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The Demographic Transition Revisited as a Global Process[1]

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ABSTRACT

With dramatic declines in fertility taking place throughout the world, it is increasingly important to understand the demographic transition as a global process. While this universality was a cornerstone of classic transition theories, for many decades it was largely neglected by experts because fertility in the developing world did not seem to follow the expected pattern. When comparing earlier and more recent transition experiences, important similarities and disparities can be seen. Everywhere mortality decline appears to have played a central role for fertility decline. The differences in the timing of the response of fertility to mortality decline, with very small gaps historically and prolonged ones in more recent transitions, plus the much more rapid decline in vital rates in many developing countries, constitute an important challenge to any general explanation of the process. The specific characteristics of recent transitions have led to decades of higher population growth rates, and promise to give way to much more rapid dynamics of population ageing in many countries. This may limit the ability of newcomers to take full advantage of the demographic transition for the social and economic modernisation of their societies. Copyright © 2004 John Wiley & Sons, Ltd.

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INTRODUCTION

It is often held that the demographic transition in Europe was a unique historical event, one quite distinct from the more recent process of fertility decline under way in much of the world, and that there is in fact very little to be learned for the developing world from the 'historical' experience of fertility transition. This attitude has not always been so predominant and, in its origins and development, demographic transition theory was supposed to help us explain fertility change in the light of historical (European) experience (Notestein, 1945). Yet persistently high fertility in developing countries during the 1950s and 1960s appeared to debunk much of the theory, leading many scholars to abandon it as effectively of little use for understanding the world today.

This negative view warrants reassessment in the light of the extremely intense process of fertility and mortality decline under way nearly everywhere in the world. By the middle years of the twentieth century, mortality was declining rapidly everywhere, and over the past 40 years rapid fertility decline has ended up affecting the vast majority of the world's population. The current reductions in vital rates in the developing world appear to have many points in common with the demographic transition in Europe, although important differences emerge as well. The process of transition in Europe has much to teach us about the recent past and present of the demographic transitions under way in Africa, America and Asia, and also gives us a plausible blueprint for the future.

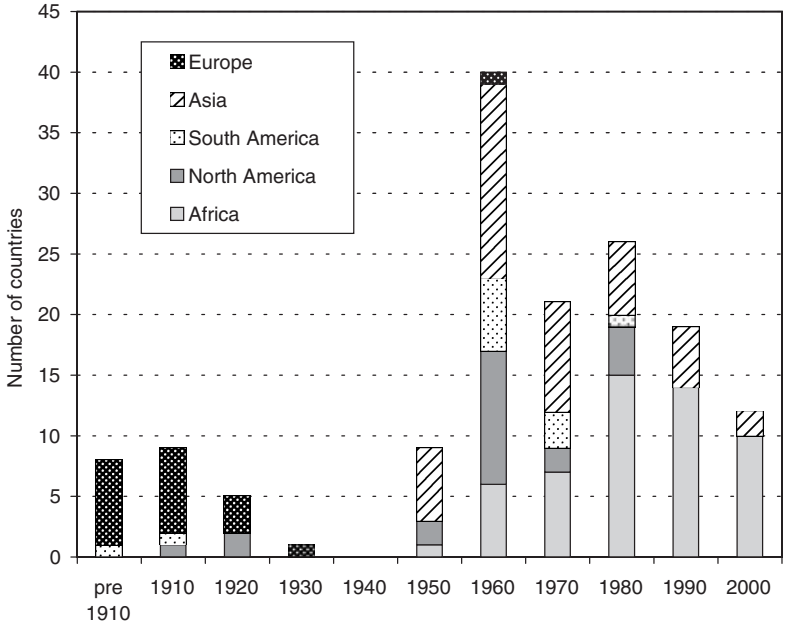

Figure 1. Date of onset of fertility transition, by country and continent.

In a period of approximately 100 years, decisive demographic change began the world over. Figure 1 attempts to track a process in which two clear phases of fertility transition can be seen. In an initial one, stretching from the latter part of the nineteenth century and lasting until about 1930, mostly European populations took the lead in implementing different measures of fertility control. During the second half of the century, fertility decline spread nearly everywhere in the world, with very few exceptions.[2] During the demographic transition in Europe, the onset of fertility change in a majority of countries was spread out over four decades, and over more than 60 years in the different provinces of Europe (Coale and Treadway, 1986: 38). Once it began in the rest of the world, fertility decline spread at an even faster pace. History is filled with examples of processes which today are considered coherent, unified historical processes, but which took far more than 100 years to consolidate. The demographic transition can and should be considered one of these processes with two or more fairly clearly identifiable stages. These stages have specific characteristics, but they do not negate the common elements affecting the entire process. In our enquiry, we will find justification for many of the basic tenets of demographic transition theory which, for want of a proper perspective, ran aground on the shoals of recalcitrant empirical realities sometime during the 1950s, 1960s and 1970s.

ESTIMATING BASIC PARAMETERS OF DEMOGRAPHIC TRANSITIONS

Our ability to understand the empirical contours of the demographic transition is severely constrained by the availability of requisite data. Here, great disparities continue to exist by country and by continent. A number of European countries, plus a few nations outside Europe, have time series for a limited number of indicators stretching back to the early decades of the twentieth century, and in some cases they exist for considerably longer periods of time. Most of these series make use of civil registration systems, and those that begin earlier are based on parish registers.[3] On this point, Europe, and especially the northern parts of the continent, enjoys a clear-cut advantage over the rest of the world, where in many cases there are no vital data available at all before the central decades of the twentieth century and even then they are flawed. Our

understanding of changes in vital rates in much of the world before the mid-twentieth century will be tentative at very best.

Since the 1950s, the United Nations has made a great effort to compile data for a wide range of countries which have been published in the *Demographic Yearbook*. Recently these data have been brought together in an extremely useful commemorative volume and CD Rom spanning the entire second half of the century (United Nations Statistics Division, 2000). This volume contains much of the more recent data that will be used in this paper. Even so, in many developing countries basic data have continued to be flawed until very recently. Where this is the case, use has been made of the estimates of the Population Division of the United Nations.[4] In any case, the reliability of vital statistics in much of the world continues to be far from perfect, and the work of the United Nations in gathering data is essential to our understanding of demographic trends in the world.[5] The countries used for this study are shown in Appendix Table A.

There are only a limited number of demographic indicators available for a large number of countries over a significant period of time. The indicators used are crude birth (CBR) and death (CDR) rates, the rate of natural increase (CBR – CDR) and infant mortality rates (IMR). More sophisticated indicators would have been desirable, but their use would have drastically restricted the number of countries and the time spans included in this paper. Among the problems affecting the measures used here, the effects of age structure on crude rates cause considerable uncertainty, especially in more recent years, and using an indicator of total fertility instead of one of marital fertility makes pinpointing the existence of conscious fertility control much more difficult. In any case, these indicators will enable us to chart the basic changes over time of mortality and fertility fairly accurately.

A database was created with quinquennial values of these indicators. Countries were grouped by the timing of the onset of fertility decline rather than by continent. This is not the only strategy possible, but it is the most straightforward one, especially considering the degree of heterogeneity holding in different continents and the fact that in many cases mortality decline appears to have already begun long before the data first become available. When fertility decline also appears to have begun before data become available, as is the case with many parts of the former Soviet Union, these countries were not used. The database includes 145 countries which were organised into the following categories. The *forerunners* are those countries where the onset of fertility decline began before 1935. For the *followers* it began between 1950 and 1964, for the *trailers* it took place between 1965 and 1979, and for the *latecomers* fertility decline only began after 1980.[6] The rates included in the database for each of these categories are simply the unweighted means of the available values.[7]

Pinpointing the date of the initial decline can be tricky and involves a certain degree of arbitrariness. For the purposes of this paper, it has been set at the beginning of the first quinquennium after a peak, where fertility declines by at least 8% over two quinquennia and never increases again to levels approximating the original take-off point.[8] In many developing countries, this is not a difficult decision to make. In others, however, especially those with very long time series and relatively early transitions, both fertility and mortality tend to float gradually downwards. Here, we have preferred to choose the moment in which the slope of decline intensified rather than its original starting point. One of the issues that interests us in this paper is the existence of conscious fertility control, yet gradual declines in overall fertility can be the result of nuptiality restrictions and other factors as well.

