

DEMOGRAPHIC SHOCKS: THE VIEW FROM HISTORY

Massimo Livi-Bacci*

Demographic shocks convey the idea of a sudden change in those factors, external or exogenous to the demographic system, that affect mortality, fertility, or migration. Famines and epidemics, wars and displacement of people, can be seen as external disturbances to the normal functioning of a demographic system. Malthus renamed them “repressive checks” and made them endogenous to the system—the inevitable consequences of unsustainable population growth. Under a traditional demographic shock, mortality suddenly goes up, fertility goes down, mobility explodes, families break down; the aftershock, however, implies changes that counter the initial consequences. In other words, a steady or semi-steady state is broken and populations struggle to recover the equilibrium.

This paper could limit itself to drawing on the abundant literature on the subject of shocks, both historical and contemporary cases. However, confining the discussion to this definition of shocks appears to be a limitation on the wider scope of the conference, which includes the consequences of long-term changes such as aging or international migration, whose current levels and trends appear to be unparalleled in the past. Indeed, they are defined as “seismic shifts,” and seismic derives from the Greek “seismos” or earthquake, so the idea is that we are going to experience an earthquake in slow motion, of which we already perceive the early subterranean rumblings. My task becomes more difficult because I am required to deal also with the long-term, profound changes, which somewhat parallel those in store for the future.

The paper will basically deal with four issues. The first one puts

*Professor of Demography, University of Florence.

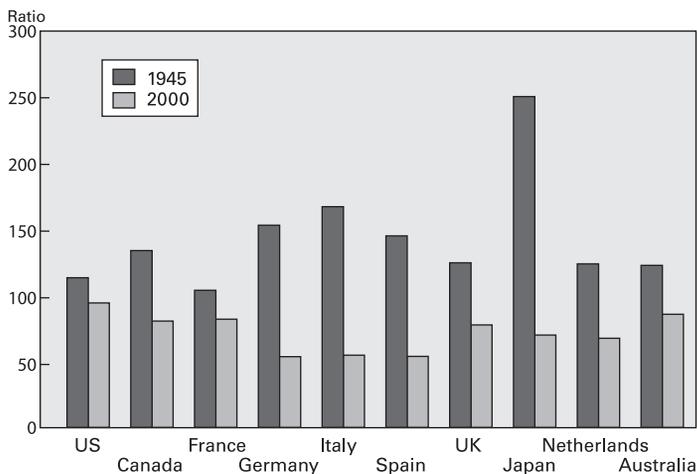
current changes or shifts into a historical comparative perspective. The second deals with “traditional” shocks or violent disturbances of the system and their consequences. The third discusses the “seismic” changes experienced in the past, attempts their measurement, and exemplifies their effects on population and society. The fourth deals with the relevance that past experience has for current changes.

A HISTORICAL PERSPECTIVE

Let us consider the seismic changes that the rich world is experiencing. I will consider the ten largest rich populations (the United States, Japan, Germany, the United Kingdom, France, Italy, Spain, Canada, Australia, and the Netherlands), which included (in 2000) 767 million inhabitants according to the latest estimates (United Nations 2001), or 90 percent of the total population of the rich world. I will consider one indicator of future growth, the ratio of the population ages 0 to 4 to that of their (theoretical) parents, on average 30 years older, ages 30 to 34. This ratio is easy to calculate and particularly useful because (a) it is a proxy for fertility, and very closely correlated with the total fertility rate; (b) it reflects the degree to which the generation of children is able to replace the adult generation; (c) it is a good proxy for the future rate of population growth, net of migration (it is closely correlated with population increase over the next thirty years); and (d) shifting this ratio into the future—with a thirty-year lag or more—we have an idea of the stress that will be undergone by the system of intergenerational transfers. For the ten countries, the ratio was 78 in the year 2000, with a low of 55 to 56 for Italy, Spain, and Germany and a high of 95 for the United States, this only slightly below the 100 percent replacement level. The remaining six countries have ratios between 69 (the Netherlands) and 87 (Australia). Over one-third of the rich population of the world (the United States) is close to replacement, about one-fourth dangerously below. In Germany, Italy, and Spain, one child will have to replace (almost) two adults, in production and reproduction, in social life, in the web of affections and loyalties.

More than half a century ago, in 1945, the rich world was ending the traumatic experience of the Second World War. Several million young people had died in the war; in Europe and Japan, births were at a minimum. These losses depleted the young male adult cohorts, so let us calculate the children-to-adults ratios for the female population alone. The ratios, at this crucial point in the history of the twentieth century, involve the relatively few births of the early 1940s and the 1910-15 birth cohorts, when fertility was higher (it had been affected only slightly by war). It is, therefore, a moment of particular demographic weakness for the West. The ratio for the ten countries was 116 (49 percent higher than that for the year 2000) with a maximum of 178 for Japan and a minimum

Figure 1
Ratio of Children Ages 0 to 4 to Adults Ages 30 to 34, in the
"Major Ten" Rich Countries, 1945 and 2000



of 86 for Germany. (See Figure 1, which compares 1945 with 2000.) One could argue that this relatively favorable demographic situation contributed to the rapid progress of economic recovery in Europe. The ratios calculated up to now do not consider mortality attrition (or the losses between ages 0 to 4 and ages 30 to 34), which in 1945, with life expectancy for females above 65 years, would have depleted a cohort by about 5 percent (and proportionally lowered the ratio), against 1 percent in the year 2000, when life expectancy was close to 80 years.

Can we find in the modern history of the Western world any instances of large populations whose newly born generations were unable to replace the generations of their parents? Let us consider periods of particularly acute demographic crisis. In the First World War, Germany and France were the Western countries that experienced the largest military losses (respectively, 2 million and 1.3 million deaths or 15 and 17 percent of the mobilized forces) and that, in the aftermath, had acute need of demographic recovery. The children-to-adults ratio (for the female population, in order to avoid the war losses bias) for France in 1921 was 74—lower than the 2000 ratio of 83—and in Germany 85—higher than the current (2000) 55. The situation was considerably more favorable in the United Kingdom (108) and in Italy (126). Even in the Soviet Union in 1923, after the war, the civil war, and the famine, the ratio was a “healthy” 215. Discounting for a mortality attrition of 10 to 12 percent (and for more

than double that in the USSR) would lower the ratios by a corresponding amount, leaving them at a level still considerably higher than the current one (except for France). Note that the birth rate in the years 1915 to 1918 was far below the normal level of peacetime years.

