutation of the basic biographic elements of the level  $s_i$  without considering the secondary area of the positions adopted within the levels. Of course, these can be considered by extending the model structure. Nevertheless, the conclusions reached within the framework of the simplification are still valid.

Firstly, it is obvious that in reality no virtual biographies can exist that contain all theoretically possible sequences of  $n$  even commonly occurring phases, levels or states. No one is in the position to say how many or which phases, levels or states come into question for building the basic structure of his virtual biography. However, the assumption that the virtual biography consists of all permutations assists in reaching conclusions with a strong bearing on real life, especially on generative behaviour. Not every possible sequence has to be actually present in the virtual biography in order that effects result, perhaps unconsciously, on the awareness and self-confidence of the individual even when the source of these effects is only vaguely perceived.

### 3.3.2 Biographic Long—Term—Commitments and the Concept of Biographic Age

If it is assumed that a virtual biography consists of all permutational sequences of  $n$  considered phases then the risk of making a decision in life is particularly large towards the beginning of the sequences. When  $n=6$  there are  $6! = 720$  different sequences but once the first level or phase has been chosen 600 of these are no longer possible, and a second decision causes a further reduction of 96. After five phases there is no more choice:

Table 1

Biographic Separation Matrix for Sequences with Four Phases

		Sequence Number																								
$S_i S_j$		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	
Sequence Number	1	0	2	3	3	3	3	4	+																	
	2		0	3	3	3	3	4	+																	
	3			0	2	3	3	4	+																	
	4				0	3	3	4	+																	
	5					0	2	4	+																	
	6						0	4																		
	7							0	2	3	3	3	3	4	+											
	8								0	3	3	3	3	4	+											
	9									0	2	3	3	4	+											
	10										0	3	3	4	+											
	11											0	2	4	+											
	12												0	4	+											
	13													0	2	3	3	3	3	4	+					
	14														0	3	3	3	3	4	+					
	15															0	2	3	3	4	+					
	16																0	3	3	4	+					
	17																	0	2	4	+					
	18																		0	4	+					
	19																			0	2	3	3	3	3	
	20																				0	3	3	3	3	
	21																					0	2	3	3	
	22																						0	3	3	
	23																							0	2	
	24																									0

all Elements = 4

$$\overline{S_i S_j} = \overline{S_j S_i}$$

Table 2  
Biographic Separation for Sequences with n Phases

Number of Levels	Total Number of Sequences	No. m of Sequences for which the first n-i elements are the same	Number of Sequences with a Separation of 1 to a Given Sequence													
			1	2	3	4	5	6	7	8	9	10	n			
n		m														
1	1		-													
2	2	1	1													
3	6	2	2	2(2!) = 4												
4	24	6	6	4	3(3!) = 18											
5	120	24	24	4	18	4(4!) = 96										
6	720	120	120	4	18	96	5(5!) = 600									
7	5 040	720	720	4	18	96	600	6(6!) = 4320								
8	40 320	5 040	5 040	4	18	96	600	4 320	7(7!) = 35 280							
9	362 280	40 320	40 320	4	18	96	600	4 320	35 280	8(8!) = 322 560						
10	3 628 800	362 280	362 280	4	18	96	600	4 320	35 280	322 560	9(9!) = 3 265 920					
.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
n	n!	n-(n-1)	(n-1)!	4	18	96	600	4 320	35 280	322 560	3 265 920	(n-1) (n-1)!				

<u>Level</u>	<u>No. of Sequences Eliminated by Decision</u>
1	600 = 5 (5!)
2	96 = 4 (4!)
3	18 = 3 (3!)
4	4 = 2 (2!)
5	1 = 1 (1!)

This numerical fact supports the everyday experience that the risks associated with an irreversible (or long-term) biographic decision are greater the earlier this decision is taken. The analogy with real life can be illustrated in many ways; for instance, with the decision as to the type of school (and therefore of type of education) long-term effects are produced reaching far into later life. In general, decisions taken on the behalf of children, in particular when they are negative, e.g. against occupational or career training, have far-reaching effects on their future biographies.

It can be concluded that awareness of the risks connected with irreversible decisions or long-term commitments, in particular, awareness of the loss of freedom (alternatives in life) associated with having a child, can only lead to lower birth rates, especially for young people. Statistics on the birth rate confirm this view; whereas the fertility rate for those under 30 years old has halved for some specific categories, it has remained constant or even increased slightly for those over 35 (for example, the age-specific fertility rate for third children has decreased from 27.6 per thousand to 12.5 per thousand for women of 29 born in 1951 as apposed to those born in 1936, for women aged 35 only from 11.7 per thousand to 8.2 per thousand (BIRG et al., 1984a: 122).

The conclusion can be formalized as follows: the number of sequences eliminated from the virtual biography by a decision in the  $i$  th phase is:

$$(5) \quad \Delta G_i = (n-i) (n-i)!$$

The cummulative number of alternatives of the virtual biography eliminated up to and including this decision is:

$$(6) \quad G_i = \sum_{j=1}^i \Delta G_j = \sum_{j=1}^i (n-j)(n-j)! = n! - (n-i)!$$

If it is assumed that the probability of making what later turns out to be a wrong decision at some stage in life is directly proportional to the number of sequences eliminated by the decision then the risk  $q$  ( $0 \leq q \leq 1$ ) can be quantified as the ratio of the number of alternative sequences eliminated to the total number of alternatives available at the point of decision. At the first level the risk associated with a decision is therefore:

$$(7) \quad q(1) = \frac{(n-1)(n-1)!}{n!} = \frac{n-1}{n}$$

For large virtual biographies, i.e. for virtual biographies with a large number of permutational phases and so alternative sequences, the risk involved in taking a decision is overproportionally large as compared with that involved in making decisions within the framework of a restricted virtual biography. With increase in  $n$  the risk becomes greater. Ad absurdum, there is no chance of making satisfactory decisions when freedom of choice in life is unlimited.

For a given  $n$  value the risk reduces from decision to decision, i.e. from phase to successive phase. The risk involved at the  $i$ th level is:

$$(8) \quad q(i,n) = \frac{(n-i)(n-i)!}{(n-i+1)!} = \frac{n-i}{n-i+1}$$

For a given magnitude of the virtual biography ( $n$  fixed) the risk of a long-term commitment decreases from phase to phase. But if we compare virtual biographies of different magnitude we can state that for a given number of phases ( $i$  fixed) the risk increases with the magnitude  $n$  (Table 3 and Figure 15).