In a number of European countries, where particularly long time series are available, it is apparent that mortality and occasionally fertility were declining more or less gradually as early as the latter part of the eighteenth century. This process had important implications for these countries, although here it has not been considered, at least in a formal sense, as a part of the demographic transition. In some ways it can be said that in these countries (England, Sweden, France, etc.) by the early years of the twentieth century the demographic transition had been under way for over a century, characterised first by gradual declines in vital rates and subsequently by far more abrupt ones (Wrigley, 1985). With the exception of France, most of the earlier gradual declines in fertility appear to have been achieved mainly by means of progressively restricted marriage. During the subsequent stage of rapid

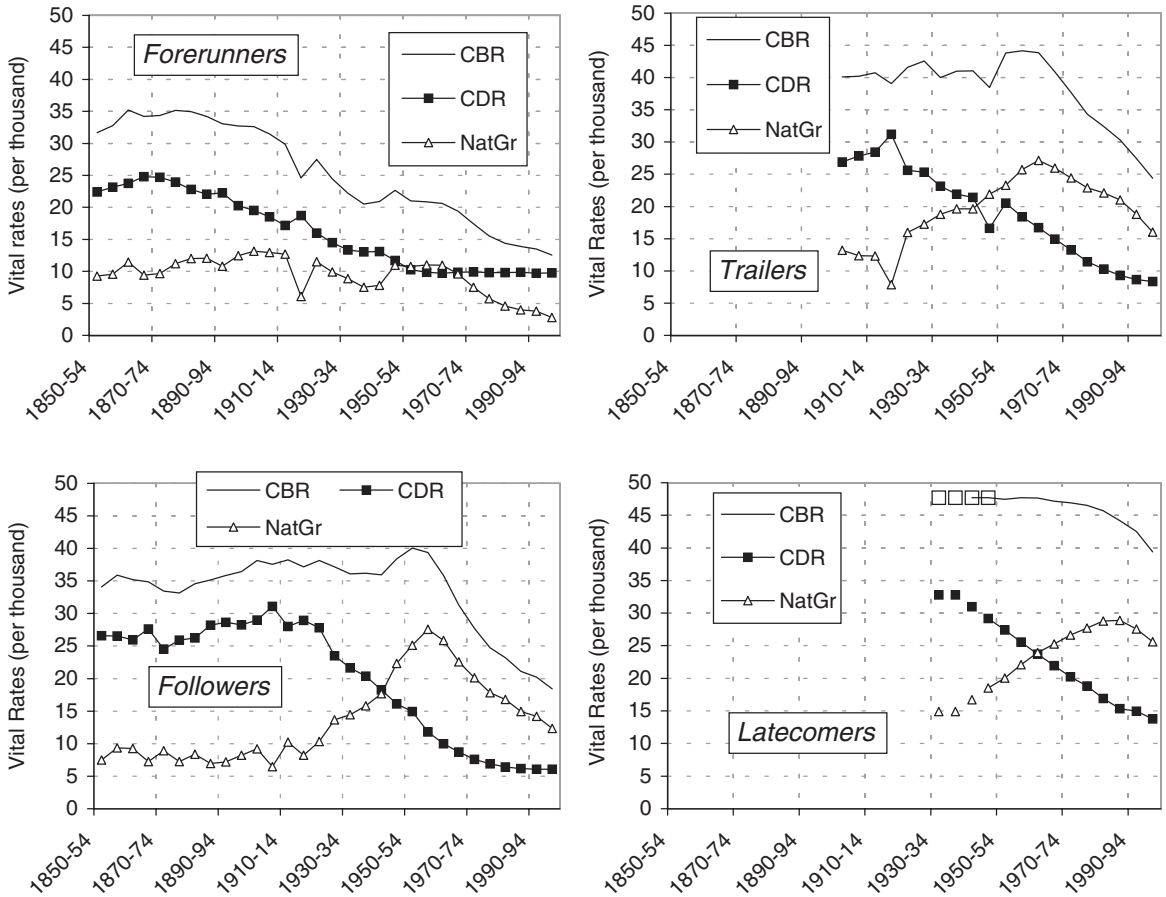

Figure 2. Profiles of demographic transition.

transition, fertility control within marriage became the key factor. We have chosen to focus on this last period of rapid transition which coincides with the onset of the demographic transition in other societies.

Figure 2 contains the basic profiles of the demographic transition for each of these groups. Among the *forerunners*, pre-transition crude birth rates (CBR) hover near 35 per thousand, with mortality some ten points lower. Very gradual fertility decline appeared during the later part of the nineteenth century, accelerating after 1910. Mortality decline started somewhat earlier, and it too was fairly gradual and constant, with the exception of the increase caused by the great influenza pandemic of 1918. During much of the period shown, natural growth remained fairly constant, between 10 and 13 per thousand, and only decreased sharply during times of crisis and then again after 1970. The *forerunners* are made up of 18 European and 6 American countries. Within this group interesting differences can be observed. Fertility was always considerably higher in the Americas than in Europe, both before and during the transition.[9] Moreover, in America the baby boom of the 1950s and 1960s was very important, with fertility once again approaching 30 per thousand, as opposed to Europe where any boom was only slightly perceptible. Pre-transitional mortality was also much higher in the Americas, although after the 1890s there was little difference. The great contrast, however, is in natural growth rates, which were always much higher in the Americas (15–18 per thousand) than in Europe (10–11). Despite the similarities in the onset and basic pattern of the demographic transition, among the *forerunners* intriguing differences emerge.[10]

Among the *followers*, pre-transition levels of crude birth rates ranged between 35 and 40 per thousand, and death rates between 25 and 30 per thousand. Mortality decline was first visible in the mid-1920s and continued unabated throughout the period under study. Fertility, on the other hand, continued unchanged until the decade of the 1950s when it too started its precipitous fall. The result of this delay was that natural growth rates surged well above 25 per thousand during the 1950s and early 1960s, before returning to much lower levels in more recent years. By the century's end, natural increase continued to be higher than during the pre-transitional period. It is worth noting that all of the countries in this group (see Appendix Table A) either show fairly strong European influences, ethnically (as in the case of those countries from North America) or as ruling powers both present and past, or, as in the case of Japan, India or Singapore, they occupy very special regional positions as well. Asian and African *followers* cannot be considered representative of the majority of the countries in these continents.

For the *trailers*, information is considerably less reliable before 1950, mainly because only 11 of the 47 countries in this group (most of them in the Americas) have time series beginning before 1945. Pre-transition birth rates were well above 40 per thousand and mortality was between 25 and 30 per thousand.[11] The mortality transition appears to have started during the 1930s, while fertility did not decline until around 1970, with the result that natural growth rates exceeded 25 per thousand during the 1960s and into the early 1970s. Much of the rest of Latin America plus numerous Asian and African countries make up this group. The only consistent difference between the *followers* and the *trailers* is to be found in the slightly earlier onset of fertility and mortality decline among the *followers*.

Among the *latecomers*, there are no data before 1950 and at that point mortality appears to have been already in the process of very rapid decline, although levels suggest that decline only began some time during the 1940s.[12] Fertility, on the other hand, did not begin to decline until the 1980s, and even then reductions cannot be considered truly intense until quite recently. Population growth rates were near 30 per thousand during the 1980s. The *latecomers* are almost entirely made up of African and Asian countries. Our understanding of the demographic transition among the latecomers is severely limited because in most of these countries it has only recently begun.

The basic profiles of the demographic transition in these different groups of countries are summarised in Table 1 and deserve careful scrutiny. Some of these will be mentioned here and discussed in greater detail in subsequent sections of this paper. Pre-decline levels of fertility and mortality appear to have been lower for those countries with earlier declines and higher for those with later transitions, although with mortality data, limitations make it difficult to be completely sure on this point. The gap between fertility and mortality decline is short for the *forerunners* (5–10 years), considerably longer for *followers* and *trailers* (30 years), and longest for *latecomers* (45 years). Once the decline in vital rates sets in, it appears to be much faster for those countries experiencing demographic transition more recently, and considerably slower for the *forerunners*. This disparity in the rates of decline is greater for fertility than for mortality, but is present everywhere. Finally, pre-transition natural growth rates do not appear to have varied substantially in countries where long-standing time series exist, although the gap in the onset of decline makes growth rates far lower among the *forerunners* than for other groups. These rates appear to be highest in those countries that have the highest pre-transition vital rates and start their transitions most recently. In fact, *followers* and *trailers* experienced natural rates of increase above 25 per thousand for about 15 years, as opposed to the *latecomers* where it was above those levels for more than 35 years. The disparities in growth rates existing at the end of the twentieth century merely reflect the positions occupied by each group of countries in their own particular demographic transitions.

SHARED CHARACTERISTICS AND DIVERGENT EXPERIENCES

Viewing the demographic transition as a global process vindicates a number of the basic postulates of demographic transition theory, while it calls others into question. There is much to be learned from recent transitions for understanding the general process, and developing nations continue to have much to learn from the experi-

Table 1. Summary indicators of demographic transition (by category).