More than a hundred years before, after the fall of Napoleon and after the bloody wars that cost the French army more than a million deaths, the ratio of children to adults (female population) was a healthy 162 (Bourgeois-Pichat 1951, p. 661). This ratio, net of a mortality attrition of about one-third, typical of the high mortality levels of the times, would be reduced to 108.

I have compared the potential for replacement and growth at the beginning of this millennium—after more than half a century of peace and prosperity—with the situation in periods of crisis, after conflicts that had depleted the adult population, lowered the birth rate, and unfavorably altered the age structure. Only in the case of France in 1921 do we find a situation worse than the average for the ten major countries in the year 2000. Indeed, the ongoing seismic changes pose challenges unparalleled in the past two hundred years.

Do we really want to look for a period when the potential for replacement and growth was, over almost all Europe, and for a long time, badly hampered? We have to go back to the late Middle Ages, when European populations were repeatedly hit by the plague. Biraben (1979) has estimated that the population of the continent declined 30 percent between 1348 and 1400. An extraordinary documentation—*inquisitiones post-mortem*, or inquiries into the succession to a man who had died—has provided the raw material that allows the calculation of replacement rates (Russell 1948, pp. 92-117, successively re-elaborated by Hollingsworth 1969, pp. 375-88). The replacement rates refer to the male population and are the ratios between surviving sons and men dying and leaving a succession. These ratios, well above 100 before 1350, fall below these levels from 1351-55 onward, getting as low as 68 in 1381-85 and gradually recovering thereafter, and reemerging above the level of 100 from 1446-50 onward. The estimates of net replacement rates made by Wrigley and Schofield (1981, p. 530), in their secular reconstruction of the English population between 1541 and 1871, show that only the birth cohort born between 1641 and 1646 experienced a replacement rate below 100 percent (actually 98.8) in a period almost three centuries long, from 1541 to 1831.

Another aspect that has been cited as a component of the current seismic shifts is aging, with its associated structural pressures on inter-generational relations and transfers and its impact on fiscal and social policies. Is the current trend in aging different—in speed and intensity—from the past? Aging has two components, the first related to the fall of the birth rate (aging from the bottom of the pyramid) and the second related to the increasing survival of generations reaching old age (aging

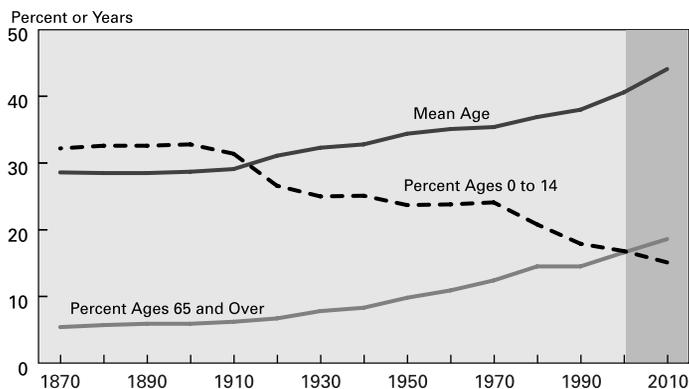
from the top). The first component dominated the aging process until the 1970s, but its impact has been declining thereafter, once the birth rate had reached its bottom level. Increasing survival to old age has been accelerating in the second part of the twentieth century, and it is projected to continue in the future as life expectancy increases further. Forecasts or projections of indicators of aging (percent of the population over a certain age, mean or median ages of the population, and so on) depend heavily on hypotheses as to the future courses of fertility and migration, which are renewing the pyramid from the bottom. Hypotheses on old-age survival are also important but less unpredictable, given the gradual historical changes in mortality and the fact that potential old-age individuals ten, twenty, or thirty years from now are mature cohorts already in existence. In the “major ten” rich countries, the population over 65 increased 73 percent between 1950 and 1975 and 56 percent between 1975 and 2000, and it is expected to increase 54 percent between 2000 and 2025 and 16 percent between 2025 and 2050. As a percentage of the total population, the number of persons over 65 has increased from 8.2 percent in 1950 to 11.1 percent in 1975 and 14.9 percent in 2000, and it is expected to reach 21.7 percent by 2025. So while relative aging is accelerating, the increase in the total number of old people is decelerating.

A broader picture of the changes in the age structure can be gained from Figure 2, showing the mean age, and the proportions below age 15 and 65 and over, of the population of the “major four” Western European countries (France, Germany, Italy, and the United Kingdom) from 1870 to 2000, and the projected values for 2010, a date close enough to yield estimates that can be safely relied on. The acceleration of the process of aging since the 1970s is quite evident, after a continuous increase from the end of the nineteenth to the mid twentieth century and then a plateau in the central part of the twentieth century.

For a very long view of age-structure modifications, let us again look at England in the three centuries after 1541 (Wrigley and Schofield 1981). The population over age 60, for instance, gradually increased from a minimum of 7.2 percent in the 1566-71 period to a maximum of about 10 percent in 1711-21, then gradually declined to a new minimum of 6.5 percent in 1826-36. These changes are significant but mild and slow, hardly comparable with the swift fluctuations of modern times.

The process of aging will undoubtedly deeply affect Western societies in future decades. But what really matters, in the long run, is the process of renewal and reproduction of the population, and its potential for growth. Never in the past—not even after long and deadly crises—has this process fallen to negative levels, as it has at the transition of the millennium. Hence, a somewhat disturbing question: Is prosperity, and the dearth of births associated with it, the fourth horseman of the (Demographic) Apocalypse, riding astride with war, plague, and famine?

