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The Development of Fertility Theories: A Multidisciplinary Endeavour

Demographers do not merely quantify and describe; they also contribute to theoretical knowledge, drawing inspiration from conceptual frameworks developed in related disciplines. The “Textes fondamentaux” collection published by INED comprises a series of founding texts that illustrate the depth and vigour of demographic thought. Each thematic volume presents a selection of key articles that have marked the history of the discipline. Following an inaugural volume on the theories of migration, the second in the series focuses on the theories of fertility. This new volume is edited by Henri LERIDON and his introductory article is reproduced here in full. He compares the different approaches to fertility adopted by thinkers and researchers from the eighteenth century up to the present day.

The quest to understand or even to control fertility behaviour is nothing new. Any exploration of the destiny of a human society almost inevitably, at some time or another, involves an analysis of its modes of reproduction and its capacity to maintain or increase its population. But for many years, such analyses were conducted in the absence of reliable statistical data, being seen rather as questions of philosophy, morals, political science and, of course, religion. In fact, it was often taken as read that the goal was to create the necessary conditions for maximizing the number of births, given the low probability of survival to adulthood (or the desire to outnumber one's neighbours).

This article aims to explore the various theoretical approaches that have paved the way for progress in demographic thought over the last two centuries. It is based on the introduction to a book of founding demographic texts published by INED in the “Textes fondamentaux” series (see Box) which focuses not on analysis methods or data collection, but on theoretical approaches to demographic phenomena. Nonetheless, certain methodological advances raise or reveal fundamental questions or problems of interpretation

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The articles included in *Les théories de la fécondité*

Given the numerous articles cited here but not included in *Les théories de la fécondité*, it is clear that the task of selecting the articles was a difficult one. The 23 articles translated and reproduced in the book (referenced and marked by an asterisk in the bibliography) were not chosen on merit; the aim was simply to cover the broad range of fertility theories as fully as possible, in a manner that was rational, though inevitably imperfect. Some excellent articles were not included simply because the topic had already been covered by others. At the risk of displeasing some readers, we also gave priority to “established” theories at the expense of more recent developments whose importance cannot yet be measured. These readers may refer to the long list of references to explore the field more fully. Last, articles that were relevant to our topic but which focused more largely on the demographic transition were not included as they will feature in a future volume of the “Textes fondamentaux” series yet to be published.

which are essentially theoretical in nature (the article by Norman Ryder, 1956a*, for example).

Early approaches to fertility

It was at the very end of the seventeenth century, and above all in the eighteenth century, that the first “theories” of fertility emerged, with the birth of “political arithmetic” in England (William Petty, 1683), followed by debates on the history of European populations. Montesquieu, for example, blamed religion for the supposed decline of the European population since Roman times. In Letter CXIII of his *Lettres Persanes* (translated title: *Persian Letters*), he puts these words into Rhedi’s mouth: “After a calculation as exact as may be in the circumstances, I have found that there are upon the earth hardly one tenth part of the people which there were in ancient times. And the astonishing thing is, that the depopulation goes on daily [...]”.⁽¹⁾ In some later editions the “one tenth part” even becomes the “one fiftieth part” (Montesquieu, 1721, Letter CXIII, p. 102 in the 1765 edition). This affirmation was not reiterated in his *Esprit des lois* (translated title: *The Spirit of the Laws*) in 1748, and debate was futile in the absence of reasonably reliable demographic data.⁽²⁾

From very early times, observers were attracted to an apparently secondary question, that of the sex ratio at birth. While John Graunt (1662), using statistics from the city of London, had already shown that slightly more than 100 boys were born per 100 girls, the general significance of this finding remained open to debate. Montesquieu (1748) believed that “the law of polygamy is an affair that depends on calculation”, arguing that “by the accounts we have of Asia, there are there born more girls than boys” (*The Spirit of the Laws*, 2nd edition,

(1) Translation by John Davidson, published by Gibbings and Co., London, 1899 (accessed at <http://rbsche.people.wm.edu/teaching/plp/index.html>).

(2) On the debate surrounding population and depopulation in the eighteenth century, see Blum (2002).

Book XVI, chapter IV⁽³⁾). Hence “The law, which, in Europe, allows only one wife, and that, in Asia, which permits many, have, therefore, a certain relation to the climate”. Montesquieu remained prudent, however, estimating that in any case, polygamy “is not of the least service to mankind”. Süssmilch (1741), a great data compiler, and Moheau (1778), a careful analyst, were quick to sweep away these hesitations. Indeed, Süssmilch saw the slight male surplus at birth as a manifestation of Divine Providence, anticipating excess male mortality before adulthood and marriage (on this question of the sex ratio, see Brian and Jaisson, 2007).

The pioneers of statistical data collection to document population trends, such as Graunt, Süssmilch or Moheau, provided useful information on the levels and variability of mortality and fertility, but made little attempt at interpretative analysis. In his *Natural and Political Observations Made upon the Bills of Mortality* (1662), John Graunt used very rudimentary calculations to explore population dynamics, but without seeking to explain or set norms. *The Divine Order in the Circumstances of the Human Sex, Birth, Death and Reproduction* (1741, then 1761-1762) by the pastor Johann Peter Süssmilch was the most advanced demographic treatise of its time, citing religion, agrarian laws or the desire for luxury in its examination of “the means to increase or diminish the population”. His was an optimistic vision, founded on the principles of Christianity, concluding (250 years ago) that there was space on earth for 14 billion humans. Jean-Baptiste Moheau’s *Recherches et considérations sur la population de la France* (Research and considerations on the population of France) is an assemblage of two very different parts. The first reviews and discusses the available data on the French population, while the second (probably written by the intendant Montyon, of whom Moheau was the secretary) explores the “causes of progress or decadence of populations”, notably the “political, civil and moral causes” that influence fertility, such as religion, political choices, legislation on marriage and inheritance, taxation and mores (*les mœurs*). His famous suspicion about the spread of birth control methods is well-known: “Already, these pernicious secrets, unknown to any animal other than man, these secrets have reached the countryside: nature is cheated even in our villages” (Moheau, 1778).

In the texts on population questions published from the seventeenth century, the reasons for a specific fertility pattern or its variations are often examined, although the authors’ suppositions are never truly supported by data nor put to the test of generalization. It was not until the birth of the “social sciences” in the nineteenth century that the first real theories of fertility started to emerge. Many of these new disciplines could legitimately lay claim to the subject, be it anthropology, sociology, economics, political science, psychology or, of course, demography.

(3) Translation taken from *The Complete Works of M. de Montesquieu*, T. Evans, London, 1777 (accessed at <http://oll.libertyfund.org/titles/837>).

I. No single theory but a range of theories

A quantitative science

Paradoxically, demographers were slow to develop a theoretical approach, and competing disciplines progressively filled the void. Nathan Keyfitz expressed the problem in these terms: “Demography has evolved in a special fashion. Far from being imperialistic, it has withdrawn from its borders and left a no man’s land which other disciplines have infiltrated” (Keyfitz, 1984, p. 1). This was perhaps because demography, a partial offshoot of statistics, was seeking to assert its position as a quantitative discipline, at the frontier between “hard” and “soft” sciences. It is sometimes said that demography, along with economics, is the most quantitative of the social sciences. Not only because it deals with numbers, but also because it has developed mathematical formulae for population change. When the first demography “laboratories” were set up before and after World War II, such as the Office for Population Research at Princeton, or the Institut national d’études démographiques (French Institute for Demographic Studies) in Paris, most of their members – often boasting a scientific background – took pains to ensure that their work was never classified as sociology, or indeed as a discipline of any kind in the humanities or social sciences. Hence a refusal to acknowledge any ideas that might be considered as a risky interpretation of available data: the facts, nothing but the facts! As a student of Louis Henry, the author of these lines well remembers how the first versions of his articles were scored out in heavy red ink when his tutor deemed the analysis to be inadequately grounded in fact, or overly subjective. Indeed, Louis Henry, whose contribution to demography was immense, rarely “theorized” (or even synthesized) his findings, too often leaving his readers to make what they liked of the vast quantities of data he had gathered and scrupulously verified.

So, we cannot but observe that there is no overarching, generally acknowledged theory of fertility, nor even a small number of theories upon which demographers can agree or disagree, and which might serve as a foundation for ongoing debate.⁽⁴⁾ This observation is shared by most authors who have reviewed the various approaches to fertility. Here are three examples. In 1990, Susan Greenhalgh wrote: “It seems that the closer we get to understanding specific fertility decline, the further we move from a general theory of fertility transition” (Greenhalgh, 1990, p. 85). On the broader theme of the demographic transition, John Cleland and Christopher Wilson wrote in 1987: “It is clear that neither the historical nor the contemporary data will permit a definitive appraisal of any single theory [of demographic transition]” (Cleland and Wilson, 1987, p. 11). The main interest of their study was to compare historical data

(4) Note that in the large corpus of 20 million books digitized by Google, the Ngram Viewer software detects the expression “théorie de la fécondité” (theory of fertility) only sporadically in French books from the mid nineteenth century, mainly around 1845-1855 and 1920-1930, with frequency increasing sharply only from 1975 onwards. In the English corpus, “fertility theory” is not found until the twentieth century, and above all – as in French – from 1975.

shedding light on the demographic transition in developed countries with the findings of contemporary surveys conducted in numerous developing countries (notably the World Fertility Surveys, or WFS). In an attempt to integrate research on the determinants of fertility, Dirk Van de Kaa, for his part, wrote: “There does not yet exist a single ‘good story’, accepted by all knowledgeable scholars, about the setting and conditions necessary and sufficient to generate the central action of fertility change” (Van de Kaa, 1996, p. 390).