Indicator	Forerunners	Followers	Trailers	Latecomers	Total
Onset fertility decline	1905	1950–60	1965–75	1980–2000	
Pre-decline birth rates	33–35	36–40	41–44	46–47	
CBR decline (in 10 years)	0.92	0.79	0.84	0.89	
CBR decline (in 20 years)	0.84	0.63	0.74	?	
Time to 50% decline	75	30	?	?	
Time to 10 point decline	30	15	15	?	
Onset of mortality decline (CDR)	1895	1925	1930	1945–50±	
Pre-decline death rates	22–25	26–29	27–30±	33–34±	
CDR decline (in 10 years)	0.88	0.78	0.90	0.87	
CDR decline (in 20 years)	0.77	0.66	0.66	0.74	
Time to 50% decline	50	30	30	45	
Time to 10 point decline	45	20	20	30	
Gap mortality–fertility decline	5–10	30	30	40–45±	
Onset of infant mortality decline	1895	1920	1935	?	
Pre-decline IMRs	170–190	200–220	180–220	180–220+	
IMR decline (in 10 years)	0.91	0.83	0.87	?	
IMR decline (in 20 years)	0.81	0.73	0.73	?	
Time to 50% decline	40	30	35	?	
Time to 50 point decline	30	25	25	?	
Natural growth rates: pre-decline	9–11	7–11	10–13	15	
Natural growth rates: peak	12–13	26–27	26–27	27–29	
Natural growth rates: 1995–2000	2.8	12.6	16.1	25.6	
Countries (by continent)	**24**	**17**	**48**	**56**	**145**
Africa	0	2	*11*	*39*	**52**
North America	*4*	*4*	*10*	*4*	**22**
South America	*2*	*1*	*8*	*1*	**12**
Asia	*0*	*10*	*18*	*12*	**40**
Europe	*18*	*0*	*1*	*0*	**19**

Note: Underlined estimates are only approximations. '?' means that no estimation is possible.

ence of the *forerunners*, who continue to be several decades ahead of them along the cycle of transition. The profiles of the demographic transition presented above have enough characteristics in common to be considered manifestations of a more general process. Yet the great differences also remind us of the heterogeneity of that very process. Addressing some of the issues raised by these data will occupy much of the rest of our paper.

Similarities

The most important shared characteristic is that everywhere, without exception, mortality decline appears to have preceded fertility decline in a clear-cut way. The role of the reduction of mortality as an essential starting point for the demographic transition is one of the fundamental premises of Notestein's formulation of the theory, and it appears to be thoroughly vindicated by this large set of national aggregate data (Notestein, 1945; Davis, 1963). Even so, in recent years mortality has received rather less than enthusiastic support from many researchers. Ambiguous and contradictory empirical results on this point led Francine van de Walle (1986: 233) in her summary chapter for the Princeton Fertility Project to state: 'At the end of this quest, we cannot report that the historical evidence confirms that the declines of infant mortality led to the decline in fertility.' This view is shared by many other authors (Livi Bacci, 1971: 121–4; 1977: 205–213; Coale, 1973; Knodel, 1974: 167–85; Lesthaeghe, 1977: 171–6; Haines, 1998). Other studies have suggested the existence of only very weak and often insignificant links between mortality and fertility, both in historical and contem-

porary contexts (Matthiessen and McCann, 1978: 62–7; Knodel, 1978; Palloni and Rafalimanana, 1999; Montgomery and Cohen, 1998; Rosero-Bixby, 1998). This apparent confusion can be seen in two recent overviews of transition and fertility theory published, ironically, in the same issue of *Population Studies* (1996). Kirk (1996: 379) concluded 'If there was a single or principal cause of fertility decline, it is reasonable to ascribe it to falls in mortality, which was a major cause of destabilization.'[13] Yet Dirk van de Kaa (1996: 409) countered: 'But Notestein's notion that a mortality reduction would automatically lead to a significant decline in fertility through a series of pre-existing social mechanisms, is untenable even though modelling confirms the plausibility of the hypothesized effects.'

This lack of conclusive evidence has constituted a veritable attack on demographic transition theory and has ended up undermining the importance of what can be considered to be the most basic mechanism leading to fertility change. It is our personal opinion that the results of much of the research pertaining to historical contexts have been misleading due to the demographic indicators, the administrative context or the time frames they have tended to use. In more recent years, there have been a substantial number of empirical studies pointing, often quite convincingly, to an important positive relationship between mortality and fertility, thus underlining its relevance for fertility change in historical contexts.[14] In a recent article following notions originally set out by Kingsley Davis (1963), Cleland (2001) has argued persuasively that large mortality declines are both a necessary and a sufficient stimulus for fertility decline in historical contexts and in the developing world. The results presented here offer strong empirical support for Cleland's ideas: nowhere in the world, independent of the time period, the levels of wealth or the degree of modernisation, has fertility change taken place without significant prior mortality change.

The general understanding of fertility change and of the demographic transition is often based on the following story. Before the transition, people preferred large families, probably because of perceived usefulness of children either on the family homestead, in later life as a source of old age insurance, or for cultural reasons. Modernising elements in society then led to changes in desired family size, with parents preferring ever lower numbers of children. The onset of fertility decline, at least when explained from the standpoint of ideational change, was a chapter in the triumph of human emancipation, rationality, secularisation, individualism or 'westernisation' (Caldwell, 1976; Lesthaeghe, 1983).

This story is attractive, yet it tends to founder on a reality that is present in both contemporary and historic contexts. Families were never large before the demographic transition. It is as though the proponents of these theories had never read the work of the legion of followers of Peter Laslett who have shown convincingly that the net sib set size in historical Europe was small before the demographic transition (Laslett, 1972: 83). The relatively low population growth rates prevailing in much of the world before the demographic transition are proof that families tended to be small, rather than large (Wilson and Airey, 1999).[15] That being the case, there is no reason for imputing to these populations some sort of perceived value for large families. The important number was the number of surviving children, not the number of children ever born, and that number was never high. The exception here corresponds to the two or three decades immediately prior to the fertility decline in the non-European world, when families were indeed very large. This was an entirely exceptional situation, however, as the low natural growth rates prior to the decline of mortality convincingly show.

With this as our starting point, then, mortality decline and the subsequent onset of fertility control takes on an entirely different meaning. Within this context, fertility control can be seen as an attempt to maintain family size, not to decrease it. The desire for substantially reducing family size is only typical of a far later stage of the demographic transition, often decades after the onset of fertility control. Here, even though mortality decline may end up strengthening the '. . . belief that humans can control and modify their environment and destinies' (Kirk, 1996: 369) and thus contribute profoundly to the changing of ideas so necessary for the modernisation of society, at a more immediate and perhaps much more powerful level, it upsets the careful demographic-economic equilibrium so important for the survival of families and of societies.

Nearly everywhere child mortality appears to have declined first and fastest, followed by infant

mortality and only later by mortality among adults. This is a largely undisputed characteristic of the mortality transition in Europe, although the lack of reliable data makes it more difficult to ascertain for countries in much of the developing world. Where we have been able to find the data, however, the existence of prior and more rapid decline of child mortality appears to receive some confirmation, thus suggesting the importance of including both infant and child mortality when looking at implications for fertility.[16] These gains started with inroads made against infectious disease and were achieved, at least in the initial stages, by means of relatively unsophisticated and therefore inexpensive technologies. While it is clear that mortality declined earlier in wealthier countries (e.g. in Europe) than it did in poorer ones (e.g. in Africa), it is also true that in any given period, countries with widely divergent levels of wealth and modernisation embarked on a process of significant mortality decline. In other words, the initial reductions in childhood mortality appear to have had relatively little to do with wealth and were achieved by means of rudimentary and inexpensive technologies, normally through often-informal maternal education and improved child care.

When fertility transition set in, it also did so in a wide constellation of social and economic contexts in a very short period of time. This happened in historical Europe and it has happened in much of the developing world where a wide variety of countries and social groups appear to have initiated patterns of conscious fertility control more or less simultaneously (Knodel and van de Walle, 1986: 399–400). In other words, the onset of fertility decline appears to have little to do with prevailing levels of wealth, the relative development of family planning programmes or many other of the standard indicators normally considered to be important for fertility limitation. The only aspect all countries have in common is the existence of a prior mortality change.

There is considerable evidence among the *forerunners* that fertility decline first began among relatively older women of reproductive age.[17] This has been related to parity-specific fertility control, whereby plausibly women were making an effort to compensate for greater numbers of surviving children (Coale, 1986: 8–30). For those countries whose fertility transition began more recently, marital fertility decline appears to have been spearheaded by couples with three or more surviving children, with the result of a progressive reduction in the span of childbearing (Cleland, 2001: 78). In other words, the pattern is not entirely unlike the one holding in historical Europe. This same pattern of change also appears in a small sample of countries where we have been able to generate age-specific general fertility rates during the initial years of fertility decline where older women appear to have been the spearheads of fertility decline, although they were not the only age group participating in the trend (Table 2).[18] In other words, in more recent fertility reductions, all women of reproductive age participated, although it was among older women that declines were greatest. Reductions in

Table 2. Relative rates of fertility decline, by age of mother.