Figure 2
Age Structure Indicators for France, Germany, Italy,
and the United Kingdom, 1870 to 2010



TRADITIONAL SHOCKS AND THEIR CONSEQUENCES

Traditional shocks, or violent disturbances of the demographic system caused by a sudden increase in deaths, have been the recurrent lot of Western populations. Indeed, the gradual decline of the mortality rate since the late eighteenth century has been characterized by a reduction in the number and intensity of mortality fluctuations. Major mortality shocks—mortality crises entailing a doubling or more of the number of deaths in normal years—usually could hit a population once or twice over a generation (about thirty years). The highest incidence of crises in Europe occurred during the century following the arrival of the plague in 1347. In Tuscany, mortality peaked in 1348, 1363, 1374, 1383, 1390, and 1400. In the period 1340 to 1450, a crisis (defined as a threefold or greater increase over the “normal” number of deaths) occurred roughly every nine years, and the average crisis represented a sixfold increase over the normal number of deaths (Livi-Bacci 1978). The plague occurred at more or less the same frequency in the other European countries—from England, where a *pestis secunda* is recorded in 1361, a *pestis quinta* in 1391, to Russia, with plague years in 1363-65, 1374-77, 1387-90, and 1396 (Livi-Bacci 1999, p. 73). In Tuscany, typhus-related mortality in 1649 produced an increase of deaths 100 percent or more above normal in 25 of 34 municipalities on record (Del Panta 1980, p. 165). France, the largest country in Europe after Russia, suffered two devastating subsistence crises in 1693-94 and 1709-10, each one implying a doubling of the number of deaths.

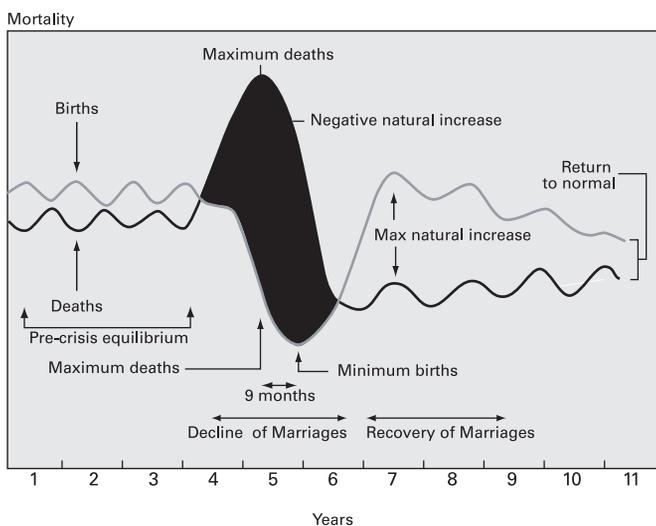
The frequency and intensity of crises declined during the eighteenth century, but the periphery of Europe continued to suffer into the nineteenth century. In Ireland, the Great Famine produced an excess mortality of 1.1 million to 1.5 million deaths in 1846-47 (at least a fourfold increase); in Finland, famine-induced mortality in 1868 was three times greater than normal (Pitkänen 1993). A chronology would be out of place here: I wish only to make a general point. In a high-mortality population (with a 3 percent death rate in normal years), a doubling of mortality—caused by plague, typhus, famine, or other disturbances—would have caused an approximate decline of the population of 3 percent. Assuming that in normal times the population could grow at the speed of 0.3 percent (actually the population of Europe doubled between 1450 and 1750, with a rate of growth of about 0.2 percent), ten years would be required in order to recover the pre-crisis size.

Things were a little more complicated than the above simple arithmetic calculations suggest. The impact of the shock, as well as the after-shock recovery, was a function of many factors, such as the cause and nature of mortality and its age pattern (smallpox killed the young, plague those of all ages, for example); whether or not the killing disease induced immunity in survivors; the negative impact on nuptiality and fertility and their rebounds; and selection operated by migration. Figure 3 sketches the paradigm of a mortality crisis in a typical high-mortality setting (Livi-Bacci 2000, p. 41). Let us assume that the mortality crisis was induced by an epidemic; its effects can be outlined as follows.

Deaths and mortality. The diffusion of the epidemic determined an increase in the number of deaths. As the number of nonimmune people decreases and the number of the immune increases, deaths, after reaching a peak, rapidly decline and bottom out at a level lower than the pre-crisis one. This is the result of a double effect: first, the decline in size of the population; second, the weeding out, caused by the crisis, of the vulnerable, weak, and frail in higher proportion than the rest of the population. As a consequence, the number of deaths and the death rate fall below the pre-crisis level and this favorable effect lasts a few years before normality is restored.

Births and fertility. Conceptions usually decline when mortality increases, reach a minimum when mortality peaks, and rebound to a maximum one or two years after the crisis. Births follow the same course with a nine-month lag. The reasons for the decline in conceptions are many: decline in new marriages; decline in sexual intercourse, caused by stress; deliberate control; decline of fecundity because of starvation or infection. Increase in fetal losses may determine a further decline in births. The rebound in conceptions and births may be due, among other factors, to the recovery of marriages, but also to an increase in marital fertility. Even in non-controlling populations, there is evidence that

Figure 3
Diagram of a Mortality Crisis



Source: Livi-Bacci (2000).

cohorts formed after the crisis had a (natural) fertility rate higher than pre-crisis couples.

Marriages and nuptiality. When mortality increases, marriages are postponed or made impossible by death; after the crisis come a revival of postponed marriages, an increase in marriages of widowed people, an acceleration of marriages made possible by transmission of property of deceased parents, and so on.

Natural increase. Strongly negative during the crisis, the rate of natural increase is positive and higher than normal after the crisis, owing to the opposing rebounds of mortality and fertility. The rates return to normal patterns after a few years.

Mobility and migration. Increased out-migration from the affected area occurs during the crisis; out-migrants return after the crisis, but permanent losses of long-term out-migrants are possible.

The textbook model outlined above may be difficult to identify in the profile of many mortality crises of the remote (and less remote) past because of the varying combinations of factors at play and the varying patterns of their insurgence and development. However, the forces indicated above are at work, and the paradigm recognized, in most mortality crises, included those induced by the two world wars of the twentieth century.

SEISMIC CHANGES OF THE PAST

The Plague Age

The depopulation of Europe in the century-long period after 1348 had a profound impact on the economy and on society. Depopulation implied abandonment of farms and villages: All over Europe the number of *lost villages* increased. Demand for food declined everywhere, plantings were abandoned, and land turned into pasture (Slicher van Bath 1963). Prices of cereals declined everywhere and a shortage of manpower resulted in an increase of real wages. Demand for meat increased and diets improved, but this further stimulated the conversion of land into pasture (Boserup 1981, pp. 95-96). The entire agricultural system underwent a profound process of "de-intensification."