Of course, one might assume that the “theory of demographic transition” widely diffused over the last half-century necessarily includes a *de facto* theory of fertility and of its determinants, providing an explanation for the downward shift from traditionally high fertility levels observed in the most advanced contemporary societies. We will not make explicit reference here to the demographic transition, to which a future volume of the “Textes fondamentaux” book series will be devoted. But we can safely predict that the conclusion of that other book will be comparable to our own. We could mention, for example, the disappointment triggered by the publication of the major Princeton study on the transition in Europe (Coale and Watkins, 1986), which confirmed that no common indicators could be found to explain the onset of fertility decline in the various countries. In fact, this relative failure was due primarily to the inadequacy of purely macroscopic analyses based on national or regional statistical indicators. The shift to microscopic analysis (thanks mainly to purpose-built surveys) revealed the importance of cultural and individual factors.

There is also a book called *Théorie générale de la population* (General theory of population) published in two volumes by Alfred Sauvy in 1952 and 1954 (then in 1963 and 1966) in which one might rightfully expect to find theoretical developments on fertility. This treatise, which provides a good synopsis of the author’s views, including those he later explored in more depth, is above all a work of economics, focusing on the questions of population growth, optimal population size, ageing and migration, and their relationship with economic growth and employment. Sauvy was convinced that population growth is beneficial, up to a certain rate at least, and in his second volume he logically dwelt up the “social factors of fertility”, “birth prevention” and the “Malthusian spirit”. But he simply drew up an inventory of the ideas put forward to explain reproductive behaviours, without contributing anything new. The quest for a theory of fertility remained unfulfilled.

The contribution of other disciplines

Many demographers have a background in two disciplines, and often look to their second area of expertise (sociology, economics, etc.) for references to build a theory that explains observed behaviours. The field of economics has probably been most influential in this respect. But it would be naïve to think that each discipline can address a particular aspect of fertility independently.

As already noted by Warren Robinson and Sarah Harbison: “There is a strong overlap among the cultural, economic, social and psychological approaches” (Robinson and Harbison, 1980, p. 225). Likewise, each discipline might be tempted to believe that it alone holds the key to the truth because, for example, a statistical test shows that the incorporated variables account for most of the variance to be explained.

A simple example will suffice to show how easily such levels of certainty are reached. In the search for factors to explain fertility differences across the many states of India, two authors produced analyses based on the same method of multiple regression, taking each state as the unit of observation. The first article (Zachariah and Patel, 1984) concluded that 91% of variance in birth rates could be explained by just a handful of socioeconomic variables (women’s educational level being the first). The second (Jain, 1985) concluded, just as convincingly (90% of the explained variance), that three main variables were at play: age at marriage, infant mortality and contraceptive use. So each could claim to have identified the key variables of Indian fertility, despite a total absence of overlap between the two lists! Both authors were right of course; the two lists were not independent of each other and the socioeconomic variables identified in the first paper acted on the variables considered in the second.

There is more agreement about proposed analytical frameworks, the aim being to arrange the numerous variables to be considered in such a way that their interactions can be understood and their respective influences – which themselves depend on the social and economic context – can be measured. Work in this area acts as a sort of safeguard, steering researchers away from red herrings and errors of interpretation, in the same way as fertility indicators and age-specific rates serve to correct the false impressions given by the birth rate. These articles are presented in the book before the theoretical ones in order to demonstrate the importance of choosing the right indicators and understanding the context before launching into a theoretical analysis.

Most of the studies mentioned from here on were published after 1960. The ideas they develop did not appear out of thin air, however, and we will begin with a brief look at some of the pioneering early articles published between 1890 and 1956. Their methodologies are still tentative, for the reasons mentioned above, and their style and tone often reflect the modes of thinking and the preoccupations of their era. But in one way or another, they have influenced the work of succeeding generations of demographers, and justly deserve a mention in this overview.

The existence of potentially retroactive effects also needs to be considered. All the studies mentioned so far sought to explain fertility behaviours, which in turn contributed to population change. But this change may itself affect fertility, as is the case in the so-called “Easterlin hypothesis”. The fertility variable can also be incorporated in a general model of population change that

includes economic or other variables, and in which each variable is both cause and effect. We will return to this point when discussing the last article in the selection (Easterlin, 2004).

II. The pioneers

Malthus and his critics

Our overview inevitably begins with Malthus. There is no space here to present all the works of a thinker whose ideas have sparked so much debate and controversy. We will simply focus on the fifth edition of his *Essay on the Principle of Population* which developed the notion of “moral restraint” that Malthus considered to be the best means of controlling fertility. The first edition had been severely criticized, not only by those who reproached Malthus for advocating submission to the established order (the poor were expected to escape from their condition by their own means), but also by those who abhorred the idea of seeking to limit the number of God’s children. Conscious of the sometimes roughshod and simplistic nature of his arguments, Malthus wrote a much longer, revised edition, which included the famous allegory of the mighty feast, which he removed from later versions:

A man who is born into a world already possessed, if he cannot get subsistence from his parents on whom he has a just demand, and if the society do not want his labour, has no claim of right to the smallest portion of food, and, in fact, has no business to be where he is. At nature’s mighty feast there is no vacant cover for him. (2nd edition, Book IV, Chapter VI)

Rather than allowing death to curb population growth, Malthus argued the need for moral restraint. It was no longer a question of limiting population growth to keep pace with that of subsistence, but of narrowing the gap between the two and limiting the adverse effects of this gap. Malthus thus exhorted couples to voluntarily limit their family size, and encouraged young men and women to postpone marriage until they could support a family. For an Anglican priest, there was no question of advocating contraception, let alone abortion: abstinence was the only option. This need for moral restraint is highlighted in the excerpt reproduced in the book.

As we have seen, Malthus’ ideas were vehemently attacked during his lifetime, not least by those whose opinions he refuted, and whose names he cited in the very title of his book (*With Remarks on the Speculations of Mr. Godwin, M. Condorcet, and Other Writers*). But one of his most implacable adversaries was to be Karl Marx. For Marx, population size is determined primarily by modes of production and the distribution of wealth. So in his view, birth control cannot be justified on the basis of an economic imperative. We will return to this point later. This question was thrashed out at length by Malthus’s successors, but without much progress in the theoretical debate

on reproductive behaviour. In the mid-nineteenth century, Quetelet (1848) sought to establish a link between “social laws” and the growing number of physical laws newly revealed by science. He speaks of “moral forces” like other physical forces, and uses the terms *penchants* or *tendances* (both translated as “tendencies”) to describe what demographers would later simply call rates or probabilities, and economists, propensities or preferences. The analysis in his book remains somewhat abstract, however (Quetelet later moved on to more empirical studies).

Fertility and progress

It was not until the end of the nineteenth century that a truly novel approach, that of “social capillarity”, was developed by Arsène Dumont in *Dépopulation et civilisation* (Depopulation and civilization) (1890*), with his “new population principle”. Europe was no longer threatened by overpopulation, but rather by depopulation. Dumont offered a simple and convincing explanation for the fertility decline observed in many countries. In his view, the new economic and social context created by industrialization and economic development offered prospects for social promotion that did not exist in traditional societies. This encouraged couples to limit their family size, in order either to facilitate their own promotion by limiting their spending and their family constraints, or to focus their efforts on a small number of children, thereby increasing their chances of upward social mobility. This argument was taken up by many other authors (as we shall see with Landry and Ariès) and, in one form or another, is still used today: when the curve of fertility by educational level is U-shaped (or J-shaped), for example, the existence of a low point is easily explained by the idea that the intermediate categories are most sensitive to the possibility of elevating their social status. The excerpt entitled “Nouveau principe de population” neatly sums up the author’s views (Dumont, 1890*).

In this quest to identify the determinants of low fertility in Europe, Adolphe Landry was the first to provide an overall interpretation of the transition between old and new demographic regimes. In his 1909 article in *Scientia*, “Les trois théories principales de la population” (The three main theories of population) Landry* placed specific emphasis on this major change, referring to two successive demographic regimes in France: regulation through celibacy and late marriage, and then through “voluntary control of procreation within marriage” (*La Révolution démographique*, p. 181). While he mentions the possibility that declining mortality may be a factor behind the falling birth rate, he does so merely to rule out the idea (for France at least). He sanctions Dumont’s theory, but prefers to focus on the true cause of declining birth rates, namely the spirit of 1789, the “rationalization of life” (op. cit. p. 40), combined with the idea of progress. But there is no end in sight to the effects of this cause, and its limits are quite unforeseeable:

A vast movement of the spirits is under way, releasing them from secular submission [...] to established authority [...]. The aspiration is to reform society, to rebuild it upon a rational vision (op. cit., p. 40).

This tendency towards more rational behaviour in all areas, including in the transmission of life, is clearly a secular trend, that Landry does not appear to regret, however, despite expressing concerns about its effects: “No matter how far they [birth rates] fall, they never reach the bottom” (op. cit., p. 191). As Landry sees it, this is a topic of grave concern for the future of western societies.