Country	Onset of decline	Years	Mother's age							TFR rate of decline	Standard
			<20	20–24	25–29	30–34	35–39	40–44	45–49		
Costa Rica	1965	1960–4/1973	1.45	1.10	0.97	0.90	0.83	0.90	1.08	0.55	1.00
Peru	1975	1965–9/1980–4	1.16	1.08	1.01	1.00	0.86	0.96	0.77	0.67	1.00
Sri Lanka	1960	1953–6/1980–4	0.83	1.02	1.03	1.08	0.87	1.04	0.85	0.67	1.00
Tunisia	1965	1966/1985–9	0.58	0.95	1.15	1.20	0.96	0.72	0.54	0.57	1.00
Venezuela	1965	1980/1967	1.14	1.05	1.01	0.98	0.80	1.05	0.97	0.64	1.00
Chile	1960	1970/1960	1.35	1.18	1.01	0.83	0.84	0.93	0.71	0.68	1.00
Mexico	1970	1990/1973	1.60	1.40	1.17	0.89	0.69	0.46	0.21	0.54	1.00
Philippines	1955	1988/1979	1.02	1.02	1.06	1.00	0.94	0.83	0.95	0.79	1.00
Mean			1.13	1.09	1.05	0.98	0.85	0.87	0.77	0.64	1.00

Note: Rates of decline are relative to rate of decline of TFR (= 1.00). *Demographic Yearbook*: see text for further details.

general fertility rates may also have been influenced by changes in nuptiality and other factors, although conscious fertility control is likely to have been the most important factor conditioning change.

Emphasising the pre-eminence of prior mortality decline for any sort of conscious fertility control is, in a sense, a self-evident proposition. Why else, if not, would women have begun to control their fertility when pre-transitional natural population growth rates were never very high (Wilson and Airey, 1999)? Ultimately this is an economic argument because it suggests that the onset of fertility decline was the result of the deleterious economic effects on the well-being of households caused by surviving children, whose numbers increased at a far faster rate than access to resources or economic growth (Cleland, 2001: 80–83). From this standpoint, it is difficult not to be persuaded that the reduction of mortality was the single universal factor involved in all long-term fertility declines, the world over. Most of the other factors associated with fertility reduction, ranging from the existence of family planning programmes to the advent of new ideas or the role of women in society, appear to have contributed to a process that was unleashed by the earlier decline of mortality.

Divergences

Mortality decline was unquestionably a necessary stimulus for fertility decline, yet it is fair to ask whether or not it was also a sufficient one, as Kingsley Davis (1963) and many others have believed. If a sufficiently long view of world events is taken into account, fertility has ended up tumbling the world over, and so the answer must be yes (Mason, 1997: 449). Yet the path to fertility decline was by no means a uniform one either, as significant differences appear when comparing the experience of the *forerunners*, in particular those in Europe, with that of much of the rest of the world. These differences warrant our attention as well, and can be summed up in the following points: (1) The gap between the mortality and fertility decline was far shorter among the *forerunners* (5–10 years) than it was for later transitions (30–40 years). (2) As a result, natural growth rates hardly increased among the pioneering countries (8–12 per thousand) as opposed to the more recent transitions where it soared to 25–29 per thousand, thus posing an enormous obstacle for the development. (3) Once decline set in, it was far faster in more recent transitions than it was historically. These disparities are important ones and counsel us against excessive reductionism with regard to the global nature of the demographic transition.

The gap between initial mortality decline and the onset of fertility control in most countries outside of Europe led to population growth rates that far outpaced the capacity for economic growth, became a serious handicap for much of the world's development during a large part of the second half of the twentieth century and placed severe strain on demographic systems everywhere (Wilson and Airey, 1999). What had been an almost seamless reaction of fertility to mortality among the *forerunners*, turned into a prolonged period of insensitivity of fertility not only to mortality change but apparently to nearly every other measure implemented by national and international authorities. Even though there was a great deal of heterogeneity in most of the rest of the world in the way this period was experienced and just how long it lasted, the comparison with what happened among the *forerunners* is unquestionably the first and most important issue we need to address.

In order to explain this gap, at least in part, Cleland (2001: 61–2, 82–3) recently made use of evidence taken from social psychology (Montgomery, 1998) suggesting that individuals are generally not adept at perceiving demographic change or its implications at a familial or a societal level. This inability does not defray the real costs of raising children, which increase inexorably as family size grows. These costs, however, only build gradually and it may take some time before they trigger meaningful reaction. When this happens, different adaptive strategies, such as later marriage or the migration of children, can delay the use of birth control.

While this may have been the case for countries experiencing more recent fertility decline, in earlier demographic transitions the adjustment of fertility to mortality was nearly simultaneous and it occurred despite the fact that mortality changes were gradual when compared with those taking place several decades later in much of the rest of the world. The perception of demo-

graphic change was sharp and accurate in those historical populations. If not, adjustment would never have been so smooth. In Europe people must have been well aware of exactly how many surviving children maximised the household well-being and were not hesitant to do what was necessary to make sure that goal was met. If this was the case, it is plausible that perception took place within the household and followed very traditional and well-know pathways.

There is some reason to doubt the traditional belief among demographers that parity-specific fertility control was never present in pre-industrial populations (Knodel and van de Walle, 1986: 390, 400–7; Coale, 1986: 10–14, 21–22; Cleland and Wilson, 1987: 11–17), at least in most of Europe and with the exception of certain sub-populations (Demeny, 1968; Andorka, 1972, 1978; Livi Bacci, 1986). Within a general context of child hoarding (insurance) typical of high mortality regimes, it is plausible that families with positive experiences in child survival tended to adjust their fertility downwards in higher age groups, while if many children died, fertility remained high (Preston, 1978: 9–15; Palloni and Rafalimanana, 1999: 41–42). This situation would tend to escape notice when using Coale and Trussel's parameter *m*, designed to detect the existence of parity based fertility control, because it is ill-equipped to pick out the behaviour of specific groups in society, especially when their numerical importance is fairly limited (Coale, 1971; Coale and Trussel, 1974, 1975, 1978).

The consistently strong link between high mortality and high fertility appearing in both aggregate and family-level studies suggests the existence of a relationship of this nature (Knodel, 1988: 393–441, 1978; Wrigley *et al*., 1997: 477–92). Fertility was directly linked to infant mortality (through the cessation of breastfeeding following the death of a child), although the overall relationship could have been tied, at least in part, to conscious forms of parity-specific fertility control (Preston, 1978: 5–9). If we compare the age-specific marital fertility rates from a series of pre-industrial European populations with those of the classic natural fertility population, the Hutterites between 1921 and 1930, it is apparent that, with only the partial exception of Quebec, the most important differences for these European populations can be seen among women above 35 years of age (Table 3). A plausible explanation for

Table 3. Age-specific marital fertility in pre-transitional populations in comparison to Hutterite marital fertility.

Age specific marital fertility rates	Period	20–24	25–29	30–34	35–39	40–44	45–49
Hutterites	1921–30	550	502	447	406	222	61
Sweden	1871–80	475	390	333	266	156	25
England	1600–1824	411	366	313	246	130	21
Quebec (pioneers)	XVII	460	442	416	332	162	16
France (average 4 regions)	1690–1719	439	393	343	266	150	16
Spain (average 3 places)	XVII–XIX	467	401	371	260	139	25
German villages	1775–1799	455	426	376	301	155	25
Mean historical populations		451	403	359	278	149	21
Fertility rates relative to 20–24	**Period**	**20–24**	**25–29**	**30–34**	**35–39**	**40–44**	**45–49**
Hutterites	1921–30	1.00	0.91	0.81	0.74	0.40	0.11
Sweden	1871–80	1.00	0.82	0.70	0.56	0.33	0.05
England	1600–1824	1.00	0.89	0.76	0.60	0.32	0.05
Quebec (pioneers)	XVII	1.00	0.96	0.90	0.72	0.35	0.03
France (average 4 regions)	1690–1719	1.00	0.89	0.78	0.61	0.34	0.04
Spain (average 3 places)	XVII–XIX	1.00	0.86	0.79	0.56	0.30	0.05
German villages	1775–1799	1.00	0.94	0.83	0.66	0.34	0.05
Mean historical populations		1.00	0.89	0.80	0.62	0.33	0.05

Note on sources: Sweden: Sundbärg (1970: 121); England: Wrigley *et al*. (1997: 355); France: Henry (1978: 866); Henry (1972: 979); Henry and Houdaille (1973: 589) and Houdaille (1976: 359); Quebec: Charbonneau (1987: 88); Spain: Pérez Garcia (1979: Table 4.19); Reher (1990: 92), and unpublished data on Aranjuez; Germany: Knodel (1988: 259).

these results is that a proportion of women in these age groups in Europe were indeed limiting their fertility later in reproductive life. Results emerging from a recent research project on the Spanish town of Aranjuez appear to indicate that this sort of fertility limitation existed for families with positive childhood mortality experiences, as families with no childhood deaths for children parities 1–3 stopped childbearing earlier and had fewer total childbirths than families who had lost some of their earlier children.[19] More research is required on these issues, but the results shown here suggest that strategies of prenatal family limitation are not to be ruled out in historical Europe.[20] By implication, should they receive further validation, these findings would call into question important parts of our notion of natural fertility (Henry, 1961a, b; Knodel, 1983).