The case of Languedoc, extensively studied by Le Roy Ladurie (1969), can serve as an example in a variety of similar situations. Population reached a minimum in 1450, with a series of typical consequences. As elsewhere, villages were deserted and fields abandoned. Woods and forests regained the ground lost during the previous demographic growth cycle, initiated in the eleventh century. Stagnant waters expanded and so did the fevers associated with them. Prices of basic staples went down, manpower was rare, and wages went up. However, there were additional interesting consequences concerning the distribution of land ownership. In Albi, the extent of properties remained unchanged between 1343 and 1357, but the number of taxpayers went down from 1623 to 686. The mean size of holdings increased, since small ones disappeared or merged into larger units. This process of recomposition of farms and properties made economic sense in a system poor in labor but rich in land.

The population crisis also produced another interesting institutional change. Landlords were forced to be less exacting toward their bondsmen and tenants. The attempt to tighten the bonds of servitude failed, because it was easy to move or emigrate, "and this emigration contributed towards the total disappearance of bondage in most of Western Europe (in the East it was on the increase). The only way to keep or attract tenants, *fermiers* or *métayers* was to give in to their demands and lighten their dues" (Duby 1972, p. 213). The crisis of the seigneurial estates worked to the benefit of the peasants.

Another interesting phenomenon accompanied the recomposition of properties, and this was a process of restructuring of families into larger units. Married brothers and their families remained united in *frèrèches* under the authority of the father. Dotal and succession rules reinforced this process, and "all these rules underline the surprising strengthening of the family as an institution between 1300 and 1500. The extended family was a paternalistic and suffocating institution, but very protective

towards children, with old and young couples bound for life" (Le Roy Ladurie 1969). Duby writes, "[W]hile the demographic catastrophes and the concomitant migrations were leading to the disintegration of the family framework, it seems that the bonds of kinship grew tighter in the face of need. The large family units subject to the strict control of the eldest male again came into being, and the *affrètements*, fraternal joint-ownership associations increased in number, frequently grouping together men from different families. These compact groups were the only effective defense against the difficulties resulting from depopulation" (1972, p. 184). The cities that had expanded until the beginning of the fourteenth century were demographically and economically depleted, and they put into action policies favoring immigration.

Population decline in the plague age may have had yet another relevant consequence. In Italy, France, and elsewhere, documentary evidence shows rather peculiar patterns of marriage, very precocious for women but much later for men. Working with the Florentine cadastre of 1427, Herlihy and Klapisch-Zuber (1978) have derived an average age at marriage of 17.6 for Florentine women, which increased to 20.8 by 1480; men married on average ten years later. Women of Prato married at 16.8 years on average in 1372 and at 21.1 in 1480. The trend in the countryside was similar, although age differences between brides and grooms were smaller. The situation in France—in Toulouse, Périgueux, Tours—was similar. Klapisch-Zuber (1988) concludes that "throughout Europe, adolescents between 14 and 18 years old became the brides of men six to ten years older." Russell and Hajnal have reached similar conclusions for England using the Poll Tax of 1377, although these conclusions have raised controversies (Russell 1948; Hajnal 1965). Little is known about pre-plague marriage patterns. The hypothesis has been offered that the high-nuptiality system prevailing in the late fourteenth and fifteenth centuries was a structural reaction to the devastating plague losses and the breaking down of the economic obstacles (scarcity of land, for instance) that had restricted access to marriage.

Besides the effects on the marriage system (up to now nothing more than a hypothesis), plague-related human losses put in motion rebounding mechanisms that determined a population recovery in the second part of the fifteenth century. In much of Europe—as in Languedoc—depopulation seems to have resulted in the effect of reorganizing the surviving human capital into larger units (families), more efficient in dealing with a sudden increase of per capita physical capital.

The Great Irish Famine

Certainly the best known and most extensively studied mortality crisis after the plague is the Great Irish Famine of the mid nineteenth century. There are many reasons for the great interest in the famine: It

happened in the Anglo-Saxon cultural area, and this has brought the Famine into the focus of the developed world; it fits well the Malthusian paradigms; it has been seen as the crucial factor in the transformation of the Irish demographic and social system; it has been the most deadly episode in a large Western population (Finland in the 1690s and Iceland in 1780 suffered deadlier crises, but their populations were much smaller). Finally, another aspect is of great interest for our purposes: The Great Famine initiated a long-lasting cycle of population decline in Ireland, from 8.2 million people in 1841 to 5.4 million in 1871 and 4.5 million in 1901. There is no other instance, among Western nations, of a sustained population decline after the Industrial Revolution, if we exclude the case of the Democratic Republic of Germany, whose population fell between 1950 and 1990 from 18.4 million to 16.2 million. Prior to Ireland, the last episode of a sustained and large decline is that of the German population in the first half of the seventeenth century as a consequence of the devastation of the Thirty Years' War, a fall from 16.2 million in 1600 to 9 or 10 million in 1650 in the area corresponding to 1914 Germany (Bulst and Pfister 1997, p. 519).

Interpretations of the consequences of the Great Irish Famine are not unanimous, but its demographic consequences are well known (Edwards and Williams 1957; Mokyr 1983; Mokyr and O'Grada 1984; O'Grada 1993). The death toll resulting from the potato blight was enormous: It has been estimated that 1.9 million died between 1846 and 1850, with an excess of deaths of about 1.1 million (13.4 percent of the population enumerated in 1841); about 200,000 people per year left Ireland between 1847 and 1854. Age at marriage rose and the proportion remaining single rose, and mass migration (mainly to America) continued throughout the century. Fragmentation of land gave way to the recomposition of holdings in larger units. Inheritance customs changed.

A classic interpretation of the events associated with the Famine is typically Malthusian (Connell 1950). In Connell's view, a natural tendency of the Irish to marry early was inhibited by the difficulty of obtaining land on which to build a house and start a family. This obstacle was removed in the second half of the eighteenth century by a series of complex factors—among them the great success of the potato—which allowed the extension of farmland. As a consequence, nuptiality increased and, together with a high natural fertility and a not too high mortality, this resulted in a high rate of growth. Population increased from 3.2 million in 1751 to 6.9 million in 1821 and 8.2 million in 1841. Connell writes, "In the late eighteenth and early nineteenth centuries it is clear that the Irish were insistently urged and tempted to marry early: the wretchedness and hopelessness of their living conditions, their improvident temperament, the unattractiveness of remaining single, perhaps the persuasion of their spiritual leaders, all acted in this direction" (Connell 1950, pp. 81-82). The increasing demand for foodstuffs in England led to

the expansion of arable land and to its subdivision for a fast-increasing population of tenant farmers; subdivision was enhanced by the rapid diffusion of the potato as the main (and highly productive) food staple of the Irish. But this equilibrium became precarious as a result of excessive growth, until the Great Famine permanently upset the old demographic and social order.