In his Conclusion to the *Encyclopédie française* published in 1936, the influential author Maurice Halbwachs laid claim to the analyses of Dumont and Landry, and cited the approaches of Condorcet, Malthus and Marx, adding a quasi-genetic dimension to his argument: “the transmissible traits of the lower classes tend to spread throughout the nation”, with the poor progressively swelling the ranks – thanks to social transformations – “of the noble and moneyed classes” (Halbwachs and Sauvy, ed. 2005, p. 356). Above all, Halbwachs gave precedence to “group representations” over “individual rational motives”. This point will be discussed more fully below. In the United States, Frank Notestein (1945) was among the first to argue that falling birth rates in industrialized countries could be attributed to the emergence of “rational control” of fertility and the spread of contraception. But efforts to investigate the trends and factors of fertility had already been initiated in the 1930s by the Milbank Memorial Fund (see a summary of Stix and Notestein’s work in their 1940 book), which had notably supported the major Indianapolis survey of 1941 whose results were published between 1943 and 1958 (see a presentation in Kiser, 1950). Conducted only among White couples in an urban environment, the survey measured for the first time the “degree of planning in reproduction” and showed, among other things, that fertility differences by degree of planning were due solely to variations in the effectiveness of contraception, couples’ “potential” fertility being invariable. The hypothesis of biological variations was thus invalidated.

Measuring fertility

The article by Norman Ryder which concludes the first part of the book (1956a*) is of a more technical nature. If we chose to include him, it is because more accurate fertility measurement enhances the quality of theoretical analysis, not least by limiting errors of interpretation. Data on fertility by birth order, for example, provides information on some of the reasons why couples might wish to limit their family size. Do they want to avoid having children altogether (a question that can be answered by looking at the proportion of childless marriages), or to limit their offspring to two or three? Theoretical interpretations may differ substantially in one or other case. Yet it is impossible to distinguish between the two situations by means of a

simple overall fertility indicator, especially if it is a birth rate. In their 1925 article, Louis Dublin and Alfred Lotka also pointed out that the natural growth rate (the difference between birth and death rates) is a poor indicator of the “intrinsic” dynamics of a population. The number of births observed in year t depends on the age structure of the population in the same year (only women of reproductive age contribute to births), a structure which is itself shaped by earlier patterns of fertility and mortality. In the dynamics of “stable populations”, whose main components are detailed in an appendix to the article by Ryder, the number of births is obtained by combining age-specific fertility rates with the proportion of women of each age. From then on, the analysis of population trends, like demographic forecasting, was based on the use of age-specific rates, the aim being to explain or predict these rates. This development coincided with the debate on the notion of “rate of reproduction”, initiated by Robert Kuczynski (1931), and incorporated by Lotka in one of his very last texts (1947).

The debate over the use of “crude” or “net” reproduction rates took hold in the interwar years (1920 to 1940), in a context of declining births. While the main ambition was to take account of mortality (which was also declining), the question of the difference between a “cross-sectional” indicator obtained by summing the age-specific rates observed in a single year, and a “longitudinal” indicator obtained by summing the rates within a given cohort, also emerged. The problem attracted renewed attention after the Second World War, the main analysts being Norman Ryder (1964) and Nathan Keyfitz (1985) in the United States, Pierre Depoid (1941) and Louis Henry (1965), then Roland Pressat (1973) in France. In his article, Norman Ryder (1956a*) demonstrates the advantages of cohort analysis, notably when period fertility rates are affected by mechanisms of postponement or recuperation in the timing of childbearing: any cross-sectional composite indicator is liable to give an erroneous idea of completed fertility by cohort. More technical presentations can be found in two other articles by the same author published in 1956 and 1964 (Ryder, 1956b, 1964). Ryder also advocates – as suggested by our initial remark – measures of fertility by parity and by marriage duration.

The question was taken up once more after the end of the baby boom, when fertility in certain European countries plummeted to an all-time low. It was suspected – rightly so – that the drop in the total fertility rate did not simply reflect a quantum decline in fertility, but also a change in tempo, with the postponement of births to later ages. The idea of producing tempo-adjusted “cross-sectional” indicators led to the production of indices of varying usefulness – the two effects cannot truly be dissociated until the cohorts concerned reach the end of their reproductive lives – (see, for example, Bongaarts and Feeney, 1998; Rallu and Toulemon, 1994) but it certainly enhanced our understanding of fertility trends.

III. Structured analytical frameworks

Taking determinants into account

As the number of hypotheses gradually increased, along with the number of variables to be considered, a bit of pruning was required. One article was instrumental in this task, that of Kingsley Davis and Judith Blake published in 1956*. After identifying a large corpus of ethnological studies, the two authors suggested that the variables influencing fertility be classified on several levels: first, the variables they labelled as “intermediate”, through which any social factors influencing the level of fertility must operate; second, “social norms”, strongly linked to cultural conditions, which govern fertility and marriage behaviours and the other intermediate variables; and third, the “characteristics of economic and social structures” which establish an individual’s position in society. This classification proved highly fruitful, and the long list of intermediate variables proposed by Davis and Blake drew attention to many factors that had been largely ignored until then. It also contributed to a major error, however: for almost 20 years, from the 1960s to the mid-1970s, and despite the existence of studies demonstrating its importance, the role of breastfeeding – absent from Davis and Blake’s list – was all too often ignored, including in demographic survey questionnaires. Yet, as we shall see below, in high-fertility countries the two key variables are marriage and breastfeeding.

It was also by looking for historical references to the fertility situation in societies not yet practising birth control that Louis Henry developed the concept of natural fertility. He first used the term in 1953, (before Davis and Blake’s study) in an article entitled “Fondements théoriques des mesures de la fécondité naturelle”⁽⁵⁾ (Henry, 1953), then in 1961 (Henry, 1961a*), and in a highly successful article published in English (Henry, 1961b). In the meantime, Henry had published his models of the processes of family formation (Henry, 1957), showing that fertility under a “natural regime” is the foundation upon which the analysis of “controlled” fertility can be constructed. It could also be said that natural fertility forms the central core of Davis’ and Blake’s study of intermediate variables, and of the analysis of proximate determinants later developed by John Bongaarts. In several articles, Henry defined natural fertility as that observed in the absence of birth control, when fertility is dominated by physiological factors. But not only. Henry worked primarily on fertility within marriage, and he was well aware that age at marriage – strongly determined by the social environment – acts directly on completed fertility, and that, likewise, breastfeeding (an individual practice, but very much socially determined) governs birth spacing. Indeed, Henry states a preference for the term “natural” rather than “biological” precisely to avoid any confusion. Given that a couple’s efforts to space births or limit their number leads to a decrease

(5) Later published in English under the title “Theoretical basis of measures of natural fertility” in his book *On the Measurement of Human Fertility, Selected Writings*, 1972, New York, Elsevier, pp. 1-26.

in fertility rates, the number of children already born at a given age provides, in Henry's view, a relatively simple method to detect the transition from a natural regime to a controlled regime. Further developments on the notion of natural fertility can be found in Leridon (1989).

Modelling

In a paper published in 1973, Ansley Coale* gives a brief but incisive overview of fertility trends in developing countries. Beginning his analysis with a long quote from Notestein (1953), he concludes that three preconditions must be met before fertility starts declining in a given society: fertility must enter the realm of conscious choice, of rational calculation; lower fertility must have perceived advantages in the prevailing economic and social environment; effective birth control techniques must be available. It thus became clear why certain family planning programmes had ended in failure: it is not enough simply to provide women with contraceptives if the other two preconditions are not met. These points raised by Coale are examined in detail below.

Following the same rationale, Ansley Coale had previously suggested that four indices be calculated (Coale, 1966; see also van de Walle, 1974), making it possible to compare the analyses based on data from the various above-mentioned Princeton surveys on the transition in Europe. The index of overall fertility (I_p) is expressed in terms of an index of the proportion married (I_m), an index of fertility of married women (I_g) and an index of fertility of non-married women (I_h) where applicable, all indexes being standardized by age structure within the reproductive period. The aim is to separate the effects of marriage at earlier or later ages from those of birth control within marriage. A further advance was made by Coale and Trussell (1974), who used the pattern of age-specific fertility rates to detect an acceleration in the decrease with age, the first manifestation of voluntary fertility reduction (the index m in the authors' model).

To take things further, more information was needed. The relevant data were not always available in vital statistics, so specific surveys had to be organized. The notion of a statistically representative survey was still quite recent in the early 1950s, but things started moving in the 1960s, and above all in the 1970s, with the launch of the major programme of World Fertility Surveys (WFS). More than 40 developing countries took part in the project between 1974 and 1981, on the basis of a sampling plan, a questionnaire and a common programme of tabulations (see the report by Eugene Grebenik, 1981).

This tool provides a means to obtain – at individual level – numerous other potential explanatory variables, as listed in the analytical diagram presented below. At the same time, the available information needed to be synthesized via a limited number of composite variables, preferably comparable from one study to another. This was the approach adopted by John Bongaarts (1978). A

later version of his paper (1992*) is included in the book. Bongaarts' proximate determinants share many similarities with the intermediate variables of Davis and Blake, although the author's idea was to synthesize the variables into a limited number of indicators. Building upon findings on the fertility transition already available both in historical demography and in developing countries, he considered that the fertility rate at a given age could be expressed as the product of five factors: a reference level (total fecundity rate drawn from historical data), the effects of marriage (C_m), of post-partum infecundability (C_i) determined by the frequency and duration of breastfeeding, of contraception (C_c), and of abortion (C_a). Each of the last four indexes can only take values of between 0 and 1, thus expressing the reducing effect of each variable. The marriage index is easy to calculate (it is sufficient to know the marital status of each female respondent). Determining index C_i on the basis of the (observed) duration of breastfeeding is slightly more complex, however, and calculating C_c via the (observed) proportions of users of various contraceptive methods relies on even more questionable assumptions. In the absence of reliable data on the frequency of induced abortion, C_a is generally set at 1. It is hardly surprising, therefore, that the model works rather poorly: using data from sources such as WFS, or later DHS (Demographic and Health Surveys), the four main indicators and the level of fertility can be determined simultaneously. Thus, the value of the "total fecundity rate" (TF) can be recalculated using the four other indexes: applied to overall fertility (total fertility rate), and over 29 WFS surveys, the TF ranges from 10 to more than 16 children, for a theoretical value of 15.3 (Singh et al., 1985). In fact, given the fragility of the assumptions upon which it is based, this model has its limitations. It nonetheless functions quite well in a variety of situations, with an economy of information that makes its use all the more attractive.