In Europe parents may have always been willing to curtail their reproductive potential when they saw that they had too many surviving children. There was an ideal family size in pre-industrial Europe and it was small, even though families were often not successful in achieving this goal. The great destabilising force in the reproductive equation ends up being the decisive change in mortality at young ages. Before the demographic transition, families with favourable childhood mortality experiences probably practised different forms of fertility limitation, yet high and sharply fluctuating childhood mortality kept the importance of this group low. With the onset of long-term mortality decline and its progressive stabilisation, the percentage of the population with favourable experiences was increasing and so was the percentage of the population exercising fertility control. In Europe, then, the onset of fertility control would not be a matter of implementing new behaviour patterns so much as one of the spread of well-known, traditional practices.

The existence of traditional prenatal fertility control practices in pre-industrial populations helps to explain the mechanics of the reaction of fertility to mortality decline. Nearly simultaneous mortality and fertility decline among the *forerunners* also suggests that in historical populations there were common underlying reasons for both mortality and fertility change. These make up the backbone of demographic transition theory. We are not in a position to judge whether or not certain types of parity-specific fertility limitation also existed in non-European pre-industrial societies. Even so, the lack of simultaneity suggests that traditional fertility constraints were not nearly so effective among them, and that the underlying reasons diverge from those holding in historical Europe. Delayed perceptions of changing mortality may explain part of this process, but clearly not all of it.

When comparing the demographic transitions in historical and in contemporary populations, it is important to understand that the original decline of mortality and fertility among the *forerunners*, dating from the latter part of the nineteenth and the initial years of the twentieth century, took place in a very different historical context than in the countries where mortality decline gathered intensity during the central decades of the twentieth century (1930–1960). The importance of scientific progress, medicine and especially that of international agency for the decline of mortality was quite different at mid-century than it was 50–70 years earlier. The original European mortality transformation was mainly the result of improved maternal education with respect to child-bearing and rearing practices, improving nutritional status and incipient public health measures spearheaded by governments at the behest of the medical and scientific establishment (Woods and Shelton, 1997; Reher, 2001). Many factors played an important role in this transformation. Changes in child feeding practices, the importance of personal and public hygiene, the resistance to certain diseases (whose prevalence, especially in the case of respiratory diseases, may well have increased during the period) because of improved nutritional levels, and more adequate care of sick children were all of crucial importance. Public health measures designed to clean up towns, improve housing conditions, purify water supplies and institutionalise certain types of illness also played a key role. It was a period when the medicalisation of life and health was only in its incipient stage, and the effect of medicine on health was largely indirect. Mortality decline was achieved with remarkably rudimentary technologies yet it was dramatic, with life expectancy rising by as much as 6 or 7 years per decade, and childhood mortality being reduced by over half in as few as two or three decades. In sum, these changes can be attributed to modernising elements present in these societies.

The major difference with the next wave of mortality decline, starting in the third and fourth decades of the twentieth century, is the role played by international agency, formal medicine and active governmental intervention in that process. The use of sulphonamides and antibiotics, large-scale immunisation programmes and the diffusion of medical technologies through health-care systems point to the predominant role of scientific research, international organisations and government in promoting the health of young children (Caldwell, 1986: 194–200). The 'classic' reasons for the decline of mortality among the *forerunners* of the demographic transition were less relevant. Instead of stemming from changes inherent in the transformation of society, the improvements in infant and child health were more the product of measures designed elsewhere, and aggressively and successfully promoted by governments (Riley, 2001: 104–6). In Europe and in countries with strongly Europeanised societies it had been basically an autochthonous process, the result of their development during the nineteenth and early twentieth centuries, whereas in much of the rest of the world it was much less so. Despite notable exceptions, dramatic health improvements, far more pronounced than among the *forerunners*, often began in the absence of the sort of profound social transformation taking place in Europe (Caldwell, 1986).

The original context of fertility decline in Europe was in part the result of that same process of modernisation that brought about improvements in mortality. They were two aspects of a deep social and ideational transformation that involved the industrialisation of society; the ascendance of salaried labour over inherited wealth; rapid urbanisation; dramatic increases in educational levels, especially of women; massive overseas and rural-to-urban migration flows; the increasing role of public institutions, especially governments, for individual life; the emergence of powerful secular social institutions (labour unions, for example): and, of course, the incipient democratisation of public life. These factors help explain both the reduction of mortality and the decline of fertility. Yet most of them were of relatively little significance when mortality first began to diminish in most of the countries experiencing more recent demographic transitions. The appropriate social context existed among the *forerunners* at the onset of the demographic transition, but not elsewhere. This helps explain why fertility ended up being less responsive to the challenges presented by improvements in child survival.

Beyond this, however, in much of the world mothers appear to have been less sensitive to the potentially negative effects of increasing numbers of surviving children than they were among the *forerunners*, or at least they were not sensitive in the same way.[21] For most of the *followers* and the *trailers*, the period of maximum population growth took place between 1945 and 1970 when economic growth was also fairly strong and opportunities for migration were abundant. These migratory movements were directed mainly towards the large cities, giving rise to a period of intense urbanisation and the breakneck growth of extremely large urban areas. If women were able to send their 'excess' children to the towns at fairly young ages or put them to work locally, the economic effects of increasing numbers of surviving children tended to be mitigated. Other social and culturally-determined mechanisms tending to limit the implications of increasing numbers of children also existed (Mason, 1997: 447–52; 2001; Skinner, 1997). Postnatal responses to excess fertility were common in all societies and they could delay the onset of fertility control within marriage (Davis, 1963). In sum, the relatively low cost of unwanted fertility and the lags of individual perception of mortality declines helped cushion the effects of rapidly increasing child survival levels (Bhat, 1998).

Mason (1997: 451–2) has explained the greater European readiness to use prenatal methods of fertility limitation in terms of a more limited range of morally acceptable forms of postnatal family limitation than elsewhere. While this may be the case, it does not fully solve the conundrum of why in Europe prenatal controls were so readily adopted in the face of relatively moderate improvements in child survival, when in much of the rest of the world far more dramatic increases in survivorship were not met with in a similar way until many decades after initial improvements in survival. Cultural differences regarding the role of the family and the economic autonomy of conjugal family units may have

also played an important role. It is interesting to note that all of the *forerunners*, practically without exception, were countries characterised historically by relatively late and restricted marriage patterns, as opposed to those where the gap between mortality and fertility decline was substantial, characterised by early and universal nuptiality, by joint family, clan and/or tribal-based forms of social organisation, or by significant proportions of fertility taking place outside of marriage. In none of these societies did marriage have the same range of meaning as it did in historical Europe or, for that matter, among the non-European but very 'Europeanised' *forerunners*.

For Malthus, populations that held their fertility in check by means of restricted nuptiality were examples of 'moral restraint'. For him, moral restraint formed a structural part of people's priorities and helped assure economic well-being further on in life. The 'European marriage pattern', characterised by relatively late and restricted nuptiality, was unique in the world (Hajnal, 1965, 1982). It was determined basically by the belief that a marriage could not take place unless a couple had the wherewithal to be economically independent (Smith, 1981: 596–602, 613–18). It is unquestionable that in Europe marriage patterns were strongly determined by both collective and individual economic realities. This was largely because these realities formed the basis of household decision-making. This led to relatively late and restricted marriage in many parts of Europe and helps explain many of the other economic and social differences separating historical Europe from much of the rest of the world.

There is also abundant evidence that in historical Europe there was a long tradition, very much embedded in people's awareness, of limiting fertility for the purposes of assuring economic well-being. Access to marriage is one example of this. There is also proof that the temporary limitation of fertility, either in times of duress or for reasons of seasonal labour practices or religious obligations, was practiced by many sectors of society. The increase in the incidence of child abandonment during times of economic hardship can be considered another type of economically motivated reproductive strategy (Reher, 1990: 143–8). The persistently positive relationship between economic fluctuations and fertility, both in the short run (Lee, 1981; Galloway, 1988; Bengtsson and Reher, 1998) and in the medium run (Wrigley and Schofield, 1981: 402–35; Lee, 1985; Reher and Ortega-Osona, 2000), proof positive of the existence of the preventive check predicted by Malthus, was due – at least in part – to conscious attempts by people to limit fertility, either within marriage, through it or by other means.[22] Parity-specific fertility control was another dimension of family limitation that may well have been used among certain low-mortality population subgroups.

The point here is that in historical Europe the links between economic conditions and reproduction had always been strong at a household level, and these societies were no strangers to certain forms of family limitation in the past. Given the much higher prevailing levels of mortality in many countries outside of Europe, the strictly demographic reasons for family formation probably took precedence over the economic ones. Among the *forerunners*, on the other hand, where pre-transitional mortality was much lower, it was relatively easy to meet reproductive goals, thus enabling later and more restricted marriage and overwhelmingly economic considerations to become normative behaviour for young couples. In other societies, the necessary balance between population and resources tended to be achieved within the larger kin group or the tribe or at a more general societal level, rather than directly through the conjugal family group, as it was, by and large, in Europe. In this way, the penalty for individual reproductive excess, exacerbated during the initial phases of the demographic transition by rapidly declining mortality, was less directly felt by mothers and their immediate families than it was among the *forerunners*. It is an example of how culturally-induced behavioural patterns within a context of traditionally high mortality and limited resources helped cushion the inexorable economic implications of increasing numbers of surviving children.