This approach opens the way to a new interpretation of age which — in terms of years — is a decisive parameter in demography. An individual can be regarded as being "old" (a) if he has no, or only few, alternatives remaining in life, and/or (b) when every decision made is heavily restricted by previous phases and/or decisions. This can apply even for the relatively young in terms of years. Getting old in the





sense of living through the calendar years is a process running parallel to the process of aging by progressing from phase to phase along a sequence in the virtual biography. This parallelism offers the opportunity for introducing the idea of biographic age as a lack of alternatives or as the degree of dominance exerted by the past biography, in particular within the framework of this model. The definition of biographic age  $A^*$

is coupled with the number of alternatives (sequences still open for choice) remaining in life. It can be assumed that the biographic age  $A^*$  in this sense is directly proportional to the total number of alternatives eliminated up to a given point in time, i.e. that:

$$(9) \quad A^*_{i \sim G_i} = n! - (n-i)!$$

from equation (6).

For purposes of analysis equation (9) is specified as follows

$$(10) \quad A^*(i,n) = n! - (n-i)! = n! - \Gamma(n-i+1)$$

Equation (10) may be denoted as a biographic age function, relating biographic age to the magnitude of the virtual biography and to the number of phases already experienced.

With this definition two people can have different biographic ages even when they were born in the same year. The larger the number of alternatives contained in the virtual biography, the larger is the number of eliminated sequences once a certain level  $i$  has been attained, i.e. the "older" the individual is in comparison upon reaching this level. In other words, the size of the remaining biographic universe is directly related to the cumulative predetermining effects of age.

For the phase  $i=n-1$  the biographic age variable reaches its maximum and this maximum is the same for the last phase  $i=n$ . This can be interpreted as follows: In the Phase  $i=n-1$  the number of biographic alternatives is zero because there is only one phase left. Therefore biographic age remains constant for the last two phases:

$$(11) \quad A^*_{\max} = n! - (n - (n - 1))! = n! - (n - n)! = n! - 1$$

The intensity of the biographic aging process depends on the magnitude of the virtual biography which is a function of the number  $n$ . Standardizing the number of phases

and the biographic age variable by dividing them by their maximum values, variables are obtained which fall in the interval [0,1]. The impact of the magnitude of the virtual biography on the intensity of the biographic aging process can be illustrated using these standardized variables, as shown in Figure 13. For the suggestion of graphical representation of the relationship between the standardized variables I have to thank E. Klijzing from NIDI.

### 3.3.3 The Risk Involved in Long–Term Commitments, Biographic Age and the Probability of Births

With the analytical tools of section 3.3.2 the function for determining the probability of a birth or any other irreversible biographic event ( so defined for marriage, migration etc.) can be derived using the following assumptions.

(a<sub>1</sub>) The virtual biography is of magnitude  $n$  and contains  $n!$  sequences. The individual pursues a sequence and plans to have a child (to be married etc.) in phase  $i^*$ :

phases     1, 2, . . . ,  $i^*$ , . . . ,  $n$

(a<sub>2</sub>) For  $i \leq i^*$  the probability of a birth is lower the higher the risk of a long–term commitment:

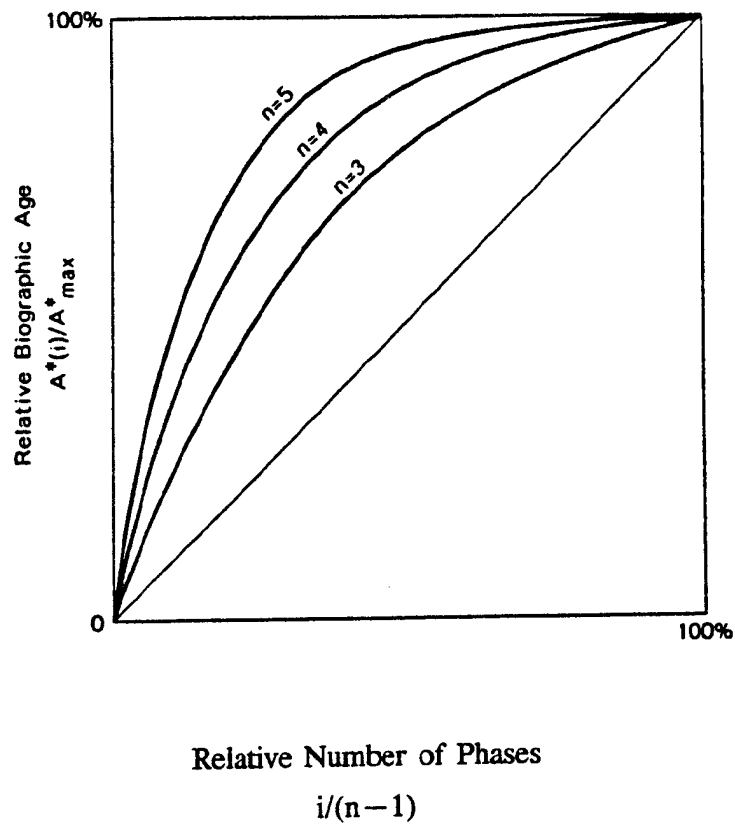
$$(12) \quad p = p(\bar{p}, q(i)) \quad \begin{array}{l} i < i^* \\ \bar{p} = \text{const.} \end{array}$$

$$\frac{\Delta p}{\Delta q} < 0$$

From equation (8) and (10) the following relation can be derived between the risk of long–term commitment and biographic age

Figure 13

The Magnitude of the Biographic Universe and the  
Intensity of the Biographic Aging Process



$$(13) \quad q(i) = (A_i^* - A_{i-1}^*) / (n - i + 1)! \\ = \Delta A_{i-1}^* / (n - i + 1)!$$

Substituting (13) into (12)

$$(14) \quad p \equiv p(\bar{p}, \Delta A^*(i)) \quad \begin{array}{l} i < i^* \\ \bar{p} = \text{const.} \end{array}$$

$$\frac{\Delta p}{\Delta(\Delta A^*)} < 0$$

$$\frac{\Delta p}{\Delta A^*} > 0$$

(a<sub>3</sub>) For  $i > i^*$  the probability of a birth is lower the higher the biographic separation between the sequence for which a birth was planned in phase  $i^*$  and the actual sequence. As the biographic separation increases with biographic age, the postulated relationships are

$$(15) \quad p = p(\bar{p}, D(i)) \quad \begin{array}{l} i > i^* \\ \bar{p} = \text{const.} \end{array}$$