During the following decades a new régime of land use and ownership and a new nuptial order (late marriage and high proportion of unmarried), supported by the large landowners and clergy, together with massive migration, resulted in a steady decline of the population. The average age of women at first marriage increased from 23 to 24 between 1831 and 1841 (a level already higher than the one prevailing in previous decades) to 27 to 28 at the end of the century. The proportion of married women of fertile age declined, and at the end of the century about one-fifth of those above age 50 (and one-fourth of men) had never married. Extraordinary mortality and massive emigration “emphasized the precarious nature of an agrarian system based on sub-division and potato culture, and particularly from the 1870s, the existing trend towards consolidation of holdings accelerated, strengthening the forces leading to emigration” (Clarkson 1982, p. 244). Certainly the fear of the repetition of the disaster had a profound impact at the individual as well as at the societal level.

Recent scholarly work has greatly deepened the understanding of the Irish case. Mass emigration was not initiated by the Famine but had been increasing in the preceding decades; age at marriage was probably not so precocious as many thought and an increase was already evident before the Famine; profound differences existed—before and after the Famine—between the east and the west of the country, which was far from being homogeneous, and the two areas responded in different ways to the catastrophe. The strains that exploded with the Famine were already evident and it is legitimate (although not very productive) to think that they would have eventually led to a gradual abandonment of the old system. But the profound shock of the Famine certainly was more than a mere catalyst of the transformation.

Did Ireland perform, according to the economic profile, less well than other European countries? According to Maddison (1995), the average GDP per capita of fifteen European countries in 1820 was 1,142 dollars (Geary-Khamis 1990 dollars) against 954 for Ireland (Ulster excluded); in 1900, the European average was 2,583 against the Irish 2,495, with the gap considerably reduced in relative as well as in absolute terms. In 1820 only three countries (Russia, Finland, and the part of the Austrian-Hungarian Empire corresponding to former Czechoslovakia) were doing worse than Ireland; in 1900 two more countries—Spain and Italy—must be added to the former three.

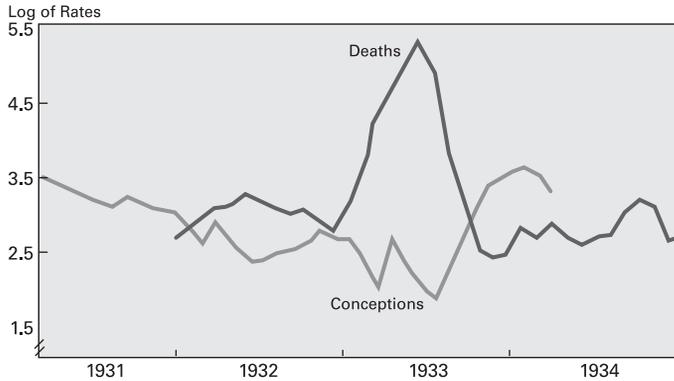
Famine in Russia

The Great Irish Famine is not the last crisis typical of the old demographic régime in Europe. The northern and eastern periphery of Europe continued to suffer severe episodes that emerged in backward rural contexts, generally the consequence of bad harvests. The 1860s were years of high mortality not only in small Finland (a threefold increase in deaths in 1868) but also in Russia, where famines were recorded in 1872-73, 1882-84, 1892, 1906, and 1911. But from the 1870s, famines in Russia became more localized than in the past, retreating from the north, the west, the center of the country, and the Black Earth region and concentrating in the Volga region, Southern Ukraine, and Northern Caucasus (Ademets forthcoming). Famine hit Russia again in 1921 and 1922, causing a high number of deaths in the Volga region and Ukraine. However, the 1921-22 losses are only the final act of the troubled decade initiated in 1914, compounding military and civil losses due to the World War and the civil war; the effects of the influenza epidemic and those of the famine; and the general territorial, economic, and social dislocation caused by the Revolution. "Excess deaths amounted to about 16 million—soldiers and civilians who were killed or who died prematurely. Simultaneously, the birth rate temporarily declined, and as a result the number of children born in this period was 10 million less than normal. At the beginning of 1923, the population was 4 to 6 million smaller than in 1914, and some 28 million smaller than it would have been if pre-war death and birth trends had continued" (Wheatcroft and Davies 1994, pp. 57-58).

It is in the Soviet Union that the last European, hunger-related, catastrophic event took place. Accelerated industrialization, increased appropriation of grain from the peasants, forced collectivization, liquidation of the kulaks, production declines, and hunger are the main links in the chain of events that led to the famine of 1932-33 and to millions of deaths. A recent estimate of the losses due to this series of events leads to a "plausibility range" of excess deaths between 5.6 million and 13.4 million in the intercensal decade 1927 to 1936, with a mid-range estimate of 9.5 million (Livi-Bacci 1993). Figure 4 shows the monthly series of death and conception rates for rural Ukraine in the 1931-34 period. The sequence of events, the political determinants, the intermediate factors of the high mortality and the demographic impact, closely resemble the patterns of the 1959-61 catastrophe in China following the Great Leap Forward.

The direct determinants of the crisis are evident: Hunger, together with typhus and other epidemics, and outright starvation are certainly the immediate causes of human losses. Hunger was—at least partially—determined by a poor harvest in 1932. It is commonly held that the areas sown diminished, fields were not properly harvested, and productivity in the collectives went down. Increased procurement and exports of cereals

Figure 4
Monthly Death and Conception Rates,^a Rural Ukraine
April 1931 to December 1934



^aLogarithms of annualized death and conception rates per 1000 population.

Source: Livi-Bacci (1993).

compounded the effects and deprived the producers in favor of urban populations or particular sectors of the population “entitled” to special treatment. The crisis was largely man-made, or policy-generated, quite different from other crises of the past. Other intermediate factors are likely to have amplified the crisis. The “great turn,” the “leap forward,” and the brutal collectivization that went with them weakened the social fabric, crippled the traditional defenses to economic and social stress, and amplified the effects of the economic disaster.