A final issue warrants our attention. When considering the different ways fertility reacted to initial mortality declines, it is important to bear in mind that the nature of contraception differed sharply in earlier and later fertility transitions. Among the *forerunners*, family limitation was

achieved primarily through abstinence or *coitus interruptus*, both of which were traditional, non-invasive methods of prenatal fertility control. Withdrawal may not have been terribly efficient, but both methods were well known and had been widely used by European populations to limit fertility. For more recent transitions, artificial contraception, sterilisation or abortion were the standard methods of birth control. All of them were and are invasive and many were met with considerable apprehension (Bogue, 1983). Besides, some of them involved a certain measure of daily accounting, a concept entirely foreign to many traditional societies. While efficient, their use required a basic change in values, considerable education or an overwhelming need. Succinctly stated, the new methods of contraception had a learning curve, whereas the traditional ones in Europe did not. This helps explain why it took so many years for family planning programmes to become truly effective. It also helps us understand why the first groups to implement fertility control in much of the world were educated city-dwellers.

After a gap of between 30 and 40 years, however, fertility decline finally set in. Significant social and educational changes had taken place during that period and in many ways, by the 1960s or 1970s, these societies were much more modern than they had been when mortality first began its fall. Ultimately, the fertility transition was unimaginable without both a prior decline of mortality and a profound social and cultural transformation. The gap suggests that, unlike Europe where the mothers who participated in the initial decline of mortality were also the ones initiating fertility limitation later in life, fertility control effectively skipped a generation. In other words, the women who first began controlling their fertility were probably those girls who had grown up in crowded households with decreasing living standards and who went on to experience lower than expected childhood mortality during the early part of their own reproductive lives. Even though fertility reduction was strongest among older age groups, thus indicating parity-specific limitation, it is clear that women of all ages participated in spreading birth control. The availability of contraceptive measures made little difference to women until they felt the need to use them and were ready to do so. But when that happened, these were used massively, efficiently limiting family size (Caldwell, 2001). The potent combination of pent-up demand plus the availability of effective birth control techniques helps explain why fertility decline has been so precipitous in those nations, much more so than among the pioneers of conscious fertility control.

As growing numbers of people were controlling their reproductive practices, the diffusion of their *successful* behaviour patterns (with fewer children born and fewer to die) to other sectors of society was probably a major reason why the demographic transition took hold so quickly (Carlsson, 1966; Cleland and Wilson, 1987; Watkins, 1990; Pollack and Watkins, 1993; Bongaarts and Watkins, 1996). Here social networks may have been a relevant vehicle for this process, although we know less than we should on this point. In both historical and contemporary contexts we can identify factors facilitating (or hindering) the diffusion of *successful* reproductive practices (language, education, geography, national economies, social structures, etc.), although showing empirically the specific ways they worked is a much more difficult proposition (Livi Bacci, 1993: 22–3). The diffusion of successful strategies of childcare and child-bearing was unquestionably a characteristic of all demographic transitions, past and present.

From a historical perspective, the gap between mortality and fertility decline does not seem to be so terribly long, although middle-term demographic and economic consequences of this delay were enormous. It led to extremely rapid demographic growth, created a significant oversupply of labour in much of the world, and proved to be an important hindrance for the economic development of these countries during much of the second half of the twentieth century.

DEMOGRAPHIC TRANSITIONS AND THEIR IMPLICATIONS FOR MODERN SOCIETIES

The process of demographic transition is not yet complete. In much of the world, it is just entering its second phase, with ever-more rapid declines in both mortality and fertility. Even among its *forerunners*, population changes implicit in the dynamics of all demographic transitions are still far from fully developed. By and large, these changes are affecting population age structures and the make-up of the labour force

Table 4. Incipient ageing in world populations (by continent).

Continent	Total population	%	Population age structure indicators		
			0–4/10–14	0–4/15–19	0–4/20–24
Africa	561,387,546	(10.4)	1.32	1.56	1.87
North America	454,611,744	(8.4)	1.03	1.07	1.15
South America	316,707,021	(5.9)	0.98	1.03	1.16
Asia	3,302,599,883	(61.3)	0.98	1.16	1.19
Europe	725,210,534	(13.5)	0.82	0.82	0.79
Oceania	27,254,891	(0.5)	1.12	1.16	1.10
World	5,387,771,619	(100.0)	1.02	1.16	1.21

Note: Based on census data and population estimates from the 1990s, normally around 1995 (*Demographic Yearbook*).

and will continue to do so in the future. The developing world has much to learn from the experiences of the early participants in the demographic transition, because they too will undergo similar changes in future decades.

A universal implication of all demographic transitions is a generalised process of ageing. Reductions in fertility initially, together with the increasing length of life among people of older ages at subsequent stages, lead to top-heavy population age structures and to ever-increasing proportions of people's life spent in what are considered 'elderly' age groups. In time, fertility decline also leads to a decrease in the supply of labour, although this process may be delayed as long as the size of successive cohorts continues to increase. This is no longer the case in Europe, which is facing a prolonged period of extremely rapid ageing.

Fertility is the key to this process. Among the *forerunners*, decades of moderate fertility reduction leading to a gradual ageing of society came to a temporary halt in the 1950s and 1960s during the baby boom, when decline stopped and, in some areas, fertility even underwent important increases. Afterwards, decline set in once again, but this time it was far faster than before in relative terms and has led, over the past 25 years in most European countries, to total fertility rates far below replacement levels and much lower than they ever were in the past. Some scholars have called this process the 'second demographic transition' (van de Kaa, 1987), although it can be argued that it is no more than a new stage of the general process of demographic transition. As a result, severe labour shortages, extremely rapid population ageing, intense migratory pressure, and difficulties in maintaining pensions and other systems of social welfare loom as major social and economic challenges facing many of the *forerunners*.

Will this happen in the rest of the world? Is it inherent in the very notion of demographic transition? Whereas we can have some fairly clear ideas about the plausible trends in mortality, the future course of fertility is nearly impossible to know. Judging from the dramatic reductions in fertility in a number of the countries we have classified as *followers* and *trailers*, however, we might wonder whether here, too, in the not-too-distant future fertility will fall below replacement levels. While this proposition may seem at first glance to be unreasonable, it did happen in Europe, and in many developing countries fertility is now below the levels shown in Europe during the 1960s.[23] There is nothing at all to suggest that this will not come to pass elsewhere in the world and lead to the challenges of population ageing and eventually diminishing supplies of available labour if intense fertility decline continues. The data presented in Table 4 suggest that reductions in the number of births and cohort size are already a reality for much of the world, one that will make itself felt for the supply of labour in the not-so-distant future. In this sense, the speed with which fertility and mortality have declined among many of the *followers* and *trailers* has led to an important reduction in the lags between them and the *forerunners*. For them, the process of ageing, still only in its incipient stages, will be far faster than among the pioneers of the demographic transition.

In retrospect, the pace of the demographic transition among the *forerunners* was a leisurely

one, giving rise to a gradual process of ageing and leading to nearly a century of relatively low and decreasing population dependency ratios. These were certainly not the only advantages these societies had at their disposal, but unquestionably they helped fuel a century of enormous economic growth, rising living standards and a profound transformation of society (Williamson, 1997, 1998). Population and human capital have been powerful fellow travellers for economic growth and social modernisation over much of the twentieth century among most of the *forerunners*. Demographic regimes became more efficient, thus liberating the human capital necessary to transform society (Dyson, 2001). For those countries where this did not happen, or only happened partially, it is akin to a historic opportunity lost, normally due to institutional, social or political reasons.

The breakneck pace of the demographic transition among the countries who initiated their own transformations more recently may not leave these countries with this same sort of ample margin for economic growth and social transformation. For them, a situation of explosive population growth with extremely young populations may become one of rapidly ageing populations and diminishing supplies of labour in very rapid succession. This is not a matter of opinion or an educated guess, but rather the most likely scenario for the future in much of the world. The window of opportunity for the demographic transition contributing to the process of social and economic modernisation in many countries will be a small one indeed.

The demographic realities facing the developed countries are no longer bright, as population ceases to be a positive factor for the process of economic growth and social change, and begins to exert an increasingly negative influence. In much of the rest of the world, demographic pressures are decreasing and prospects are brightening, although this improvement might only be temporary. Yet, the historical advantages of the pioneering countries once again will be present, as in the coming years they will be able to make use of the excess labour supplies of developing countries to shore up their own labour markets. Even though migration can often be socially problematic, it is unquestionably an economically expedient solution for at least part of the labour shortages these countries are beginning to face. This solution, however, is only a temporary one because in a matter of a very few decades, countries with abundant labour may begin suffering labour shortages of their own. Unless things change dramatically, however, for these countries there will be no neighbouring countries with excess labour supplies to turn to when they need them, although this need will likely be blunted and delayed by the entry *en masse* of women into the labour market, much as began to happen among the developed countries during the past half century.