$$\frac{\Delta p}{\Delta D} < 0$$

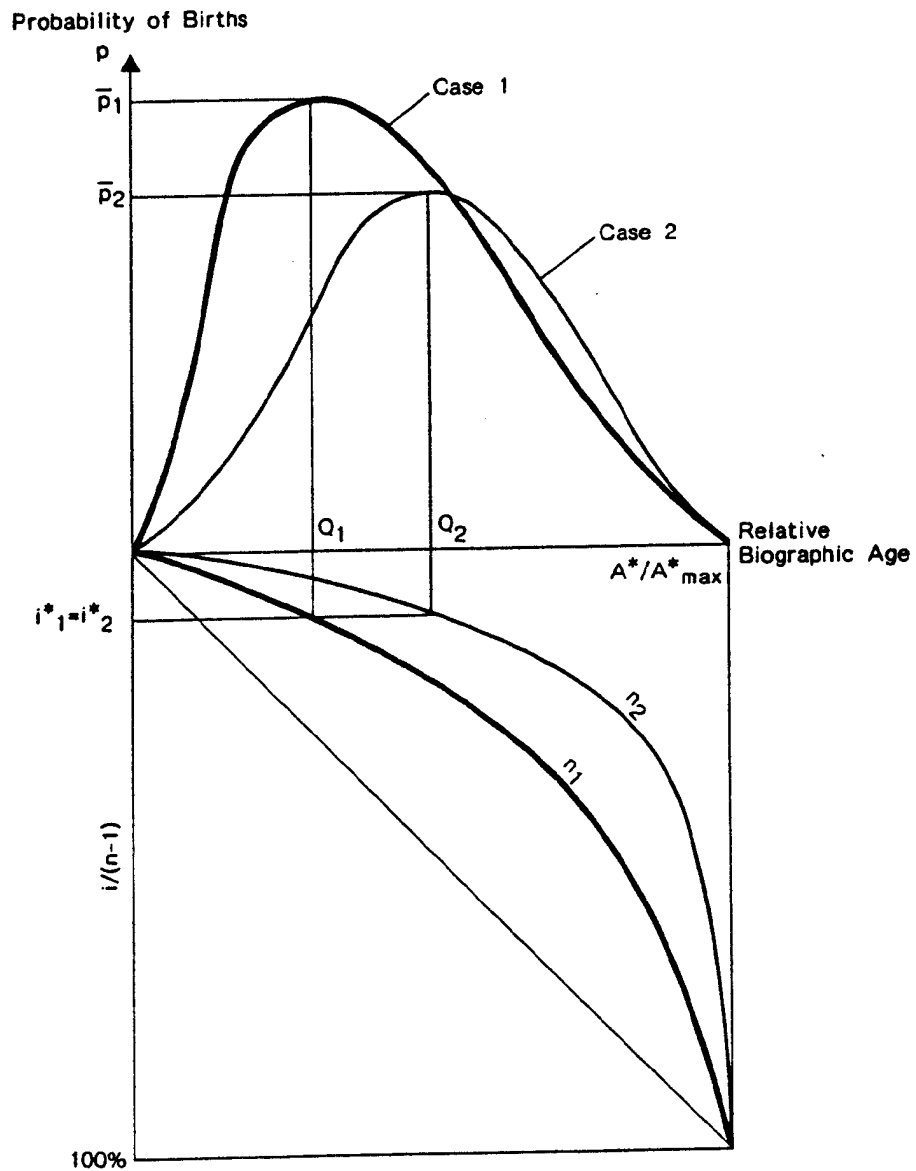
$$(16) \quad p = p(\bar{p}, A^*(i))$$

$$\frac{\Delta p}{\Delta A^*} < 0$$

The derivation leads to a probability function which increases with biographic age till phase  $i^*$  and decreases with biographic age after phase  $i^*$  (Figure 14).

Figure 14

The Biographic Aging Process,  
the Risk Involved in Long-Term Commitments  
and the Probability of Births  $p$



### 3.4. Generalization of the Model and Derivation of the Basic Biographic – Demographic Relationship

The concept of the virtual biography can now be made more precise using the definitions of the model of permutational sequences:

If an individual of given calendar age (=demographic age) can perceive a certain number  $n$  of basic biographic elements (phases or levels), say the set  $\{E_1, E_2, \dots, E_n\}$ , then the expression "biographic universe" refers to the set  $E$  of all permutative sequences of the elements  $E_1, E_2, \dots, E_n$ . The concept of the "virtual biography" refers to a subset of  $E$ , whereby certain sequences have been eliminated from  $E$ , namely:

- (a) Sequences that are logically impossible, e.g. those in which the second child appears before the first.
- (b) Sequences in which the order is in conflict with the institutional regulations of the society, e.g. the temporal order of the various levels and qualifications in the educational system, or the institutionally organized prerequisites for entering and exercising certain professions, etc.
- (c) Sequences in which the order is in conflict with the conventions and norms of the society, e.g. having a child before marriage, living together before marrying, etc. The latter example demonstrates that such restrictions are subject to continuous change.

Giving the set of sequences that can be eliminated in this way from the biographic universe the symbol  $X$ , then

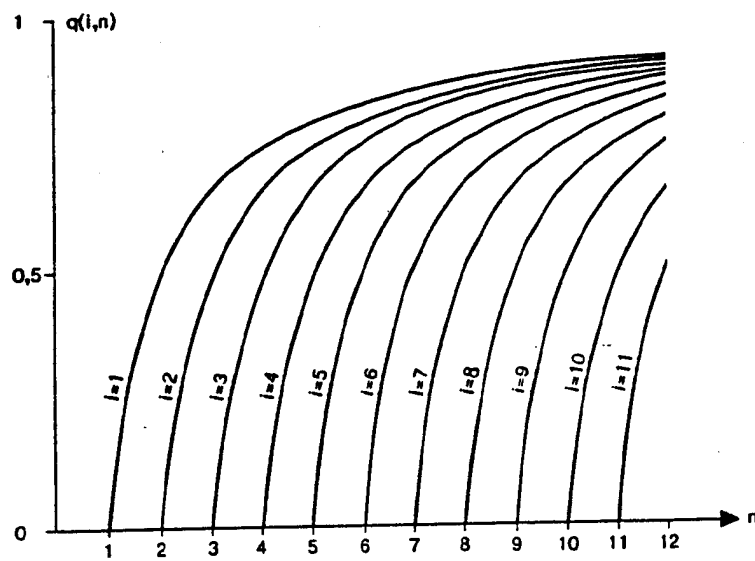
$$(17) \quad E = V + X$$

where  $V$  is the virtual biography. It can then be assumed that everyone finds himself in a certain phase of a particular sequence (element) of the set  $V$  at every point of time. Further, it can be assumed that every individual's actual situation does not