This model was later extended by Hobcraft and Little (1984), who decomposed years lived into a series of periods representing different degrees of exposure to conception risk; in practice, the data available in demographic surveys generally concern the preceding five years (at most). By way of complex calculations, the method provides, in principle, a more accurate estimation of the various intermediate variables and of the influence of socioeconomic factors.

This opened the era of "microdemography", predicated on the availability of individualized data. It moved forward rapidly in the 1970s with the mathematical formulation of the reproductive process (e.g. Henry, 1957; Potter and Sakoda, 1967; Sheps and Menken, 1973) and the construction of microsimulation models⁽⁶⁾ (e.g. Barrett, 1969; Hyrenius and Adolfsson, 1964;

(6) Note that Alfred Lotka, at the end of his paper to the Paris population conference in 1937 ("Quelques résultats récents de l'analyse démographique", vol. 1, pp. 96-107) introduced the principle of the simulation method known today as the Monte Carlo method. It involves repeated random sampling, and Lotka proposed – before the era of electronic calculators – a clever, though cumbersome, manual technique. According to Wikipedia (October 2013), the method was formalized by the physicist and statistician Nicholas Metropolis in 1947.

Jacquard, 1967; Leridon, 1977; Ridley and Sheps, 1966). Here again, the key ambition was to assess the potential weight of each variable. The interval between births, for example, which measures the “pace” of reproduction (it is, roughly speaking, the inverse of birth frequency, and hence of a fertility rate), depends on several components, such as monthly conception risk – fecundability – or the period of post-partum infecundability (see Davis and Blake’s diagram). Yet while it is very difficult to estimate *ex ante* the impact on completed fertility of a halving of mean fecundability, for example, the question can be answered quite accurately using a model. It can thus be shown that the fertility levels of ancient populations can be fully explained without considering voluntary birth control. So this approach involves no theory, but provides a means to measure the potential impact of one or other theoretical assumption (see Leridon, 2004, for example, on the efficacy of assisted reproductive technologies).

Figure 1 gives a general overview of the numerous variables influencing fertility, the levels at which they come into play, and the interactions between them. It may also serve as a guiding thread for the thematic approaches presented below. It is based on Davis and Blake’s diagram (1956) as reproduced in Bulatao and Lee’s book (1983).

IV. Thematic approaches

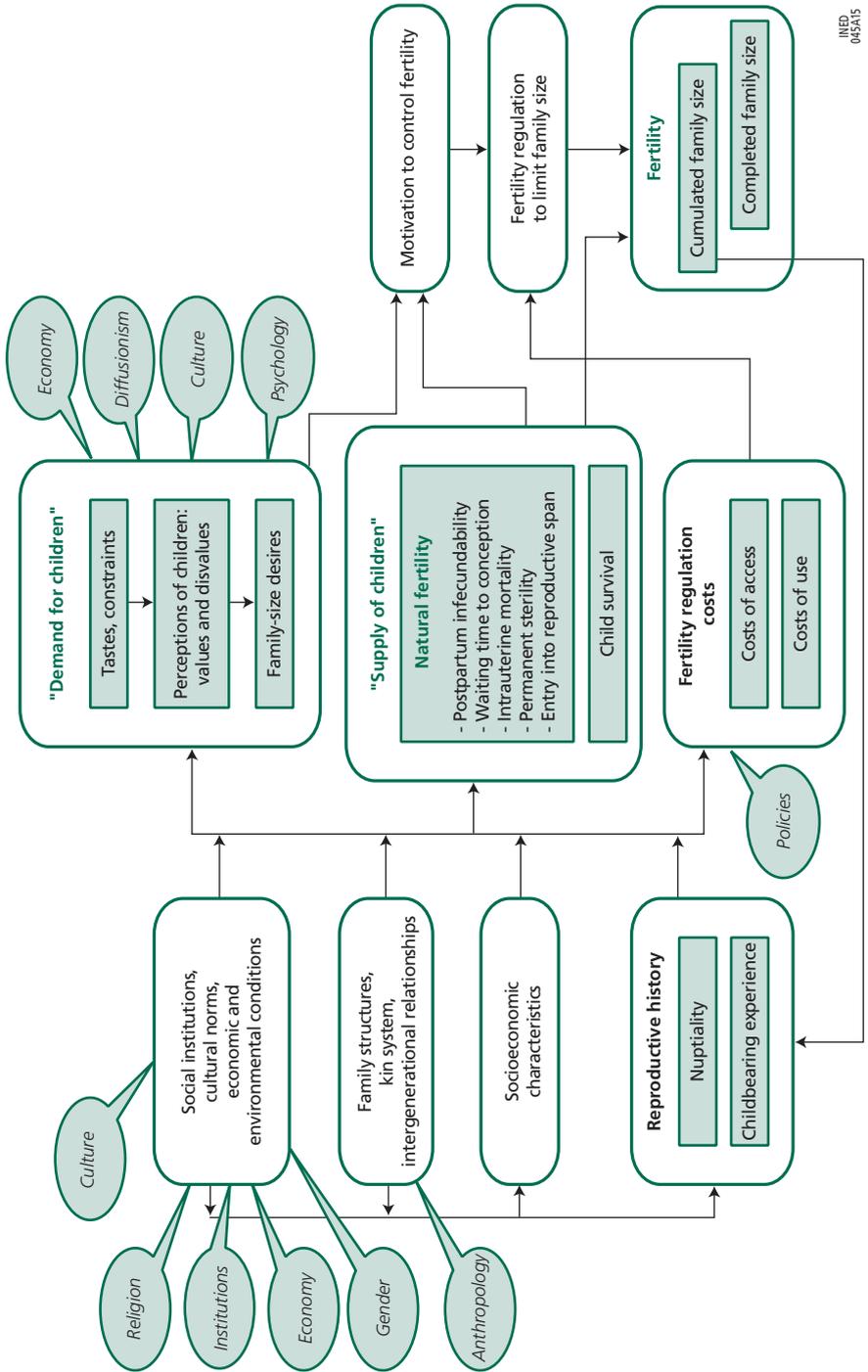
The contribution of history

There are countless studies on the history of populations, but very few provide a theoretical framework for analysing fertility, doubtless because this was pointless exercise given the lack of accurate data, or because fertility was assumed to be stable over the period considered. Moreover, when such frameworks do exist, they are often applicable only to the study population in question. Among English-speaking authors, Peter Laslett and Edward Wrigley were major contributors in this field (Laslett and Wall, 1972; Wrigley, 1985; Wrigley and Schofield, 1981). French historians also made their mark. Many applied the methods of historical demography, as laid down by Louis Henry (Fleury and Henry, 1956), including Jacques Dupâquier and Jean-Pierre Bardet (Bardet and Dupâquier, 1986, 1997) to name but two.

While focusing on the history of marriage, Hajnal’s article (1953) revealed the large age differences between spouses in pre-transitional Europe, which necessarily influenced completed fertility.

The work of Philippe Ariès, a non-academic historian who advanced our understanding of the history of mentalities, is also of particular interest. In a short paper (Ariès, 1980*) he sums up his ideas on fertility trends in western Europe. Close supervision of young people’s sexuality and social condemnation of non-marital births were two characteristics of the traditional demographic

Figure 1. Analytical diagram of fertility determinants



INED 045A15

Source: Based on Bulatao and Lee, 1983, vol. 1, p.10

regime. While premarital sexuality was not forbidden, it had to be “risk-free”, so sexual practices had to be adapted accordingly. When couples started to plan their lives and their reproduction, the family turned in on itself, becoming centred upon the child and its future; this meant limiting the number of births (as postulated by Dumont). For Ariès, the means of controlling reproduction was acquired through youthful experience, above all with *coïtus interruptus*. The article continues with an interpretation of the baby boom, during which children became princes and princesses, before later being knocked off their throne...

The anthropologists' contribution

Alongside historical populations, whose family and reproductive behaviours have been studied by historians, the contemporary societies studied by ethnologists offer almost inexhaustible opportunities to observe these behaviours in a multitude of different contexts. This is amply demonstrated in the overview by Davis and Blake. But descriptive analysis, reporting the situation in a given society, is not enough in itself. The anthropological approach pays particular attention to kinship systems, which can provide indirect information on how reproduction is organized. But this is rarely the central focus of theorization. An interesting approach was developed by John Caldwell (1982*), making especially pertinent use of certain economic arguments that will be presented below. He starts out from the observation that a large number of children is not always a disadvantage, even from a purely economic point of view. In traditional African societies, for example, children and young adults contribute to the family's income, while power is held by the male elders. In modern society, on the contrary, the parents must spend money to raise and educate their children with no hope of any subsequent monetary returns. The wealth flows from children to parents have thus been reversed. However, Caldwell shows that the onset of modernization does not necessarily produce an immediate shift from the first system to the second: high fertility may remain advantageous for certain members of society who are able to adapt their modes of social organization and economic production (by sending children to work in town, for example, and obliging them to send all or part of their wages back to the family of origin). The system is not truly destabilized until the younger generations start to challenge the authority of family elders.