Ultimately this brings us full swing back to the issue of fertility. Much more so than for migration, the future course of fertility will help shape the world our children and grandchildren will live in during the central decades of the twenty-first century. Here the key question facing us is whether or not the extremely low fertility rates so evident in Europe over the past two or three decades are inherent to the demographic transition or not. Everywhere the demographic transition basically removed reproductive behaviour from the realm of social control and placed it within the purview of individual choice (Lesthaeghe, 1980). Individual choice is, of course, also subject to the constraints of social control, although not in the same way in post-transitional societies. Does this lead necessarily to the extremely low fertility evident today in Europe, and will it do so elsewhere in the world? At this stage, we do not know the answer to either of these questions. If it does, however, then the problems facing the world as ever-smaller cohorts of women begin reaching reproductive age will make past demographic challenges and issues pale by comparison.

NOTES

(1) An earlier version of this paper was given at the recent meeting on *The History of World Population in the Second Millennium* organised by the IUSSP Historical Demography Committee and held in Florence, Italy (June 2001), as well as the CAMPOP Population History Seminar (Cambridge, UK) and at the University of Barcelona (Spain). The criticisms and suggestions of many

colleagues on earlier versions of this paper, in particular those of Patrick Galloway and Fernando González-Quiñones, have been most helpful in preparing this paper.

(2) By century's end, significant fertility decline had commenced in all but 12 of the 145 nations used in our sample.

(3) Many of these series are compiled in Mitchell's *International Historical Statistics* (1998) and provide many of the historical estimates of vital rates used in this paper. Corresponding series for Latin America contained in Collver (1965) have also been used. Where discrepancies have arisen, we have chosen those which seemed to be most reasonable.

(4) Taking Angola as an example, the yearly crude birth rates for the 1950–1959 decade are: 6.2, 7.5, 6.8, *34.8*, 6.4, 6.1, 5.8, 6.5, *32.2* and 6.5. In cases such as these, only the estimates for 1953 and 1958 (both based on Population Division estimates) have been used.

(5) For 1995–99, data taken from the *Demographic Yearbook* corresponding to 1998 have been used. It is disappointing to note that the *Demographic Yearbook* contains no data for Taiwan. Fortunately Taiwan has a fairly long historical time series lasting nearly to the present which has been most useful for this paper.

(6) Countries where decline was not yet visible in the most recent data were classified among the *latecomers* and arbitrarily given the date of 2000 for the onset of decline.

(7) This procedure is problematic when the number of countries making up a given category changes suddenly, especially around 1950. This is especially the case with the *trailers*, where very few countries have data before 1950 and several do afterwards.

(8) In certain countries, especially in North America (Cuba, Jamaica, the US, etc.), the effects of a very strong '*baby boom*' brings fertility back up to near historical levels during the 1950s and 1960s, often decades after the fertility transition had set in. These peaks owing to the '*baby boom*' have been ignored when dating the onset of fertility decline.

(9) Pre-transition CBRs were near or above 40 per thousand in America and closer to 33 per thousand in Europe. See Appendix Figure A.

(10) Within the European *forerunners* themselves, there were also important differences, with the initial levels of fertility and mortality being considerably lower in northern Europe than in southern and especially in eastern Europe. The onset of fertility decline was slightly later in southern and much later in eastern Europe than in the northern reaches of the continent. Despite their pioneering role, these countries showed considerable heterogeneity, more so than any other group. On this point, see Appendix Figure B.

(11) The jump in birth and death rates around 1950 was due to the incorporation of several new countries into the group sample at that time.

(12) For the *latecomers*, there are practically no time series dating from before the 1950s. For this reason, in Fig. 2 we projected backwards from 1950 the plausible birth and death rates needed to establish rates of natural increase similar to the other groups.

(13) See also: 'It is tempting to suggest that it was the decline of mortality which led to the disequilibrium that triggered not only the fertility transition, but more than any else reduced the shackles of fatalism which lay behind secularisation, the rise of the modern economy, and even the knowledge explosion' (Kirk, 1996: 386).

(14) In a careful review of different models of fertility change in historical contexts, Galloway *et al*. (1998a) found that changes in IMRs were a major predictor of fertility change in European countries. In their empirical studies of Prussia, these same authors found similar results (Galloway *et al*., 1994, 1998b). For an overview along these lines of mortality and fertility interactions during the European demographic transition, see Reher (1999). One of the strongest statements supporting the mortality–fertility link before and during the demographic transition can be found in Chesnais (1986: 11–12, 53–92).

(15) In any given pretransitional population, there would be families of many different sizes, but on average they would be small.

(16) During an initial period of mortality decline (lasting approximately a decade) in Costa Rica, infant mortality declined 11% more than crude death rates (CDRs) and child mortality (1–4) did so 39% more, and in Sri Lanka IMRs did so 8% more and child mortality 31% more. For an overview of historical contexts, see Reher (1999: 13, 29–30).

(17) Using Swedish national statistics for marital fertility, for example, between 1876–80 and 1896–1900, marital fertility among women aged 20–29 declined by about 3–4%, among women aged 30–39 by about 12%, and among women aged 40–49 by about 24%; see Sundbärg (1970; Table 41, p. 121).

(18) In this table, the rates of decline at different ages are relative to the rate of decline of the TFR for any given society.

(19) These results refer to the decades immediately prior to the onset of the transition itself (circa 1905

for period measures). For cohort marital fertility trajectories completed between 1890 and 1910, we divided a sizable sample of families with multiple births (final parities 4 and higher) into two categories: '*successful families*' [with no childhood deaths for parities 1–3] (206 families) and '*unsuccessful families*' [where deaths in childhood had taken place] (527 families). Our results show that age at last birth was one year earlier for *successful* than for *unsuccessful* families (36.9 → 38.0) and final parities were lower (6.1 → 7.0). In a related study, it has also been shown that nearly a quarter of mothers ceased childbearing at 35 years of age or younger, and thus may well have been controlling their fertility (Sanz-Gimeno and González-Quiñones, 2001).

(20) For a partially divergent view on the existence of parity-specific fertility control in certain historical populations, see Van Bavel (2003).

(21) Here important differences existed by social group, economic sector or habitat. Even so, the gap between mortality and fertility decline would seldom have been as short as it was in most social groups among the *forerunners*.

(22) A positive short-run relationship between economic fluctuations and fertility has also been found in a number of Latin American countries (Palloni *et al*., 1996).

(23) A few examples will suffice to show this. In the 1950s and early 1960s, in Brazil total fertility rates were above 6.1 and in the mid 1990s they were 2.5; in Tunisia during the same period, fertility rates went from 7.2 to 2.8, in Sri Lanka from 5.7 to 2.3, and in Mexico from 6.8 to 3.2. In Europe during the 1960s, total fertility rates in many countries were well above 2.5.

APPENDIX

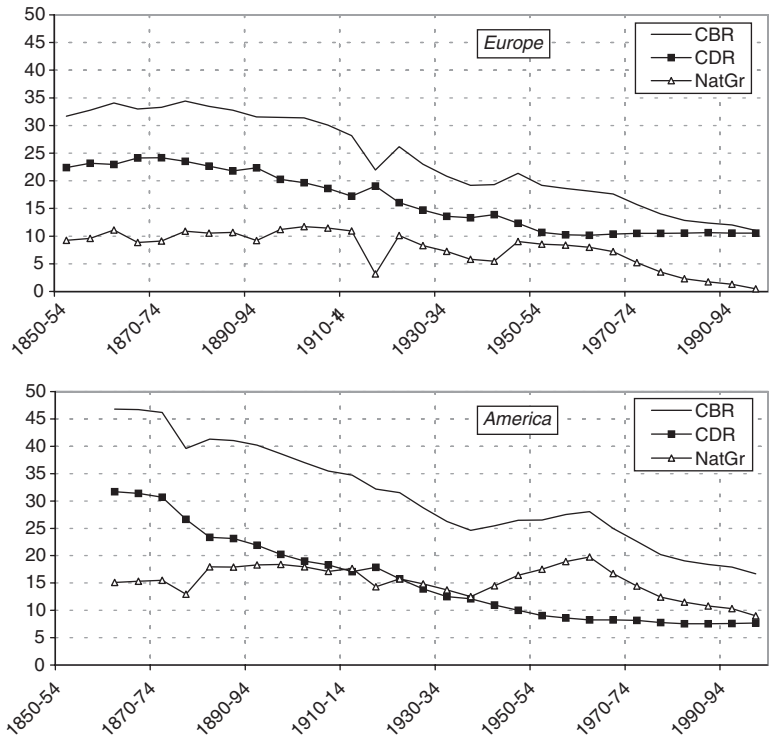

Figure A. Demographic transition among the *forerunners*.