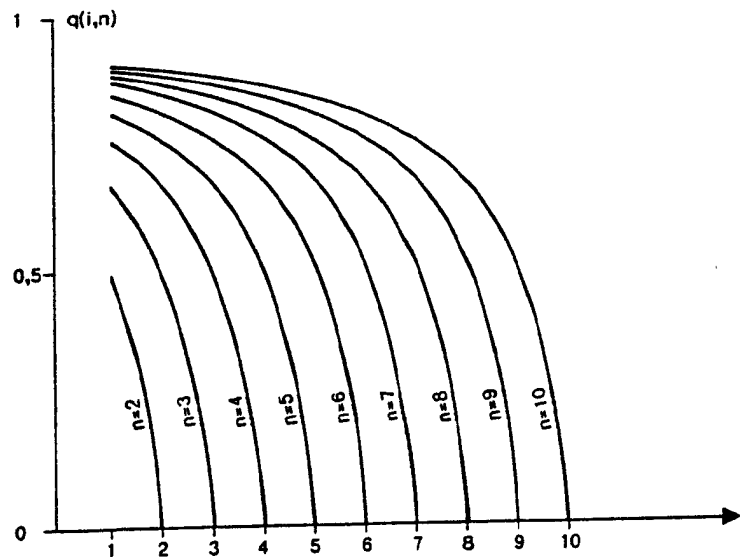
Figure 15

The Magnitude of the Biographic Universe and the Risk  
Involved in Long-Term Commitments

(a) Risk and Magnitude of Biographic Universe  $n$



(b) Risk and Level of Decision  $i$





correspond to his wishes. Finally, it can be assumed that his wished-for, ideal, situation is also an element of V, where the separation (D) between the real and subjectively ideal situations can be measured as described above, namely as the number of levels that have to be traversed (in the reverse direction of time) until the rest of the real sequence and the ideal sequence become identical. A change of sequence in this definition of D is not allowed.

With these definitions the following basic biographic-demographic relationship can be formulated in which p stands for the probability that a relevant biographic event (marriage, birth of first child, birth of n<sup>th</sup> child, etc.) can occur. The probability p is a function of three variables, the magnitude of the biographic universe, the magnitude of the set X of eliminated sequences, and the discrepancy or separation D between the real and the ideal biographic sequences. Fundamentally, it is D that has to be regarded as the determining factor of biographic mobility so that in the following equation D could be replaced by any variable through which biographic mobility can be represented, e.g. by the mobility frequency F as used in the biographic opportunity cost model of section 3.1.

Defining e,x to be the number of elements of the sets E,X, the basic biographic-demographic relationship is:

$$(18) \quad p = p(e, x, D)$$

The propositions of § 2 can now be re-formulated and completed with the aid of this equation:

(b<sub>1</sub>) The more elements (sequences) contained in the biographic universe the larger is the risk to be associated with the long-term commitments, and the more difficult it is to transfer from one sequence to another in order to succeed, for example, in planning and having a child, an event which in the original sequence appears unlikely; i.e.

$$(19) \quad \frac{\Delta p}{\Delta e} < 0$$

(b<sub>2</sub>) The more sequences that are eliminated, i.e. that do not come into question, because of the conventions, regulations and the system of values of the particular social environment and the society, the smaller is the possibility of active voluntary biographic mobility and the smaller is the probability that long-term commitments such as marriage or children will be made:

$$(20a) \quad \frac{\Delta p}{\Delta x} < 0$$

Biographic mobility has a dual role, (a) mobility as a positive (active) resource and (b) mobility as a defensive involuntary reaction. Equation (20a) corresponds to the interpretation (a). If (b) applies then:

$$(20b) \quad \frac{\Delta p}{\Delta x} > 0$$

The exclusion of sequences from the biographic universe is frequently due to the ordering of biographic phases due to social constraints. The social constraint "marriage before child" reduces the number  $e$  of sequences in the biographic universe by 50%. If, in general,  $h$  phases are constrained socially to have a certain definitive order,  $x$  sequences are excluded and a number of  $N(E) - N(V) = e - x$  sequences remains as the magnitude of the virtual biography (16):

$$(21) \quad N(V) = \binom{n}{h} (n-h)! = (h+1)(h+2) \dots n$$

$$(22) \quad x = N(E) - N(V) = n! - (h+1)(h+2) \dots n$$

If  $h = 2$  the number of sequences is reduced by 50%. There is a variety of ways in which social conditions and personal preferences can influence the size and form of the virtual biography. Ordering has always the effect of an exclusion of sequences. If this exclusion is involuntary its impact on the probability of long term-commitments is negative because it reduces the possibility of active biographic mobility (equation 20a). If the exclusion of sequences results in a reduction of involuntary biographic

mobility the exclusion increases the probability of births (equation 20b). The latter condition is illustrated by the living conditions of little villages outside the agglomeration areas where fertility rates are high.

(b<sub>3</sub>) The greater the discrepancy (biographic separation) between the actual and ideal courses of life the less probable are long-term commitments:

$$(23) \quad \frac{\Delta p}{\Delta D} < 0$$

This model is an attempt to establish a closed framework of argumentation within which specific, alternative models can be developed. Equations (18) – (23) therefore should not be understood to comprise an explicit model which can be tested with data. But a lot of methods are available for transforming the fundamental arguments into models that can be tested, wether at the level of the individual, at a macro-level, or at intermediate stages of aggregation or disaggregation. However, a prerequisite for any such model is that carefully chosen biographical data have to be available which contain, implicitly or explicitly, evidence on the connection between sequential phases in life.

A particular application could be to model the biography of a married couple in such a way that the restrictions arising from the virtual biography of the wife are considered in the analysis of the husband (or vica versa). Especially when both work and are following a career it is likely that the mutual restrictions arising from the virtual biographies are more effective and lead to a reduced birth rate for this group. The harmonious co-ordination of two curricula vitae into a single biography for the married couple implies that the respective phases in the two sequences have to fit together extremely well, i.e. that both sides are genuinely willing to make compromises. If this is not so, problems occur which could be called conjugal friction effects. If these are significantly large a harmonious co-ordination is not possible. Conjugal friction effects are evident in the statistics in that it can be seen that children are being born later in life and their presence even in advance is evident in the reduction in the number of marriages of individuals in specific age groups.

#### 4. Biographic Theory and the Macro–Level: The Impact of Labour Market Dynamics on Fertility and Biographic Aging

The influence of changes of structure and level in the labour market on marriage and birth rates can be analysed using the generalized model of section 3.4 if the effects of economic and social change on the variables in equation (18) can be modelled. The continuous process of specialization of production brings with it a continuous increase in the number of different opportunities available for making a career. In general, this leads to an increased number ( $n$ ) of basic biographic elements and so to extremely rapid growth in the magnitude of virtual biographies (Figure 16). Occupational specialization, however, implies that a change of occupation is increasingly difficult, with the consequence that a lot of sequences in biographic universe are eliminated. Specialization therefore has two effects; the first is the increase in the number of alternative sequences in the biographic universe, the second is the reduction in the number of sequences once occupational decisions have been taken and implemented. Both effects result in a decrease in the probability of long–term commitments as indicated by equations (19) and (20), and the decrease in the marriage rate and age–specific birth rates is – to a large extent – presumably due to such influences (17).