These intermediate factors can be classified under different headings, each acting with different force, but all pushing in the same direction. The first factor was residential dislocation. Its negative effects were all too evident in the case of deportations that accompanied de-kulakization, but dislocation also hit millions of migrants who built industrial “konbinats” or worked in gigantic public projects. The efficiency of mutual help in case of stress, provided by the family or the community, was probably lowered for millions of people. The mass phenomenon of abandoned children reappeared all over the Soviet Union. At the same time, mobility was restricted (by the reintroduction of internal passports, prohibition of the sale of railway tickets to farmers, and the like) when it might have been a counteractive measure to starvation and disease. Second, collectivization deprived peasants of some of their traditional buffers against nutritional stress. Private plots and individual trading were prohibited, thus eliminating an important source of food and income. Forced to join

the collectives, peasants slaughtered cattle, consumed stocks, and sold the tools, thus thinning their means of survival. Third, generalized collectivization dramatically changed social relations and shifted the locus of responsibility from the individual, the family, or the community to large and anonymous collectives like the *kolkhoz*. Fourth, concealment of the famine to avoid its adverse internal and external political consequences was consistent and persistent, denying any organized form of famine relief, an extreme but often decisive help for the doomed. In short, the population was thus deprived of those mechanisms of defense and protection against stress built and tested by many generations.

Are there other long-term consequences of the 1932-33 famine? This is quite difficult to assess, since the cataclysm of the Second World War wiped out the traces of earlier events. However, one political consequence is clear: The régime tried to conceal the catastrophe, and the 1937 Census that revealed a population much lower than anticipated by Stalin (162 million instead of 170 million) was “suppressed,” and the Census leading team liquidated. The “liberal” population policies enacted in the 1920s, equating *de facto* unions and civil marriage, facilitating divorce, and liberalizing abortion, were dismantled in 1936 in favor of a policy supporting the family and restricting divorce and abortion (Blum and Darskij 1999). The change of policy was announced by Stalin in May 1935 in his speech, “Man, the most precious resource.” The Soviet Union, not unlike Italy, Germany, or Japan, became pro-natalist and pro-growth.

World War I in Europe

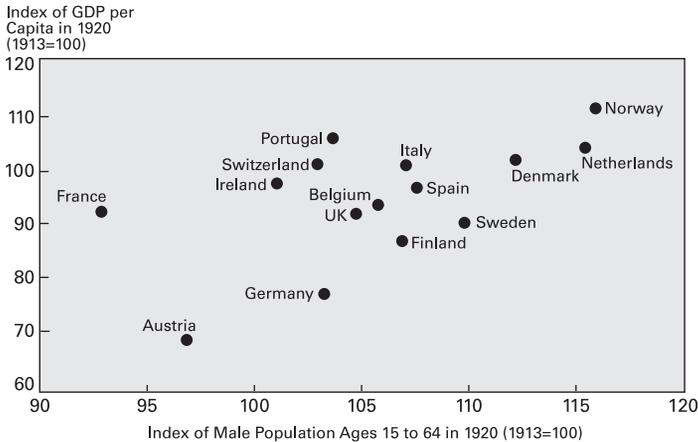
In Europe proper—west of Russia—the twentieth-century demographic seismic shifts were due to wars, to the related human losses, civilian and military, and to the geopolitical revolution of the continent through population transfers, refugee movements, and the like. As a result of the modifications of warfare between the First and the Second World Wars—1939-45 warfare was less labor intensive and increasingly technological—the balance between military and civil losses had shifted, the latter having an increased share in the tally. With a relatively young age structure, fertility usually above replacement, and long-term falling mortality (excluding the war years), war losses were soon recovered by the European population. However, between 1913 and 1920 the population declined from 340 million to 337.7 million (−0.7 percent) against an increase from 97.2 million to 106.5 million (+9.3 percent) in the United States (Svennilson 1954, p. 63). The age group 15 to 64, however, increased from 210 million to 216.3 million (+3 percent). Military losses in the five largest belligerent countries—Austria-Hungary, Germany, Great Britain, France, and Italy—were close to 6 million (out of a total of 10 million for all of Europe, including Russia), from a total of 41.5 million mobilized men (one in seven) (Becker 1999, p. 80).

Did the war losses affect economic development? Human capital was depleted (mobilized men underwent a medical selection; the warfare exacted a high number of lives among officers; many of the survivors were sick or disabled). But the issue is complex: One must not forget that Europe was losing population through migration in the years before World War I, an outflow that came to a halt during the conflict, in some measure diminishing the negative impact of war losses. Moreover, during the war many women joined the labor force, replacing men in many activities, in the fields as well as in the factories. Many of these remained in the labor force once the war was finished. In the absence of reliable and comparable data on the labor force, Figure 5 relates the change in the male population of active age (15 to 64) between 1913 and 1920, and the change in GDP per capita over the same period, for fifteen European countries. The figure shows a positive association between the two indicators and does not reject the hypothesis that depletion of human capital went hand in hand with a weak or negative performance of per capita income. However, it is likely that countries that suffered the most in terms of human losses were also those whose physical capital was most damaged by the conflict, and the association above may be in part spurious.

The case of France is interesting. It was the European country most deeply scarred by the warfare on its own territory, a strip 500 kilometers long from the North Sea to the frontier of Switzerland laid waste. Military deaths totaled 1.3 million, or 34 per thousand population, the highest rate in Europe (Becker 1999, p. 80). For a population with the lowest natural increase in Europe, the negative impact was serious. France had favored immigration during the war, particularly in the agricultural sector where the scarcity of manpower was mainly felt. Immigrants came from Spain, Portugal, and Greece, but also from Indochina and North Africa. After the war, the government, faced with the task of reconstruction and the restructuring of the economy, initiated a policy of immigration (particularly from Italy, Poland, and Czechoslovakia). Between 1921 and 1931 the foreign population increased from 1.5 million to 2.9 million, while 0.4 million foreigners were naturalized French. The gross inflow of foreign workers in the 1921-30 period was 1.7 million, mostly in agriculture, mining, and manufacturing (Garden 1988, pp. 106-7, 112).