Caldwell makes abundant use of economic language, but often with the aim of subverting it. He talks of “satisfactions”, but in order to highlight their diversity; alongside economic rewards, he mentions, for example, the pride of belonging to a large family. He does not rule out cost-benefit analysis, but states that it must be measured over a person's lifetime – a time of net disadvantage may be followed by a more favourable period later in life. Last, he stresses the fact that not everyone is in position to make independent decisions; women's reproductive choices, in particular, are often dictated by their spouse. While scholars from many disciplines were drawn by this wealth flows theory, it is

difficult to confirm using practical examples, however, due to a lack of adequate data, quantitative data especially.

The institutional and political environment

While the anthropological approach is based on detailed observation of behaviours, it also takes account of the social environment. With the development of structured nation states, the institutional dimension tends to weaken the role of the family or clan. Geoffrey McNicoll (1982*) presents examples of interaction between the state and local structures. In the Chinese province of Guangdong, the communist system was superimposed upon existing local entities (families, neighbourhoods, villages), which were progressively supplanted by the new production teams and brigades. Here, the fertility decline was driven more by changes in rural structures and by economic incentives than by national birth control campaigns. In Bali, the Communist Party, like the Muslim organizations that followed, first established control via the complex local structures (seven levels), making it possible to manage family planning measures directly at hamlet level. Bangladesh provides a counter-example: in the 1970s, local clan networks were still too strong for national policy to make any real inroads, at least so long as families and rural communities were better off having large numbers of children.

Susan Greenhalgh, for her part, develops an approach rather than a veritable theoretical framework. She proposes a “new analytic perspective”, which she sees as “a framework that may embrace diverse theories”. Her starting point is the country’s political and socioeconomic environment as shaped by major national and international forces, such as the development of the market economy or globalization, which act in different ways across countries and communities. Research must cover multiple levels and long periods of time; it must explore the diverse political forces at play and combine both qualitative and quantitative aspects. Three highly contrasting examples – Sierra Leone, Japan and Sicily – are presented in Greenhalgh’s article (1990*). For Japan, she seeks to explain the very low prevalence of modern contraceptive use (pill or IUD). Referring to the findings of Samuel Coleman (1983), Greenhalgh points up the roles of gynaecologists (who make more money from induced abortions), family planning organizations (who sell large quantities of condoms) and an obscurantist bureaucracy. This example shows that individual rationality, economic constraint or conjugal relationships do not provide a plausible answer to the question raised. But like McNicoll and Caldwell, Greenhalgh recognizes that her approach is not easy to implement, given the complex nature of the data to be collected.

In the same vein, John Casterline places the progressive formation of nation-states, with their increasingly effective means of intervention, at the centre of his analyses (Casterline, 1989). It is the state’s direct duty to guarantee the security of citizens at home and along its borders, thereby divesting families,

clans and kin groups of this role and weakening their traditional legitimacy. More indirectly, by modernizing agricultural production, creating new jobs in the secondary sector and offering a degree of social protection, the state establishes new forms of solidarity and of communication between all citizens. For Casterline, measuring the state's level of development in a given society is key to understanding the potential consequences of the transformations and interventions under way.

The role of the state and of major economic transformations necessarily takes us to Marx, whose ideas were expertly analysed by George Simmons (1985). The development of the capitalist system being founded on growth in wage employment at the expense of family businesses and craft, individuals should have little interest in maintaining high fertility. But from a macroeconomic perspective, high fertility in the working classes provides a “reserve army of labour” and puts downward pressure on wages:

The labouring population therefore produces, along with the accumulation of capital produced by it, the means by which it itself is made relatively superfluous, is turned into a relative surplus population [...]. This is the law of population peculiar to the capitalist mode of production. (Marx, *Capital*, Chapter 25, Volume 1)⁽⁷⁾

So the state is not necessarily interested in limiting births. But if fertility declines nonetheless, this will be in response to the very harsh living conditions of the urban working classes. It is difficult, therefore, to define a Marxist doctrine on the subject. This same dogmatic ambiguity was reflected in the position of the French Communist Party in the early 1960s when it argued against contraception and the right to abortion, in contrast to the communist parties of several Eastern European countries where these practices were encouraged or tolerated.

A more detailed overview of institutional approaches can be found in Piché and Poirier (1995).

Microeconomic approaches

The economic approach was appropriated and overhauled by the classical economists of the 1960s, to the extent that if any theory of fertility is to be recognized, then they should be given credit for it. Many of the first population theorists were economists. But it was the invention of *homo economicus*, the rational actor whose behaviours can be predicted, that offered a framework – subject to a few adaptations – for the study of reproductive behaviour as a particular instance of the choices available to him. The ground-breaking study was probably that of Harvey Leibenstein (1957). The approach can be summarized as follows: “child demand” can be analysed using the macroeconomic theory of consumer demand for durable goods. These goods (which do not disappear

(7) Translation accessed from:
<https://www.marxists.org/archive/marx/works/download/pdf/Capital-Volume-1.pdf>

as they are consumed, unlike daily consumer goods such as food, leisure or energy) provide utility, itself the result of consumers' tastes and preferences for other consumables, with choices being heavily constrained by the level of household income. The increase in consumption of a good when income rises depends on the elasticity of this response, though a quality factor may also come into play: the price that a consumer will pay for a good depends on its quality, and on the satisfaction it provides. The cost of a child can be discounted against the services it provides to the parents over the short or long term. The "supply" of children, on the other hand, – i.e. the number of children that a couple could have in the total absence of contraception – is considered to be much higher than demand, so does not need to be quantified.

Gary Becker, who won the Nobel prize in 1992, was the main pioneer of this approach and his founding text is among the most frequently cited (Becker, 1960*). After developing his arguments, Becker then tests his theory using empirical data. Contrary to expectation, fertility does not generally increase with income, not systematically in any case. To get around this problem, the preferences and "quality effects" mentioned above must be factored in, adding a sociological dimension to the reasoning. In the 1960 book in which Becker's article was published, it was followed by a commentary by James S. Duesenberry who pointed up this contradiction: "Economics is all about how people make choices. Sociology is all about why they don't have choices to make" (op. cit., p. 233). In other words, constraints on individual decisions are so strong that pure economic rationality can hardly be applied. And if the economic models can only "work" by making abundant use of concepts such as desired "child quality" or by considering purely psychological satisfactions for parents, then their usefulness is limited. Judith Blake (1968), for her part, challenges the principle of classifying children as durable goods. More broadly, the economic approach has a hard time incorporating "irrational" behaviours, such as the need to reproduce, individuals' capacity to make the right decisions on the basis of incomplete information, or a balance of power that favours men.

Harvey Leibenstein's contribution (1977*) is more recent. It is a brief summary presented at the IUSSP conference in Mexico City in which the author assesses the "benefits and costs of children" approach, specifying the various dimensions of the concept and examining the relationship between income and number of children. For Leibenstein, rich people do not choose to have small families because they want "higher quality" children, as assumed by Becker, for example, but because the rich spend more money on children than the poor. He also adds a competition effect; in order to maintain their social standing, rich people buy status goods and this reduces the amount of income available for children. But the author goes further, by proposing to relax the rationality assumption. He uses terms borrowed from psychoanalysis:

Selective rationality refers to the idea that people work out a compromise between the way they would like to behave, in the absence of constraints,

(the *id*), and the way they would like to see themselves behave in terms of their standards of behavior (or *superego*). [...] In other words, they select a degree of constraint concern that is determined by (1) their personalities, and (2) the context.

As one might imagine, such concepts are difficult to model, and the arguments presented in the rest of the paper are of a qualitative nature.

The economic literature expanded steadily. A significant advance was achieved with the incorporation of “time allocation”, drawing inspiration from the New Home Economics proposed by Becker in 1965: household members may each use their time in different ways, for example to look after the children or do paid work outside the home. Time use will, of course, depend on the income to be derived from this activity and the cost of children, among other things. Under this approach, the household is subject to a dual constraint in terms of total income and total available time, the aim being to maximize a “family utility function” which takes account of the various household outputs (children, health, etc.). Robert Willis (1973, 1974), Theodore William Schultz (1974) – Nobel prize winner in 1979 – and Theodore Paul Schultz (1987) made notable contributions to these models. In mathematical terms, the model is expressed as an equation linking the final number of children to variables such as level of income or level of education of each spouse, etc., much like the equation formulated by other researchers in a more classical manner without recourse to economic theory. The sole advantage of this economic approach is to specify the meaning of the coefficients in the equation and to somewhat reduce the arbitrary nature of the calculation.

Last, it is worth mentioning an original approach that aimed to draw demography and economics closer together. It was proposed by Richard Easterlin (1975*), another prominent economist who took a close interest in demographic questions. Starting out from the classic economic approach of the balance between supply and demand, Easterlin innovates on several levels. He starts by developing the supply side, generally assumed to be in surplus with respect to demand; the potential output of children, C_n , will be equal to the number of surviving children parents would have if they did not deliberately limit fertility, but variables contributing to the definition of natural fertility (see Figure 1) and probabilities of survival to adulthood are also taken into account. This number is not the same for all couples, and may be below the desired number of children. The latter represents the demand for children, C_d , obtained through direct questioning in surveys, that would be reached (if it does not exceed C_n) if perfectly effective contraceptive methods were used. But this latter condition is not necessarily simple to achieve. Easterlin introduces “costs of fertility regulation”, RC which are not only financial but also psychological, for example, if the woman is obliged to act against her husband’s wishes, her social environment or her religion, or if it is difficult for her to find out about available contraceptive methods. Unfortunately, RC is difficult to measure, and

Easterlin must resort to very indirect measures, such as the number of known contraceptive methods, because this is the only question asked in some surveys. This approach, which is much more comprehensive than the standard microeconomic models, served as the backdrop for the analyses in Bulatao and Lee's collective work published in 1983.