Finally, it should be pointed out that it is possible to explain regional differences in relevant demographic behaviour (frequencies of marriage, births and migration, and death rates) on the basis of the model. "Regional" circumstances in this sense are those for which a large number of people can be shown to have identical or similar conditions of life, as can be easily perceived, for example, for the inhabitants of a large city; all inhabitants share the same (or similar) advantages or disadvantages of a particular labour market, the same infrastructure facilities and transportation systems, the same accessibility to other regions and cities, etc. This similarity in living conditions and therefore of opportunities in life has the effect that for all sufficiently well–defined groups in the society the individual virtual biographies can be regarded as being similar with respect to both the total number of alternatives  $e$  in the biographic universe  $E$  and the number of alternatives that can be eliminated from  $E$ . Both

Figure 16

Biographic Universe and Fertility  
in Historical Perspective

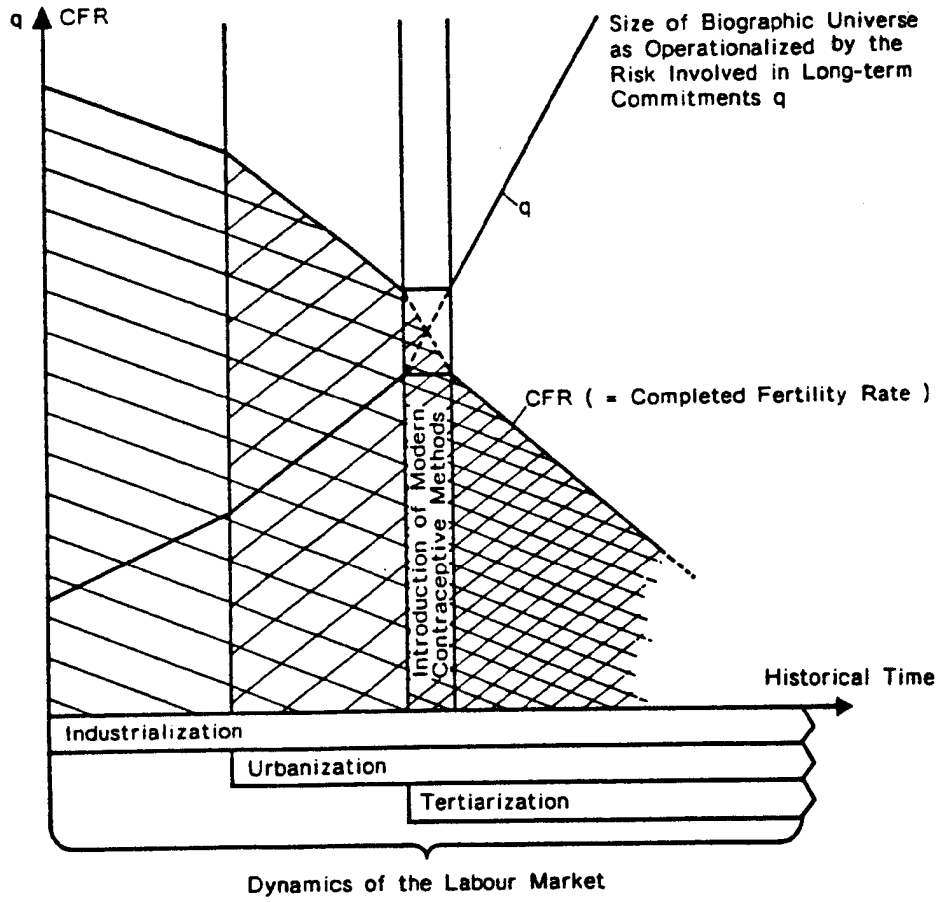
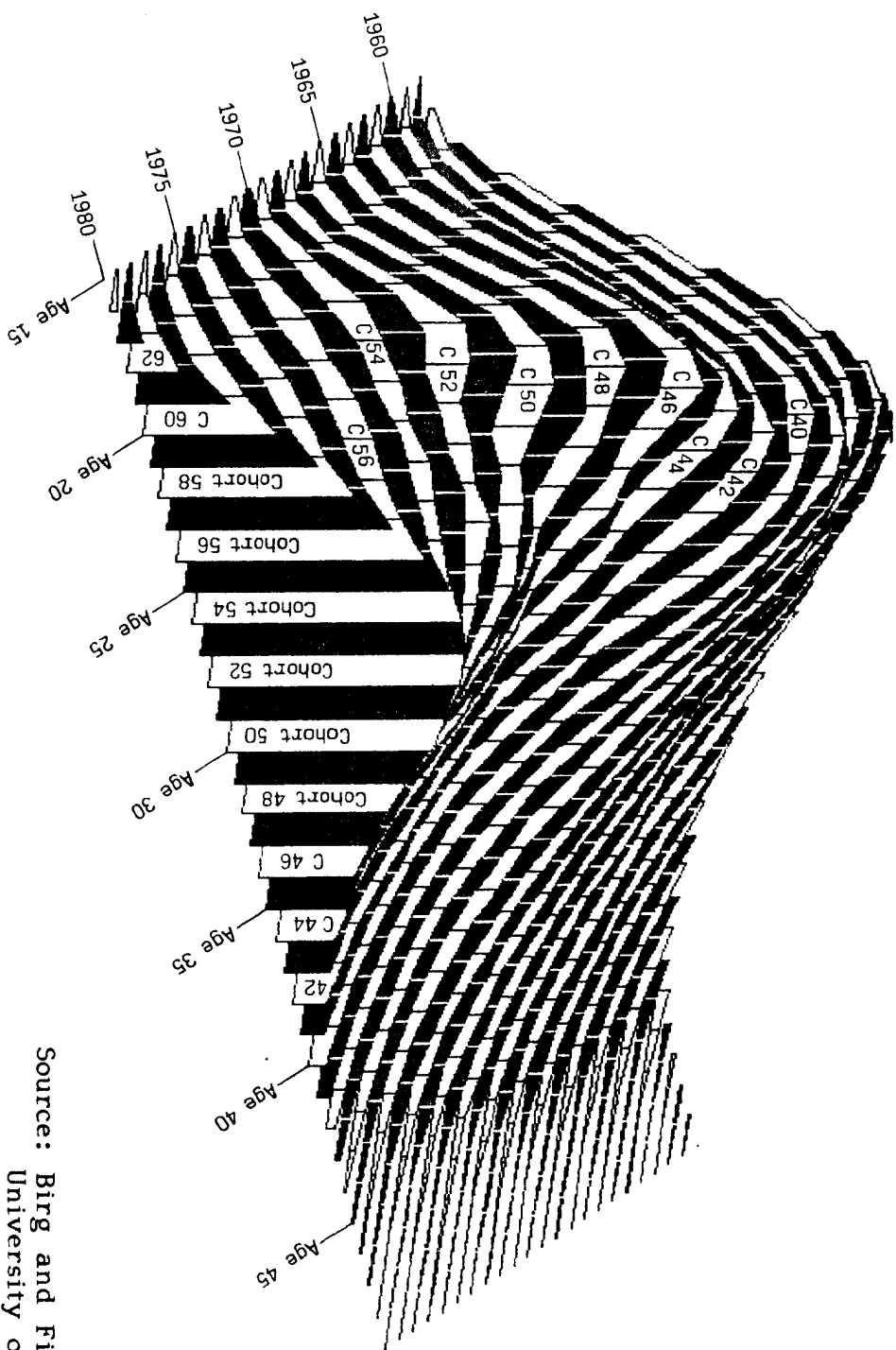