The case of Britain was different. Human losses were lower than France's (0.7 million against 1.3 million), and Britain's demography was much more dynamic. It was quality, more than quantity, that mattered. A common opinion was that the war had been dysgenic because it had stripped the country of the best young people: Those who joined the armed forces enthusiastically and early, and who were in the forefront of the battle, were also more educated and skilled. The myth of a "Lost Generation" was created. J.M. Winter has tested the Lost Generation hypothesis against the available data: Officers had proportionally more

Figure 5
Growth in Population and GDP per Capita
in Western Europe, 1913 to 1920



killed, wounded, missing, and prisoners of war than other ranks. Members of the Universities of Cambridge and Oxford who joined the Army had a much higher proportion of casualties than average (Winter 1977). The negative effects of the war on the élites were further compounded by the gender asymmetry created in the marriage market, forcing many women to renounce marriage and forgo reproduction. The higher toll of the élites in the war is supported by French and Italian data: Officers' mortality was substantially higher than that of men of other ranks.

So one provisional conclusion is that war depleted the human capital in both quantitative and qualitative ways. In terms of per capita welfare, the losses may have had a depressing impact, at least in the short term. In the case of France, where losses had been very serious, immigration provided a solution.

World War II

The consequences of the 1939-45 war were deeper than those of the war of 1914-18. Human losses were less pronounced in 1939-45 than in 1914-18 in France, the United Kingdom, Belgium, or Italy; they were of the same order in Germany; they were much heavier in Eastern Europe and the Soviet Union. Living standards fell much more during the Second World War than during the First, and the destruction of the capital stock was much more extended and pronounced. Germany lost its territorial

acquisitions, plus East Prussia and other territories west of the Oder-Neisse line. Forced migrations of ethnic Germans living in Poland and Czechoslovakia added millions of people to the Federal Republic of Germany. The redefinition of the borders added some 14 million people to the USSR. More than 100 million people living in Eastern Europe were absorbed into the Socialist political and economic system (Maddison 1976, pp. 468-73).

Separation of the effects of the demographic shocks from those of a political, social, and economic nature goes beyond the forces of this author and—perhaps—beyond the scope of this conference. We have seen, however, that in terms of “potential growth” (the ratio of people ages 0 to 4 to those ages 30 to 34), the European countries shown in Figure 1 were better off in 1945 than in 2000 or in 1920. Economic reconstruction in Western Europe and the quarter of a century of strong growth after the end of the war certainly benefited from a plentiful supply of cheap labor through immigration; this held down the cost of labor and goods, enhanced international competition, and promoted mobility between economic sectors. Between 1950 and 1970, France, Germany, the Benelux countries, and Switzerland had a net immigration of about 8 million people, coming mainly from Italy and the Iberian peninsula, areas that were still generating large rural population surpluses and benefiting from the migrants’ remittances. So immigration was once more, for Western Europe, an easy and convenient response to the human losses of war.

RECENT DEVELOPMENTS IN THE FORMER USSR

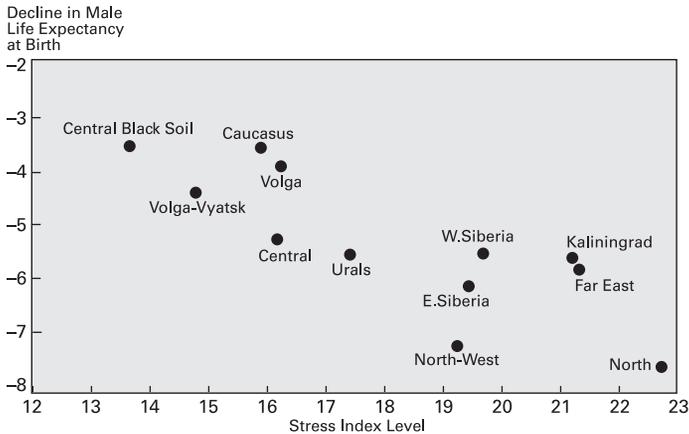
Developments of the late 1980s and 1990s in the former Soviet Union and in Central and Eastern Europe have not ceased to produce consequences and are not yet “history.” But they offer many opportunities for reflection on the nature and effects of demographic shocks. Populations in this region have suffered a marked worsening of survival rates during the economic and political transition; fertility has declined far below replacement and negative growth has set in almost everywhere. The transition mortality crisis has been very severe in Russia and the Ukraine, particularly for the male adult population. In Russia, male life expectancy declined from 64.2 years in 1989 (more or less the level achieved in the 1960s) to a minimum of 57.6 in 1994; the following recovery has been modest and it is estimated that in 1999 life expectancy was only 59.9, about 15 years below the level of the Western populations. Among women, the fall in life expectancy has been smaller, from 74.5 years in 1989 to 71.2 in 1994. Declines in the Ukraine have been about half those in Russia. It has been estimated that over the 1989-95 period, the crisis caused 2.6 million excess deaths in Russia and the Ukraine (Cornia and Paniccià 2000, p. 5). In Russia, life expectancy for men had started deteriorating in the late 1960s; an improvement in 1986-87 was widely

credited to the anti-alcohol campaign; then the decline resumed in 1988-91 and accelerated in 1992-94, with stabilization in the following years. Increased mortality was particularly high among adults 30 to 60 years old and was due, above all, to cardiovascular diseases, injuries, and violence. Shkolnikov and Cornia (2000, pp. 272-77) have explained the crisis under five different headings:

- (1) *Rising poverty*. Poverty rates soared from 10 percent in 1991 to 30 to 40 percent in 1993-94, increasing malnutrition and undernutrition. However, the authors estimate that the impact must have been reduced, judging by the modest increase in poverty-related diseases such as infectious, parasitic, and respiratory disease.
- (2) *The collapse of the health system*. This development, however, seems unable to explain the increased incidence of cardiovascular attacks and violent and accidental deaths.
- (3) *The weakening of the state*, attested to by the increase in homicide and injury rates, caused by the erosion of law and order. The authors also underline the inability of the Russian leadership to recognize the gravity of the problem and adopt policies adequate to cope with it.
- (4) *Adverse change in lifestyles*, such as smoking and, particularly, alcohol consumption, the latter closely related to the staggering increase in violent deaths as well as to a wide range of other causes of death.
- (5) *Rising psychosocial stress*. In these transitional societies, unemployment, job insecurity, family instability, personal insecurity, marginalization, changes in social hierarchies—all factors of psychological stress and disadaptation—have been rising and, in the opinion of the authors, have contributed to the rise in mortality. “Stress and mortality rises were less marked among women, the youth, people in stable employment, married people and people with higher education” (p. 277). Alcohol consumption is closely associated with stress. Figure 6 shows the negative association between the absolute decline in life expectancy in the various regions of Russia between 1989 and 1993 and a “stress index” summarizing the impact of changes in unemployment, labor turnover, and marital status over the same period.