In all these approaches, it is difficult to factor in the potential benefits of children twenty or more years after their birth. Yet for authors such as Mead Cain (1983, 1984), parents in some societies may see their children as veritable insurance policies, protecting the mother in case of early widowhood, or providing care in old age. This guarantee lasts a lifetime – for as long as the children themselves remain alive – and is therefore vastly more attractive than any commercial insurance policy. To minimize risk, having two adult sons is a reasonable objective. This means five births, if mortality between ages 0 and 20 is around 20%. Below this threshold, there is no incentive to control fertility. This example shows that economic calculations can be extended in many directions.

Sociocultural approaches and “values”

As we have seen, the study of fertility owes much to sociology, with key contributions from Ronald Freedman as early as 1963 and Geoffrey Hawthorn in 1970, for example. Psychology also has a part to play, though studies in this field have focused on qualitative aspects, or on a small number of cases, with little impact on the demographic debate (see Fawcett's bibliography, 1970). Analyses are often centred around the notion of “values” guiding the decisions of individuals or couples, and the quest to identify their nature, scope and determinants.

The somewhat technical article by Ron Lesthaeghe and Dominique Meekers (1987*), rendered all the more arduous by its use of statistical methods such as principle components analysis or rank correlations that have fallen from general use, is a very good example of a rigorous quantitative approach to standard sociological concepts, and is characteristic of Lesthaeghe's entire corpus of work (see, for example, Lesthaeghe, 1983; Lesthaeghe and Surkin, 1988). The authors refer to Inglehart's work (1977) on post-materialism, where non-material ideas and aspirations take precedence over the quest for material advantages, to the ideas of John Simons (1982 and 1986) and to Easterlin's hypothesis which will be discussed below. Using data from the European Values Surveys, they build three types of indicators: dependent variables, such as familialism (acceptability of divorce, meaning of parenthood, tolerance of non-conformist behaviour, etc.); independent variables such as religiosity, materialism versus post-materialism, altruism, etc.; and control variables such as sex, age, household income, education and so on. The authors draw many conclusions, observing, for example, that a large majority of Europeans still value parenthood, despite its weakening anchorage in institutional or personal

religion; that the younger cohorts are much more post-materialist and “dissatisfied” than their elders, and substantially less nationalist and “moralistic”; that the intergenerational solidarity upon which European welfare systems (such as pay-as-you-go pensions and family benefits) are founded, have been weakened by the development of individualism and pluralism and by the fact that free riders are not penalized. For Lesthaeghe and Meekers, these trends suggest that European fertility will remain at a low level for the foreseeable future.

These analyses are broadly confirmed by Sam Preston (1986) for the United States. He suggests that the worries about over-population that emerged in the 1970s led to a relative devaluing of motherhood, with the people reporting the greatest concern about this issue being those with the fewest children (though this might reflect a rationalization of existing behaviour...). He also believes that the spread of contraception has strongly eroded certain systems of thought, notably those linked to Christianity. Last, like Lesthaeghe, he highlights the rise in individualism, which he sees as a response to changes in the socioeconomic environment rather than as an independent dynamic.

Clearly, religion is a major component of these analyses, as it is in historical studies. For John Simons (1982*), it is important to consider religion, or religious practice, as more than just one independent variable among many. Religion must be seen as a system of meanings that shapes all behaviours, not just those pertaining to reproduction. If Durkheim is to be believed, each society generates an ideal and sacred perception of itself, of which religion is the manifestation. Hence, for Simons, the systems of meanings may render the act of procreation sacred in itself. A good example is given by the Hutterites, an Anabaptist community in the United States and Canada with very high fertility (up to 10 children per marriage). While pursuing a frugal, rural lifestyle, their mortality levels are equivalent to those of an industrialized country and education (of both boys and girls) is a priority.⁽⁸⁾ But in this society “the function of the family is to produce new souls. [...] Children are not extensions of the parents’ egos but gifts of God who belong to the colony and potentially to the Church, which is the body of Christ”, says Simons, citing Hostetler. This is admittedly a minority view, but that may well still exist among other fundamentalist religious groups today. Returning to Simons’s interpretation of the historical fertility decline, he sees the influence of the Protestant Reformation: by giving space to the individual, even within a religious and Christian context, it opened the way to a positive vision of worldly realities and of man’s capacity to act upon them. However, as the author points out, under this interpretation the French case remains a mystery, since France still has a largely Catholic population.

(8) This Hutterite population has interested demographers for many years, and is a standard reference for “maximum” fertility in numerous models, such as those of Henry, Coale or Bongaarts. Apparently, only the first generations of female French emigrants to Quebec in the seventeenth century qualify for this record fertility (Jacques Henripin, 1954, *La population canadienne au début du XVIII^e siècle*, Paris, INED, Cahier 22).

Another interesting aspect of this article is its explanation (one of very few) of the European baby boom. In England at least, the Second World War was followed by a simultaneous resurgence of religiosity, belying the commonly-held belief that religious sentiment was in steady decline.

Lutz (1987) follows the same reasoning, considering that religion not only influences individual behaviours directly (condemnation of abortion, for example), but also shapes the entire system of social norms, forming an integral part of a society's overall cultural identity. His macro analysis reveals that the cultural environment and the dominant religion play distinct roles, independently of the socioeconomic variables taken into account.

The text by James Fawcett (1983*) uses the term “value” to mean something different, namely the value of children to their parents. This looks like a return to the economic concepts of costs and satisfactions, but the context here is much broader: the framework for analysing costs and satisfactions used by Fawcett, based on work by Hoffman and Hoffman (1973), includes no fewer than 28 elements. His article examines the structural factors influencing these variables (socioeconomic status, cultural influences, gender roles) and the effects of these values on fertility behaviours. On this second point, his research finds that the most significant factor in the fertility decline is the disappearance of the child's economic role; next come rising aspirations for life as a couple and as a family, and expectations for future satisfactions from children (see also Bulatao, 1979).

Finally, most of these authors claim to be very sceptical about the explanatory power of microeconomic approaches (see also the strong critique by Cleland and Wilson, 1987) because they are convinced that the forces shaping historical fertility trends are inadequately taken into account. Such approaches are seen as tools for analysing fertility differentials at a given moment in time (or as immediate responses to a change in the economic context of the family) rather than for investigating medium- or long-term trends.

Birth control and family planning programmes

No genuinely new fertility “theories” will be found in this section. Some researchers have even asserted that demographers seriously compromised their position by working with family planning propagandists, straying beyond the field of “scientific” demography. But the topic was such a compelling issue for at least two decades that its main theoretical foundations deserve to be examined here. In the early 1950s, a longitudinal study, known as the Khanna Study, was organized in the Punjab region of India with the aim of offering contraception to the population, monitoring its acceptance and measuring its effect on birth rates. When the programme ended eight years later, the final results were disappointing: despite a certain level of acceptance, the effect of contraception on birth rates was negligible. However, upon returning to the same villages in 1969, the researchers discovered that birth rates had finally started falling in

the years following their departure, without any major shift in contraceptive use (Wyon and Gordon, 1971). In other words, fertility change is not necessarily correlated with contraceptive practice.

In the 1960s, at a time of record population growth (it peaked in 1965), a number of international agencies launched programmes to control fertility in developing countries, predicated on the finding that the observed number of children per family did not correspond to the “desired” number reported by women. Indeed, various knowledge, attitudes and practices (KAP) surveys had revealed limited knowledge of contraceptive methods, even more limited levels of use, and a desired number of children that was below the actual number. It was thus deduced that simply by offering effective birth control methods to the couples concerned, they would then use contraception to limit their family size.⁽⁹⁾ But as we have already seen with the text by Ansley Coale mentioned earlier, things were not so simple, and the about-face of John D. Rockefeller III, one of family planning’s most vigorous propagandists (and largest international donors) was quite spectacular. At the United Nations Bucharest Conference in 1974, World Population Year, he declared:

Yet the evidence has been mounting, particularly in the past decade, to indicate that family planning alone is not adequate. It turns out that women who avail themselves of family planning are chiefly those who already have had many children. [...] I now strongly believe that the only viable course is to place population policy solidly within the context of general economic and social development, in such a manner that it will be accepted at the highest levels of government and adequately supported. [...] The motivation for family planning is best stimulated by hope that living conditions and opportunities in general will improve. (Rockefeller, 1978)

This is followed by a plea for a change in our vision of economic growth and the need to limit this growth in a context of unequally distributed, finite resources. So perhaps demographers did not strive in vain after all... And the international programme of WFS surveys, launched some months earlier, could now be built upon a broader base than was the case for earlier surveys.