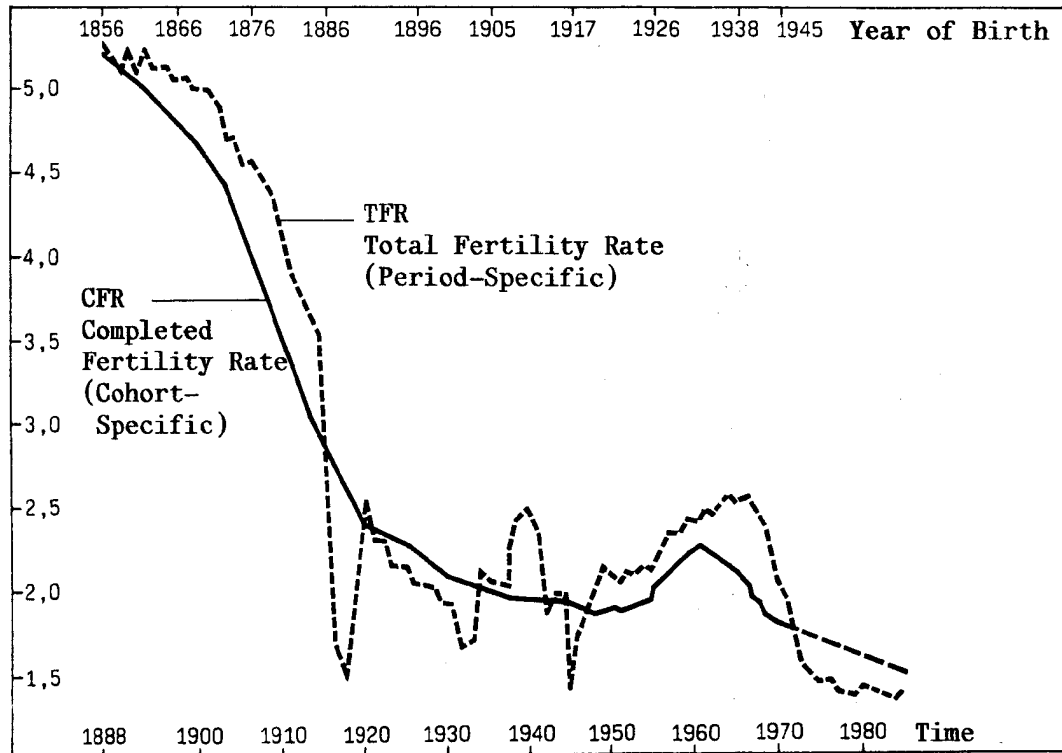
Figure 17  
 Birth Rates of the Cohorts in the Federal Republic  
 of Germany in the Lexis-Space



Source: Birg and Filip  
 University of Bielefeld,  
 1987

Figure 18

Secular Decline of Cohort- and Period-Specific  
Fertility Rates in Germany from 1880 to 1980



Source: P. Marschalck, *Bevölkerungsgeschichte Deutschlands*, Frankfurt 1984, completed by Figures in: H. Birg et al., *Kohortenanalytische Darstellung der Geburtenentwicklung in der Bundesrepublik Deutschland*, IBS-Materialien Nr. 10, Universität Bielefeld 1984

tend to induce similar behaviour. The third variable in the model, D (the separation between the actual and the personally ideal biography), produces differentiated behavioural effects which counterbalance the homogeneous effects of the first two variables within a particular social group. Heterogeneous behaviour can be expected to occur especially in a big city where obviously different styles of life exist side by side as a result of the awareness created by a concentration of social contact and therefore of information on alternatives.



## 5. Some Notes to the Questionnaire

The models arising out of the general framework of the biographic theory do not represent the only means of operationalizing the theory. There certainly exist other ways of translating the basic elements of the theory into forms in which they can be confronted with reality, and so be tested empirically. The models presented here and the other models presented of the german version of the project report (BIRG, FELBER, FLOETHMANN, 1984: Arbeitsmarktdynamik, Familienentwicklung und generatives Verhalten), as the "occupational biographic model" and the "socializational biographic model" of chapters 4 to 6 of the german report, have to be understood as examples of the confrontation process. If in the following discussion of the questionnaire designed to collect information for testing, various parts of the questionnaire are associated with particular models and hypotheses, the more general character of the associations made should still not be forgotten. The questionnaire has been designed to deliver a spectrum of information wide enough to allow empirical investigation not only of the models discussed here but also of alternative models not presented in this work.

Firstly, the basic principles of the questionnaire common to all models already presented in this volume and in the german report will be discussed. There then follows a short commentary on those questions designed for the specific models as well as for further models of the respective types.

The basic theoretical principles of the biographic approach underlying the questionnaire have been explained in the proceeding chapters. Here it is the technical principles of the questionnaire which are of interest. The most important methodical/technical aspect of the questionnaire is that the questions have been formulated and in such a way spaced and grouped that a conversational atmosphere arises with the character of a working session, in which both interviewer and the person being interviewed have their roles to play in order to produce "the result". The self-portrayal function of the interview, which could be an aid for motivation, is not emphasised, although also not forgotten. The motivation necessary for the participation of the interviewee cannot be readily assumed, especially nowadays. In order to promote motivation certain incentives must be provided. Thus the interviewees

receive a carefully designed letter explaining the nature and importance of the investigation, in particular its relevance and usefulness for every citizen because the results will have effects on employment policy, retirement and pension policy, school planning, kindergarten, etc. In the letter it is explained that the local (rural, town or city) administration provides the addresses and supports the investigation. But all this is not always enough to motivate the recipient to sacrifice the time required for the interview, which is be up to three hours and more. In the case of complicated and active lives it happened that the time needed even exceeded four hours, because the number of relevant biographic phases and occurrences is — in exceptional cases — very large. For uneventful biographies the interview time is about one and a half hour. Since previous knowledge of the biography is not available the time necessary for the interview is not known in advance and so it is not possible to inform the interviewee beforehand how long it will take. This difficulty has been overcome by offering a fee for the interview.