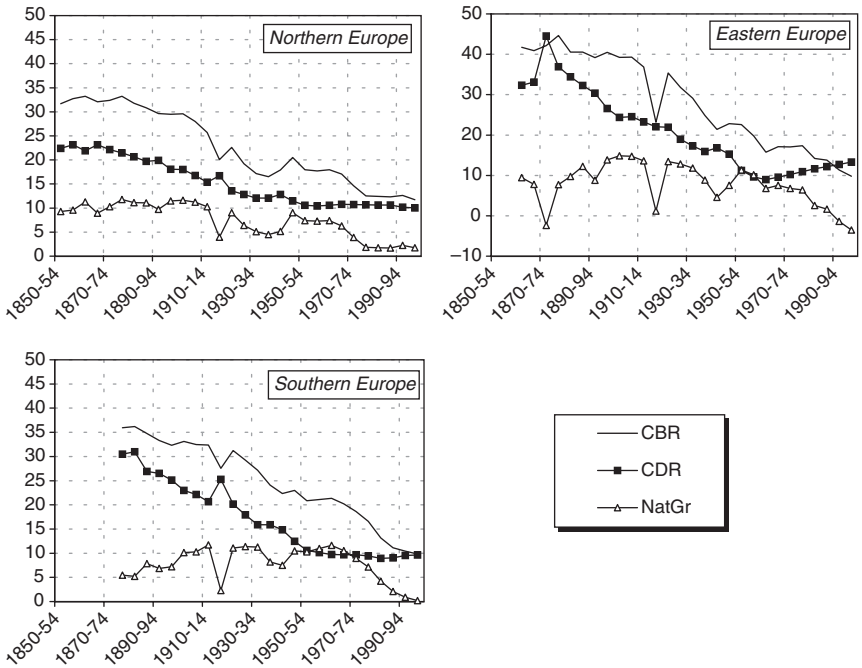

Figure B. Demographic transition among European *forerunners*.

Table A. Countries by category and date of initial data.

Category	Country	Continent	Initial data	Onset of fertility decline
Forerunners				
	Canada	North America	1900–04	1915
	Cuba	North America	1900–04	1920
	United States	North America	1905–09	1925
	Jamaica	North America	1875–79	1925
	Argentina	South America	1860–64	1910
	Uruguay	South America	1880–84	1890
	Austria	Europe	1900–04	1915
	Belgium	Europe	1850–04	1905
	Bulgaria	Europe	1890–94	1925
	Denmark	Europe	1850–54	1910
	England and Wales	Europe	1850–54	1910
	Finland	Europe	1850–54	1915
	France	Europe	1850–54	1900
	Germany	Europe	1850–54	1900
	Hungary	Europe	1860–64	1890
	Italy	Europe	1900–04	1925
	Netherlands	Europe	1900–04	1910
	Norway	Europe	1850–54	1905
	Portugal	Europe	1885–89	1925
	Romania	Europe	1915–19	1935
	Scotland	Europe	1855–59	1905
	Spain	Europe	1875–79	1910
	Sweden	Europe	1850–54	1865
	Switzerland	Europe	1870–74	1910
Followers				
	Mauritius	Africa	1755–79	1960
	Reunion	Africa	1945–49	1955
	Antigua	North America	1945–49	1960
	Barbados	North America	1910–14	1955
	Martinique	North America	1945–49	1960
	Puerto Rico	North America	1910–14	1950
	Chile	South America	1850–54	1960
	Brunei	Asia	1945–49	1960
	India	Asia	1950–54	1960
	Israel	Asia	1925–29	1955
	Japan	Asia	1870–74	1950
	Korea (Republic)	Asia	1950–54	1960
	Phillipines	Asia	1950–54	1955
	Qatar	Asia	1950–54	1955
	Singapore	Asia	1925–29	1955
	Sri Lanka	Asia	1850–54	1960
	Taiwan	Asia	1905–09	1955
Trailers				
	Algeria	Africa	1950–54	1975
	Botswana	Africa	1950–54	1975
	Egypt	Africa	1915–19	1965
	Morocco	Africa	1950–54	1965
	Seychelles	Africa	1945–49	1965
	South Africa	Africa	1950–54	1975
	Swaziland	Africa	1950–54	1975
	Tunisia	Africa	1950–54	1965
	Tanzania	Africa	1950–54	1975
	Western Sahara	Africa	1950–54	1975
	Zimbabwe	Africa	1950–54	1970

Table A. *Continued*

Category	Country	Continent	Initial data	Onset of fertility decline	Category	Country	Continent	Initial data	Onset of fertility decline
	Bahamas	North America	1945–49	1965		Comoros	Africa	1950–54	1990
	Belize	North America	1945–49	1965		Congo	Africa	1950–54	2000
	Bermuda	North America	1945–49	1965		Congo (Dem. Republic)	Africa	1950–54	2000
	Cayman Islands	North America	1945–49	1965		Djibouti	Africa	1950–54	1985
	Costa Rica	North America	1900–04	1965		Eritrea	Africa	1950–54	1990
	Dominican Republic	North America	1950–54	1965		Ethiopia	Africa	1950–54	1990
	El Salvador	North America	1900–04	1965		Gabon	Africa	1950–54	2000
	Mexico	North America	1895–99	1970		Gambia	Africa	1950–54	1985
	Panama	North America	1900–04	1970		Ghana	Africa	1950–54	1985
	Trinidad and Tobago	North America	1880–84	1965		Guinea	Africa	1950–54	1995
	Bolivia	South America	1950–54	1975		Guinea Bissau	Africa	1950–54	2000
	Brazil	South America	1950–54	1965		Ivory Coast	Africa	1950–54	1985
	Colombia	South America	1900–04	1965		Kenya	Africa	1950–54	1980
	Ecuador	South America	1915–19	1970		Lesotho	Africa	1950–54	1985
	Guyana	South America	1890–94	1965		Liberia	Africa	1950–54	1995
	Peru	South America	1945–49	1975		Libya	Africa	1950–54	1980
	Surinam	South America	1945–49	1965		Madagascar	Africa	1950–54	1990
	Venezuela	South America	1885–89	1965		Malawi	Africa	1950–54	1980
	Armenia	Asia	1950–54	1965		Mali	Africa	1950–54	1995
	Azerbaijan	Asia	1950–54	1965		Mauritania	Africa	1950–54	1980
	Bahrain	Asia	1950–54	1970		Mozambique	Africa	1950–54	2000
	China	Asia	1950–54	1970		Namibia	Africa	1950–54	1990
	Georgia	Asia	1950–54	1965		Niger	Africa	1950–54	1985
	Indonesia	Asia	1950–54	1970		Nigeria	Africa	1950–54	1995
	Iraq	Asia	1950–54	1975		Rwanda	Africa	1950–54	1995
	Jordan	Asia	1950–54	1975		Senegal	Africa	1950–54	1980
	Korea (People's Republic)	Asia	1950–54	1970		Sierra Leone	Africa	1950–54	2000
						Somalia	Africa	1950–54	2000
						Sudan	Africa	1950–54	1980
						Togo	Africa	1950–54	1995
	Kuwait	Asia	1950–54	1975		Uganda	Africa	1945–49	2000
	Kyrgyzstan	Asia	1950–54	1965		Zambia	Africa	1950–54	1980
	Lebanon	Asia	1950–54	1965		Guatemala	North America	1900–04	1985
	Malaysia	Asia	1940–44	1965		Haiti	North America	1950–54	1985
	Mongolia	Asia	1950–54	1975		Honduras	North America	1910–14	1985
	Myanmar	Asia	1950–54	1975		Nicaragua	North America	1950–54	1985
	Thailand	Asia	1950–54	1965		Paraguay	South America	1950–54	1985
	Turkmenistan	Asia	1950–54	1965		Afghanistan	Asia	1950–54	2000
	Uzbekistan	Asia	1950–54	1965		Bangladesh	Asia	1950–54	1980
	Albania	Europe	1950–54	1965		Bhutan	Asia	1950–54	1995
						Cambodia	Asia	1950–54	1990
Latecomers						Iran	Asia	1950–54	1985
	Angola	Africa	1950–54	1995		Lao People's Republic	Asia	1950–54	1995
	Benin	Africa	1950–54	1985					
	Burkina Faso	Africa	1950–54	2000		Nepal	Asia	1950–54	1995
	Burundi	Africa	1950–54	1995		Oman	Asia	1950–54	1995
	Cameroon	Africa	1950–54	1985		Saudi Arabia	Asia	1950–54	1980
	Central African Republic	Africa	1950–54	1990		Syria	Asia	1950–54	1985
						Vietnam	Asia	1950–54	1980
						Yemen	Asia	1950–54	2000
	Chad	Africa	1950–54	2000					

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