The Russian case—as well as events in other countries of the former USSR and Central and Eastern Europe—suggests two relevant reflections. The first is that extended survival is a complex achievement, the consequence of an incremental accumulation of material resources, scientific knowledge, technological advance, efficient social actions and policies, correct personal behavior, and control of the environment. Extended survival must be sustained; it is not irreversible, and it is jeopardized by a profound crisis—first of all political, but also economic

Figure 6
Association between Declines in Male Life Expectancy and
Levels of a Stress Index^a
Regions of Russia, 1989 to 1993



^aThe "stress index" summarizes the impact of changes in unemployment, labor turnover, and marital status.

Source: Cornia and Panicià (2000).

and social—such as that undergone by former USSR populations in the 1990s. The second consideration concerns the relevance of psychosocial stress among the factors determining the mortality crisis and, therefore, the importance of policies able to reduce or buffer stress, such as labor policies, policies against social exclusion, and measures enhancing personal security.

CONCLUSIONS

We have dealt with a series of crises—or shocks, seismic shifts, catastrophes—of the past in the Western world. They were due to a variety of causes that range from those completely exogenous to the demographic system, such as the plague, which literally disembarked from ships coming from another continent, to those that were completely endogenous, such as famines generated by the inability of the economic system to cope with a growing population. Of course the concepts of "endogenous" and "exogenous" depend on the definition we give of a "demographic system," which can be alternatively seen as a simple interplay of pure demographic phenomena or as a complex web of interactions between demography, economy, society, and biology.

In closing these pages it may be of some interest to consider a recapitulation of the possible impacts of crises and shocks on demography, the economy, and society.

Demographic consequences: losses and rebounds. Crises have a demographic impact, in the sense that excess deaths (for instance) and deficits of births determine a certain decline or negative deviation from trend. Moreover, a selectivity of mortality (by gender, age, frailty, social characteristics, and so on) occurs that has an impact on subsequent demographic growth, determining “rebounds” in the short or the medium period that buffer short-term losses (Figure 3). Consequences may also be of a negative nature, because cohorts most affected by the crises may later suffer higher mortality than those not touched by it (Caselli et al. 1987).

Demographic consequences: structural changes. Crises may have a permanent demographic impact, in the sense that they may determine, or open the way for, long-lived or permanent modifications of the demographic system. The hypothesis has been advanced that the plague might have caused the early and high nuptiality, typical of the late fourteenth and fifteenth centuries, that accelerated the recovery of population. In the case of Ireland, the Great Famine opened the way for a transition to a system of late and low nuptiality and—perhaps—made emigration a permanent strategy of Irish families. In the case of Central and Eastern Europe, the recent transition may have (according to varying points of view) favored, accelerated, or determined the passage to the current very low fertility—far below replacement—as an adaptive response of families to economic hardships, curtailing of welfare, rising insecurity, and the competing appeal of new consumption models.

Economic consequences. In rural society, crises have raised the ratio of capital (land) to labor and increased the price of labor, apparently improving the standard of living. After the plague a process of “de-intensification” of agriculture followed, with recomposition of land holdings, a decline in prices, and an increase in real wages. A process of recomposition of land holdings took place in Ireland after the Famine. Historically, after serious subsistence crises the cultivation of new crops—such as the potato or maize—has become popular in many areas of Europe, finding a central place in the diet. In general, in rural societies, post-crisis societies seem not to have impeded (some would say seem to have determined) an increase in personal welfare. Modern wars, on the contrary, causing destruction of physical capital as well as human capital, determine a decline of personal welfare in the short or medium term.

Human capital. Post-plague societies tended to reorganize human capital in more efficient ways, particularly through the restructuring of family units in larger and more structured groups. Settlement was reorganized, isolated units or depopulated villages were abandoned. Policies fostering urban immigration were enacted. Emigration and immigration have been powerful adaptive strategies: emigration for

overpopulated Ireland, immigration for depleted French society after the First World War and for Western European industrial countries after the Second World War.

Institutions and policies. These changes may go in a plurality of directions and their categorization is difficult. A few instances have been mentioned, such as the loss of power of seigneurial estates in favor of the peasantry after the plague, or urban immigration policies. Another example is the gradual establishment in all of Europe of "boards of health," which monitored epidemics and reacted accordingly with measures of quarantine, cordons sanitaires, blockades of merchandise, patents of ships, and the like. Still another is the progressive assumption by the state and public authorities of the obligation to relieve citizens in case of disaster and famine, through massive purchases, procurement, and so on. One could also cite the change in population policies enacted by Stalin in 1936 after the 1932-33 catastrophe, although one could find many other political reasons for it.

In general, one could say that the adaptive responses to crises depend very much on the characteristics of the societies affected, on their flexibility and their ability to adjust at the societal as well as at the individual level. This flexibility was probably much higher in rural societies with a moderate degree of specialization of functions, where people could easily replace one another. The labor force was the entire pool of able-bodied men and women: Ability to work, rather than age, was the important factor. Crises in rural societies had an impact because of the degree of depletion of human capital, rather than because of the characteristics, such as age distribution, of the losses. Families could easily reorganize themselves in more efficient units in order to provide labor and solidarity. Crises, and their consequences, are much more severe when the traditional mechanisms of solidarity, coping strategies, and economic buffers are destroyed. This was the case in the 1932-33 crisis in the USSR, where universal collectivization (going to the extreme of prohibiting cultivation of plots for personal use) deprived individuals of a traditional mode of life, making them more vulnerable to hardship. Societies open to immigration were, and are, much less vulnerable to the consequences of human losses.

Conditions at the beginning of the millennium, in the rich world, are structurally very different. Low fertility and aging, in Europe and Japan, are the bases of the prospective negative demographic dynamic. We have seen, at the beginning of this paper, that replacement levels are much lower now than at any crucial point of European history, perhaps with the exception of the plague times. The future will depend on the ability to correct ongoing negative trends through a recovery of fertility and an opening up to immigration, and the ability to increase social flexibility through a reconsideration of the age and gender patterns of social activity and functions.

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