A basis problem in re—constructing biographies is that the individual willingness and capability to remember past events varies considerably. The questions are therefore so ordered that memory is awoken, gradually stimulated and increased to an (individual) maximum in the course of the interview. Recalling data, experiences, evaluations and events stored in the memory is a complicated, context—orientated psychological process, the results of which do not automatically have a high level of validity. The nature and order of the questions have therefore been designed not only to promote the processes of memory and association but also to provide interactive controls on, and so correction of, previous answers actually during the interview. This method proved to reduce the number of contradictions occurring, which would appear anyway only on later analysis, and so save work and the disproportionately high cost of holding a corrective second interview. The tabular scheme of simultaneous registration adopted for the occupational, social, residential and family biographies provides a visual means of checking for contradictions in the time structure of the answers given and so leads to correction in the interview itself. The social biography as well as all other categories of answers are linked to the occupational biography. The thus achieved self—checking capacity of the questionnaire was tested and controlled in two pre—tests before performing the 1.500 interviews.

The information resulting from the questionnaire consists not only of biographic facts but also of evaluations and attitudes. All three categories of information arise from answers to questions that have been considered, i.e. not answered spontaneously. Thus, a large majority of the questions are not open questions but are formulated in a closed way. Where open questions occur the objective is not to obtain a spontaneous answer but rather — as far as is possible — a clear, undistorted opinion.

The procedure for collecting relevant information differs considerably from that adopted in other investigations. The basic theoretical ideas in the project encompass many differing areas of the biography. If these areas of interest, e.g. information on occupational training the professional life, residential preferences or intimate social contacts, were to be examined separately this would involve going through the biography repeatedly from the respective points of view. This sort of additive procedure is not only exhausting for the interviewee, it does not correspond to the concepts of this project which concern the analysis of the connection and interdependence of the various categories of events in life. Many of the changes occurring in a biography happen simultaneously or almost simultaneously, and are anyway — in general — to be seen as being dependent on each other. Such dependencies can be extracted better if the various biographic areas can be documented in uniquely defined stages of life also simultaneously. This procedure, at least with respect to the project under discussion, has the following advantages.

The interviewee can concentrate his thoughts and memory on a relatively short period in life. He can retrospectively consider the events that occurred not as links in a chronological chain but as elements of a then existing pattern of life and evaluations which were related to each other. The changes occurring are likely to be seen as being interrelated. This simultaneous view demanded of the various biographic areas should help to stimulate the memory better than a chronological approach with concentration on specific aspects over a long or longer period of time. It is also possible, as the test survey in Bielefeld showed, that relevant biographic events can be much more accurately dated. An opinion as to what extent this type of procedure is suitable in general for retrospective biographical research cannot be ventured here. For this particular project, in which the relationship between changes in the occupa-

tional and family life are of principal interest, the non-additive, simultaneous survey technique is clearly advantageous.

The following example of a schematic table makes the procedure clearer (see table 4):

Table 4

Example of a schematic curriculum vitae table

Age	Stage of Life	Activity	Residential Location	Type of Habitation	Family Conditions
4	pre-school age				
8	school education age	primary school			
12		secondary school			
16		grammar school			
20	post-school life (main biography)	military service			
24		university			
28					
32		occupational training			
36		first job			
40		second job			

The whole biography is divided into the three sections "pre-school age", "school education" and the "main biography". The pre-school biography (normally up to the age of 6) cannot be immediately subdivided; school life and post-school life (the main biography) cover such long periods of time that immediate subdivision is obviously necessary. In the period of school education the initial orientation for further subdivision is the school; for the main biography it is the occupation which could include military service, university, further training or education and, of course, the employment record. A separate table is constructed for each school and job into which the answers to questions on occupational social and living conditions including all major relevant biographic events are entered. Thus the number of sections in the interview depends on the individual being interviewed and is not pre-determined. The result is a flexible and natural temporal partitioning of the biography with each partition revealing recalled facts, opinions and relationships in a consistent, and therefore valid, way.

In order to detect and eliminate inconsistencies – preferably in the interview itself – all the temporal details in these separate school and job tables are entered into a curriculum vitae table which can be easily controlled. The residential biography, i.e. the temporal sequence of residential locations and housing changes, can be used to create sub-biographies in the same way as the occupational biography is used, if this proves to be necessary. In the example given above in tabular form the pre-school age is subdivided into two, the period of school education into three and the main biography into six such sub-biographical periods. For such a period all interesting biographic events can be recorded independent of whether they belong to the occupational biography or whether they concern completely different areas, e.g. intimate relationships, children, family, etc.

The factual biographic evidence alone (types of event, dates, etc.) is not enough for the research at hand. It is even more important to know the causes of events and decisions in order to estimate the effects of biographic changes. Such information is collected essentially in the modules on occupational and family changes and perspectives. The type and order of the respective variables defined are documented in flow diagrams which have been constructed for each module.



The following table shows the basic structure of the sample:

Year of Birth	1950	1955	Totals
Regional Type A	300	300	600
Regional Type B	300	300	600
Regional Type C	150	150	300
Totals	750	750	1500

In the next table the sampling plan is shown in more detail including the interviews of couples. Of course, the age of the other half of the couple is not subject to previous control and so will coincide with the selected years of birth 1950 and 1955 only by chance; but from the total sample it is estimated that only 10% at a maximum of those interviewed will not belong to the chosen years. These interviewees are denoted by "F-x" for wives/partners and "M-x" for husbands/partners of those born in year "x" in the following table.