Two texts (Freedman, 1966*; Westoff and Bankolé, 1996*) illustrate the progress achieved over three decades. Ronald Freedman’s text (1966*) is a closing speech made at one of the first international conferences on family planning programmes. Noting initial successes in South Korea, Taiwan, Singapore and Hong Kong, and promising signs in larger countries (Pakistan, India, Turkey and Tunisia), the author cautiously concludes that good results can be obtained in small populations, and perhaps in substantial segments of larger populations, provided that certain favourable conditions are met: declining (infant) mortality, ongoing social development, a desire among couples to limit family size. There is much reliance on existing social networks to promote the spread of contraception, on the presence of effective social workers and on the

(9) For a general presentation of the KAP surveys, see Mauldin (1966).

efficient management of family planning programmes. Freedman's optimism was generally borne out by the fertility declines observed in the cited countries, sometimes occurring somewhat later than initially forecast. Moreover, the contraceptive miracle at that time was the intrauterine device (IUD), upon which great hopes were pinned. It has in fact become the world's most widely used contraceptive method (14% of users among women of childbearing age living with a partner in 2011), ahead of the pill (12% along with other hormonal methods), the condom (8%) and traditional methods (7%), and is surpassed only by female sterilization (19%).⁽¹⁰⁾

In light of Freedman's list of conditions, one may well wonder how much of the fertility decline is actually attributable to a given programme. We have seen the example of a "successful" programme which only produced a decrease in fertility ... after it was halted (the Khanna Study), and Rockefeller's U-turn in the mid-1970s is easy to understand.

The article by Charles Westoff and Akinrinola Bankole (1996*) revisits the question of demand for family planning by looking more deeply at the notion of unmet need for contraception. Remember that the initial goal of family planning programmes was to narrow the gap between wanted births and actual births. Efforts were thus made to assess the proportion of women who reported not wanting any more children (or not wanting any more for the moment) in demographic surveys, but who were not using any contraceptive method. This overlooked the fact that some of them may have been sterile, pregnant or in post-partum amenorrhoea. John Bongaarts (1991) devised a method to take account of these situations. Westoff and Bankole go further, taking account, for example, of women in the above group who report not wanting to use contraception. Likewise, women who use ineffective methods (or use contraception ineffectively), and who might wish to switch to a new method, should also be considered. All these refinements seek to capture the concept of unmet needs with the aim of measuring the needs that have a real chance of being met by adhering to a programme.

The pertinence of the concept of desired fertility is another debate subjacent to the idea of family planning. As already mentioned, the question is asked in all demographic surveys, and the answers serve as input both for economic models and for measures of unmet needs. In 1977, Westoff and Ryder had shown that the predictive value of expressed intentions was low, at individual level especially. When a childless married woman says she wants two children, the probability that she will actually have two is small. This is partly because intentions can change over time, and in the light of past experience (Lee, 1980). The predictive value is much greater at collective level, however, since "inaccuracies" partially cancel each other out (see, for example, Liefbroer, 2009 and the entire issue of the *European Journal of Population* devoted to this topic). Moreover, among the many variables that can be used to analyse the

(10) United Nations, *World Contraceptive Use 2011* (wallchart).

value of a fertility prediction (marital status, duration of union, level of education, income, religion, etc.), the reported intention is still the best individual predictor (Testa and Toulemon, 2006).

Gender approaches

It is often said that “reproduction is a woman’s affair”. This is indeed the case, provided that women are truly free to decide whether to have a child or not, and can obtain the contraception they need. Gender studies have sought to place women’s status and agency at the centre of the debate. The article by Karen O. Mason (1987*) that focuses on developing countries, like that of Constantina Safiliou-Rothschild (1978) before her, starts out from a somewhat paradoxical position, whereby women’s changing status, or role, can only be understood in relation to that of men. In line with the approach of Bulatao-Lee, Mason reviews the intermediate fertility determinants potentially influenced by women’s social position. She concludes that in terms of the supply of children, it is age at marriage (often outside women’s personal control) which plays the key role. On the demand side, it is the various dimensions of the value of children that count most. Not to forget the growing “psychic costs” of children when they disrupt the conjugal relationship, and the question of how decisions relative to contraception are shared within the couple. Overall, Mason believes that gender inequalities per se have only a limited impact on fertility and prefers to emphasize the effect of social context. Again in the context of developing countries, Constantina Safiliou-Rothschild (1978), for her part, considers that any substantive future change is conditional upon a simultaneous rise in both male and female levels of education.

The problem is of a different nature in industrialized countries where fertility is already low. As highlighted earlier, in an increasingly individualistic society, the value and influence of the family are becoming weaker. Yet the roles of men and women are not necessarily evolving at the same pace. And despite their massive presence in the workforce, women’s employment often remains secondary within the couple, and fragmentary on the labour market. For Eva Bernhardt (1988*) women are “supplementary workers”. She sees room for optimism in the fact that the changes in behaviour observed today will ultimately produce a shift in values towards a new balance that favours women.

Peter McDonald (2000) rightly points out that gender relations and positions may evolve differently at individual and family levels. A society may both promote gender equality where individual freedom is at stake (notably in the economic and political spheres), while maintaining forms of support for marriage and the family (or tolerating their modes of functioning) which do nothing to reduce gender inequality. McDonald uses the term “gender equity” and considers that greater equity within the family, with the woman being truly free to choose the number of children she has, is a precondition for the transition from high to low fertility. However, he believes that persistent inequity within the family

in a context of greater equality in other areas may cause women to finally have fewer children than they would have wished. For McDonald, this is one reason for the very low fertility in Europe.

Women's presence in the labour force is, of course, a central issue. It featured in many earlier approaches, be it in anthropology (access to paid employment changes women's status, increases their autonomy and changes the direction of wealth flows in families), in the institutional environment (with women's greater access to new jobs in the secondary sector), or, of course, in economics, notably with the analysis of how available time is allocated within the household. More generally, employment status, along with educational level and social position, is included among the socioeconomic status variables presented in all analyses. It is widely agreed that working outside the home limits the amount of time available for childcare, and may therefore reduce the desired number of children. This is a key factor underlying both the changes in fertility that affect societies as their economies develop and the lengthening of the childbearing period. However, it is reasonable to believe that solutions exist for reconciling work and family life, and that their implementation might counteract the negative effect of women's increased labour force participation (see, for example, the arguments of Thévenon and Luci (2012) on the positive effects of family policies).

Other dimensions

Let us begin this list of additional themes with a question about the possible role of biological parameters. It is abundantly clear from the analyses presented above that fertility changes in recent decades have been driven by behavioural determinants, even if the concept of natural fertility includes physiological factors. The books by Gray et al. (1993) and Wood (1994) have provided an overview of knowledge in this area. Demographers of the past looked at the role of biology, notably Corrado Gini (1926), who attributed the lengthening interval between marriage and first birth to a decrease in fecundity or the "generative instinct", but his analyses were soon discredited by the work of scholars such as Landry. More recently, attention was drawn to the role of nutrition. In the 1950s, Josué de Castro achieved a degree of success with his thesis whereby malnutrition whetted the sexual appetite, pushing up the fertility of the populations concerned. However, this hypothesis did not stand up to scrutiny, and soon it was the opposite thesis that prevailed, namely that under-nutrition lowers fecundity via its influence on the hormonal system controlling the female reproductive system. This was borne out by examples of severe malnutrition (famines, concentration camps, etc.), extreme individual diets or weight loss due to excessive physical activity (Frisch, 1975). But over the long term, the effect remains limited (for an overview of the question, see Mosley, 1977). More recently, fears of a possible decline in male reproductive capacity have been expressed (see, for example, Jegou et al., 2009), though the purported decrease in fecundability does not appear to be having any significant

effect on fertility. Sociobiological theories also deserve a mention, as variants of the anthropological approaches (Wilson, 1975); here, group rationality is maximized at the expense of the individual, who must adapt or perish.

We have also mentioned on several occasions the possible effect of mortality decline, infant mortality especially, which has sometimes been seen – despite the counter-example of the Princeton European survey – as a major, even essential, determinant of fertility decline. The situation is somewhat more complex than it might appear. Indeed, infant mortality is positively linked to fertility in several ways, notably via a physiological effect; the cessation of breastfeeding produces a rapid return to ovulation and a substitution effect whereby couples may seek to replace a child lost in infancy. Dov Friedlander (1977) has shown that the impact of a mortality decline depends above all on the economic conditions in which it occurs; it is not automatically associated with a decrease in fertility.

It is always tempting to believe that changes in mentalities or behaviours spread from person to person, by contagion between individuals or groups. This has already been touched upon several times, with respect to the acceptability of family planning, for example. These diffusion processes have been analysed by numerous researchers, starting with Everett Rogers (1962), often on a geographical basis, but also by looking at the many available communication channels (Retherford and Palmore, 1983). Rosero-Bixby and Casterline (1993) adopt a contrasting viewpoint, modelling transitions between three possible “states”: a natural state of uncontrolled fertility, a state of latent demand (demand for contraception exists, but is not yet expressed), and a birth control state. The parameters governing the rate of transition between states may be purely exogenous (introduction of a birth control policy, for example), or partly endogenous, due to internal processes of contagion. There is a close resemblance here with the epidemiological models of communicable disease propagation.

The theory of a “Malthusianism of poverty” gained a certain foothold in Latin America in the 1980s and 1990s. Fertility dropped quite sharply in several Latin American countries at that time, and it was often the most disadvantaged populations that led the way. Certain researchers in these countries opted for a neo-Marxist interpretation of this phenomenon, seeing birth control as a response to rising poverty (see Cosío-Zavala, 2001; for Brazil: Merrick and Berquo, 1983; for Argentina, Torrado, 1993). Unfortunately, this approach has not been extensively formalized, and has not given rise to theoretical developments outside Latin America.