Table 5  
Sampling Plan

	Year of Birth 1950		Year of Birth 1955		Totals	
	Men	Women	Men	Women	Men	Women
<u>Regions Type A</u> Düsseldorf Hannover	120 Individual Interv. 15 Interv. of Couples <u>135 M-50</u> + 15 F-x	120 Individual Interv. 15 Interv. of Couples <u>135 F-50</u> + 15 M-x	120 Individual Interv. 15 Interv. of Couples <u>135 M-55</u> + 15 F-x	120 Individual Interv. 15 Interv. of Couples <u>135 F-55</u> + 15 M-x	240 Individ. 30 Couples <u>270 M-50/55</u> + 30 F-x	240 Individ. 30 Couples <u>270 F-50/55</u> + 30 M-x
<u>Regions Type B</u> Bochum Gelsenkirchen	120 Individual Interv. 15 Interv. of Couples <u>135 M-50</u> + 15 F-x	120 Individual Interv. 15 Interv. of Couples <u>135 F-50</u> + 15 M-x	120 Individual Interv. 15 Interv. of Couples <u>135 M-55</u> + 15 F-x	120 Individual Interv. 15 Interv. of Couples <u>135 F-55</u> + 15 M-x	240 Individ. 30 Couples <u>270 M-50/55</u> + 30 F-x	240 Individ. 30 Couples <u>270 F-50/55</u> + 30 M-x
<u>Regions Type C</u> Gronau Ahaus Vreden Leer	61 Individual Interv. 7 Interv. of Couples <u>68 M-50</u> + 7 F-x	61 Individual Interv. 7 Interv. of Couples <u>68 F-50</u> + 7 M-x	61 Individual Interv. 7 Interv. of Couples <u>68 M-55</u> + 7 F-x	61 Individual Interv. 7 Interv. of Couples <u>68 F-55</u> + 7 M-x	122 Individ. 14 Couples <u>136 M-50/55</u> + 14 F-x	122 Individ. 14 Couples <u>136 F-50/55</u> + 14 M-x
<u>Totals</u>	301 Individual Interv. 37 Interv. of Couples <u>338 M-50</u> + 37 F-x	301 Individual Interv. 37 Interv. of Couples <u>338 F-50</u> + 37 M-x	301 Individual Interv. 37 Interv. of Couples <u>338 M-55</u> + 37 F-x	301 Individual Interv. 37 Interv. of Couples <u>338 F-55</u> + 37 M-x	602 Individ. 74 Couples <u>676 M-50/55</u> + 74 F-x	602 Individ. 74 Couples <u>676 F-50/55</u> + 74 M-x
	338 M-50 + 37 M-x <u>375 M</u> =====	338 F-50 + 37 F-x <u>375 F</u> =====	338 M-55 + 37 M-x <u>375 M</u> =====	338 F-55 + 37 F-x <u>375 F</u> =====	676 M-50/55 + 74 M-x <u>750 M</u> =====	676 F-50/55 + 74 F-x <u>750 F</u> =====





## References

- (1) In addition to "time" in a cyclic sense and "time" as a linear factor contributing to maturity it can also be defined as a concept in theoretical physics; for example K.G. DENBIGH (1981:168) distinguishes 1. the time of theoretical physics, 2. the time of thermodynamics and of the evolutionary sciences such as biology, and 3. the time of conscious awareness. Only the third concept of time has a unique direction.
- (2) The expression "perception of time" is colloquial and has been used here deliberately in order to avoid encroachment in the field of the psychology of awareness. It is, however, necessary to note that "time" as such cannot be perceived, human beings have no organs for measuring it. Time can be experienced only indirectly as a medium in which events occur. "Time is not a thing that, like an apple, may be perceived" (H. WOODROW, quoted from E. PÖPPEL 1978:713).
- (3) Of 100 sons of government officials in the Federal Republic 64 obtained the German advanced school leaving certificate (university entrance qualification) in the year 1970; for sons of the working class the rate was 1%. The percentage of those born in a given year who, in addition to their schooling, successfully complete formal occupational training, correlates very well with the occupation of the fathers (Source: Berufswege und Arbeitsmarkt, IAB (Pub.): Quintessenzen, Heft 5, 1st Edition 1976, p. 5). For the analysis of the relationship of the occupations of fathers and sons ref. K.U. MÜLLER (1978).
- (4) For regional differences in the female activity rate ref. BIRG (1982); for segmentation of labour markets ref. LUTZ and SENGEBERGER (1974); for the influence of the course of careers on biographies ref. W. MÜLLER (1975, 1978 and 1983) and K.U. MAYER (1983), as well as SCHMÄHL (1983) for analysis of lifetime income.
- (5) For analysis of differences in the birth rate according to generation ref. BIRG, HUININK, KOCH and VORHOLT (1984).

- (6) For analysis of the influence of the world-wide depression of the 1930's ref. G.H. ELDER (1974) and G.M. ELDER and R.C. ROCKWELL (1978). For analysis of the differences between income on the national level and the income of specific age groups ref. SCHMÄHL (1983).
- (7) The parts of the trends of Fig. 2 with positive slope presumably represent intrasequential mobility. If this is in fact the case, then it can be deduced that an upper bound for the intrasequential mobility frequency in the career building phase exists and that the intersequential mobility frequency in general has a higher value in the phase of occupational decline (ref. the opportunity cost model of chapter 3.1).
- (8) W. MÜLLER (1978:292) has shown that increased flexibility and mobility usually imply improvement in occupational life. Other investigations of mobility confirm this finding (ref. ANDRESS 1982, NOLL 1983, HOFBAUER 1983, HELBERGER and RAUSCHER 1983 and HELBERGER 1983). A low level of professional occupational mobility should therefore imply a negative tendency in an individual's occupational life.
- (9) Forschungskolloquium des Sonderforschungsbereichs 3: "Mikroanalytische Grundlagen der Gesellschaftspolitik" of the University of Mannheim (Fed. Rep. of Germany), Dec. 1983.
- (10) Author's translation of title "Analyse mobilitätshemmender Faktoren" of given reference.
- (11) Author's translation of passage "... die Erfahrung, in welchem Ausmaß ... bisher wenig zu interessieren" from given reference.
- (12) The activity rate of married women of 20 to 35 years old, i.e. of those in the decisive child-bearing age, increased in the Federal Republic of Germany between 10 and 25% between 1965 and 1975.
- (13) As a group, government employees had more children in 1980 and 1981 than all blue- and white-collar workers. The lowest number of children (per family) occurred for non-government office workers (ref. SCHWARZ 1982:80).

- (14) It is often overlooked in the economic theory of fertility that the wife's loss of income can be compensated by the husband simply because his wife has given up her job. Interaction between husband and wife in this sense is increasingly being regarded as a zero sum game, a contention which does not apply in general.
- (15) Complete results have been published by the DIW – Institute, Berlin (1981), RWI – Institute, Essen (1980) and IFO – Institute, München (1981). The workshop "Processes of Mobility on the Labour Market" held at the University of Mannheim in Dec. 1983 also revealed an abundance of new empirical results.
- (16) For the derivation of this and related formulas see: H. BIRG and D. FILIP: The Impact of Ordering Conditions on the Size of Virtual Biographies. Forthcoming.
- (17) The birth rate for younger age groups first increased then decreased from 19 onwards. A slight increase can presently be observed for those over 30. As opposed to the birth rates in the Federal Republic, the conditional probabilities of births according to year of birth, parity and age for those born since 1936 have continuously decreased for all those born from 1937 onwards who are more than 20 years old. The figures on births are presented in BIRG et al. (1984a).

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