Fertility as an endogenous variable

While fertility (along with mortality and migration) determines the rate of population change, it is plausible to imagine that population change, in turn, influences fertility. After all, this was the foundation of the Malthusian

discourse. It is because the population is growing too fast that individuals are obliged to limit their number of offspring. If the “response” is effective, we thus have a self-regulating mechanism to control population size via fertility. Fertility is rarely treated in this manner as an endogenous variable in a model of population change. It was in this way that Jacques Dupâquier (1972) interpreted the homeostatic equilibrium that prevailed in pre-industrial France, with a population – almost entirely rural – that appeared to remain more or less stable over the long term. The idea was that in a context where young men could not marry unless they owned property or had access to land, age at marriage served as a variable of adjustment on mortality. During severe mortality crises (quite frequent in the seventeenth and eighteenth centuries), more land and farming jobs became available, enabling young men to become independent more quickly and to marry at a younger age. They went on to have children earlier than under a “normal” regime, and could have a larger number, thus making up for the excess deaths linked to the mortality crisis. Massimo Livi-Bacci confirmed this for Tuscany in Italy, through a detailed study of mortality crises in the region from 1560 to 1840 (Livi-Bacci, 1978).

The Malthusian hypothesis was also illustrated in the first (and as yet only) overall model of the “world ecosystem” constructed by Jay Forrester for the Club of Rome in the early 1970s (Meadows et al., 1972). The interacting variables are food production, resource depletion (energy, metals), industrialization, environmental pollution and world population. A large number of intermediate variables (more than 80) are used in the sub-models for the five main variables. In the demographic sub-model, for example, fertility depends on the desired number of children (itself determined by life expectancy and standard of living) and the effectiveness of contraception (which depends on the work of the service sector responsible for disseminating information on family planning). Under the “standard run” scenario, the population grows to 12 billion then collapses back to 6 billion when the shortage of food and natural resources pushes mortality up to levels that cannot be offset by the simultaneous upturn in fertility. As we know, the model was strongly criticized and has not been taken much further because the numerous causal relations it involved were very difficult to summarize in the form of simple equations.

Richard Easterlin’s 1978 hypothesis was more convincing. In its initial form, his approach is based on the notion of relative income, with comparison between parents and children, or between various age groups within the population. In its more limited, and strictly demographic, formulation, the model assumes that fertility depends on the population age structure, which is determined (in part) by previous fertility trends. The idea is that couples determine their fertility according to the difficulties encountered when they first enter the labour market: if many older workers are retiring (because the top of the population pyramid is quite broad in relation to the 20-25 age group), labour market entry will be easier and more auspicious, encouraging young

people to marry and have children at a young age; the reverse will occur if retirees are few in number. The model is very simple to run as it simply involves – in this purely demographic version – comparing the size of the cohorts aged 35-64 with that of the cohorts aged 15-34. Easterlin's 2004 article (Easterlin, 2004*) is a condensed version of his 1978 paper, which considered wide-ranging socioeconomic variables such as education, prices and unemployment. The hypothesis works well for the period 1930-1975 in a set of countries, including the United States and France. One of the major strengths of this model is its predictive dimension, since the size of the cohorts aged 15-64 is largely determined by the numbers of births 15-64 years previously. Under this model, the fertility decline observed between 1960 and 1975-1980 should have been followed by an upturn lasting at least 15 years. This was not the case, however (although fertility did level off in several countries), and Easterlin's hypothesis was discredited by many, or considered by others to only partially capture reality.

In fact, the above model is cyclical in nature, and attempts were made to exploit this property. Ronald Lee (1974) studied both formally and empirically whether such cycles actually exist. He concluded that the elasticity of the demographic response to a change in the economic variable must be very strong for a true cycle to become established. Diane Macunovitch (2000) pursued these investigations.

Researchers have also studied the risks of an implosion of the demographic system under a low fertility regime. If a very small family becomes the norm among a majority of the population, does this mean that future generations will have no alternative model to follow, especially in a context where population ageing gives more power to the oldest fraction of the population, the least concerned by policies to encourage childbearing (Lutz et al., 2005)?

Conclusion

There are many further avenues to follow, sometimes extending beyond the frontiers of demography. We could mention, for example, the influence of Bourdieu (1994) on the way in which reproductive strategies are imposed and constructed, or the theorists of social change such as Calvin Goldscheider (1971), and of cultural change, such as Franck Lorimer (1954) or Eugene Hammel (1990). This article does not aim to be encyclopaedic, but simply to introduce and place in context a certain number of reference articles on the topic in hand. Readers may refer to numerous other overviews of the question. We have already cited the book edited by Rodolfo Bulatao and Ron Lee (1983), the contributions of Warren Robinson and Sarah Harbison (1980), of George Simmons (1985), Samuel Preston (1986) and Dick Van de Kaa (1996). Other studies worthy of mention include the books edited by Charlotte Höhn and Rainer Mackensen (1982), for which I wrote the Introduction, along with those

of David Coleman and Roger Schofield (1986) or of Dominique Tabutin et. al. (1999), notably the contribution by Jean Poirier and Victor Piché (1999), the monograph by Moni Nag (1962), and Bart de Bruijn's chapter (2006) in the *Treatise in Population* edited by Graziella Caselli, Jacques Vallin and Guillaume Wunsch.

But as this overview reaches its conclusion, our final observation must be that we still have no universally accepted explanation for why the Western post-war baby boom occurred, and why it ended. Nor do we have any clear idea of how fertility will evolve in countries where it is currently below replacement level. *Homo demographicus* is yet to be born...

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Henri LERIDON • THE DEVELOPMENT OF FERTILITY THEORIES: A MULTIDISCIPLINARY ENDEAVOUR

This article retraces the history of fertility theories as illustrated by 23 founding texts grouped together in a single volume (Leridon, 2014, *Les théories de la fécondité*, INED). Until recent times, no reliable statistics were available for the analysis of fertility behaviours, which were treated rather as a question of philosophy, morals, political science or religion. It was not until the birth of the social sciences in the nineteenth century that the first real theories of fertility started to emerge. At that time, the demographic transition in Europe and the accompanying social and economic transformations gave rise to new demographic behaviours for which a theoretical framework was needed. Many new disciplines were brought into play, including anthropology, sociology, economics, political science and psychology. Paradoxically, demographers were slow to develop theoretical approaches, doubtless because the discipline first made its name as a quantitative science. Indeed, no overarching, generally acknowledged theory of fertility has yet been developed. These different approaches are illustrated through a series of pioneering texts. They present theories drawn from a wide range of disciplines and include analyses from the perspectives of birth control and gender.

Henri LERIDON • THÉORIES DE LA FÉCONDITÉ : DES DÉMOGRAPHES SOUS INFLUENCE ?

L'objectif de cet article est de présenter l'évolution des théories de la fécondité à travers 23 textes fondateurs regroupés dans un manuel (Leridon, 2014, *Les théories de la fécondité*, Ined). Longtemps, la réflexion sur les comportements de fécondité ne put s'appuyer sur des données statistiques fiables : elle relevait plutôt de la philosophie, de la morale, de la science politique ou de la religion. Il a fallu attendre la naissance des sciences sociales, au XIX^e siècle, pour que puissent apparaître de véritables théories de la fécondité. Durant cette période, la transition démographique des pays européens et les transformations sociales et économiques qui l'accompagnent induisent de nouveaux comportements démographiques et de ce fait de nouvelles formulations théoriques. Beaucoup de disciplines nouvelles éclairent ces analyses : l'anthropologie, la sociologie, l'économie, la science politique, la psychologie. Paradoxalement, la démographie a tardé à développer des approches théoriques, sans doute parce qu'elle s'est d'abord affirmée comme une science quantitative. Force est alors de constater qu'il n'existe pas aujourd'hui de théorie de la fécondité qui fasse consensus. Ces différentes approches sont présentées à travers une sélection de textes de précurseurs, de théories de disciplines diverses, d'analyses sur la régulation des naissances et des approches de genre.

Henri LERIDON • TEORÍAS DE LA FECUNDIDAD: ¿DEMÓGRAFOS BAJO INFLUENCIA?

El objetivo de este artículo es presentar la evolución de las teorías de la fecundidad a través de 23 textos fundadores reunidos en un manual (Leridon, 2014, *Les théories de la fécondité*, Ined). Durante mucho tiempo, la reflexión sobre los comportamientos de fecundidad no pudo apoyarse sobre datos estadísticos fiables, y se situaba más bien en el marco de la filosofía, de la moral, de la ciencia política o de la religión. Ha habido que esperar el nacimiento de las ciencias sociales en el siglo XIX para que puedan aparecer verdaderas teorías de la fecundidad. Durante este periodo, la transición demográfica de los países europeos y las transformaciones sociales y económicas concomitantes inducen nuevos comportamientos demográficos y, en consecuencia, nuevas formulaciones teóricas. Muchas de las nuevas disciplinas iluminan estos análisis: la antropología, la sociología, la economía, la ciencia política, la psicología. Paradójicamente, la demografía ha tardado en desarrollar enfoques teóricos, probablemente porque se ha afirmado al principio como una ciencia cuantitativa. Hay que constatar que no existe actualmente una teoría de la fecundidad que recoja un acuerdo unánime. Estos diferentes enfoques son presentados a través una selección de textos de precursores, de teorías diversas de disciplinas diversas, de análisis sobre la regulación de los nacimientos y de enfoques de género.

Keywords: Theories, fertility, economics, sociology, anthropology.

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