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Making Famine History

Cormac Ó Gráda*

This paper reviews recent contributions to the economics and economic history of famine. It provides a context for the history of famine in the twentieth century, which is unique. During the century, war and totalitarianism produced more famine deaths than did overpopulation and economic backwardness; yet by its end, economic growth and medical technology had almost eliminated the threat of major famines. Today's high-profile famines are "small" by historical standards. Topics analyzed include the role played by food markets in mitigating or exacerbating famine, the globalization of disaster relief, the enhanced role of human agency and entitlements, distinctive demography of certain twentieth-century famines, and future prospects for "making famine history."

1. *Introduction*

In this article, "famine" entails a widespread lack of food leading directly to excess mortality from starvation or hunger-induced illnesses.[1] In the global history of famine so defined, the twentieth century presents a paradox. On the one hand, it saw the disappearance of famine from most of the globe. On the other, it witnessed in China in 1959–61 what probably was, in terms of excess mortality, the greatest famine in history. A recent survey of twentieth-century famines reckons their aggregate cost in terms of lives lost at roughly seventy million: less than the toll exacted by endemic and epidemic diseases, but roughly as many as by World Wars I and II combined (Devereux 2000). In addition, famines resulted in millions of "lost" births and stillbirths, and had potentially significant effects on the physical and mental well-being of survivors.

Until recently, therefore, famines very much mattered. Almost certainly, in earlier centuries they mattered even more in relative terms. Today's high-profile famines are, by comparison, small. That in Niger in 2005 pales into insignificance compared to one that robbed the same country of up to one-third of its people in 1931 (Finn Fuglestad 1974). What was described in 1998 as Sudan's "worst famine in its history" was later deemed to have killed no more than 70,000 and another much-publicized famine in Malawi in 2002 killed fewer than a thousand (*The Guardian*, August 22, 1998; Devereux 2000; Devereux 2002). By the 1990s, famine-induced deaths were confined to poverty-stricken and often war-torn

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[1] On the range of alternative definitions proposed, see Paul Howe and Stephen Devereux 2004; Martin Ravallion 1997.

pockets of the globe. Perhaps for the first time in human history, eliminating famine should be "easy." The eradication of Thomas R. Malthus's ultimate check would be a notable achievement for mankind.

The purpose of this article is to review recent contributions to the economics and economic history of famine. Its structure is as follows. Section 2 reviews alternative explanations of why famines occur and persist. These are divided into factors relating to agricultural shocks and economic context (the frequency and impact of crop failures) on the one hand, and those relating to human agency (the functioning of markets, war and social upheaval, public action, governance) on the other.[2] Section 3 takes up the problems of defining and identifying famines, and some methodological issues in studying them. It argues that, while material progress and medical technology have undoubtedly reduced the demographic cost of famines, their long-term cost in terms of health may be greater than previously realised. Section 4 briefly reexamines three major twentieth-century famines in the light of sections 2 and 3. Section 5 concludes.

2. *Accounting for Famine*

2.1 *More Likely in Poorer Countries*

Why famines? In the past, vulnerability to famine was usually seen as a function of economic backwardness and the weak infrastructure and adverse disease environment that backwardness entailed. Coping mechanisms against harvest failure—crop insurance, storage, trade, public action—were lacking, and breakdowns in communications and transportation more likely. Because poverty meant poor hygiene and sanitation, most famine victims succumbed to infectious disease rather than famine proper. The deadliness of any given famine depended mainly on the severity of a harvest shortfall; private philanthropy and public action might mitigate, but rarely overcame, the ensuing hazards.

United Nations output and welfare indices highlight the close correlation between famine and underdevelopment today. Niger, focus of global media attention in 2005, is probably the poorest economy in the world, while GDP per head in Ethiopia and Malawi, also threatened by famine in the new millennium, are in real terms less than half that of the United States two centuries ago. Five of the six countries most prone to food emergencies since the mid-1980s—Angola, Ethiopia, Somalia, Mozambique, and Afghanistan—were ranked in the bottom ten out of 174 on the United Nations' Human Development Index in the mid-1990s (UNDP 1996); the sixth, Sudan, was ranked 146th. Moreover, famines within countries are most severe and slowest to disappear in remoter, densely populated, and poorly diversified rural regions.[3] In Ireland in the 1840s, the correlation across administrative units between population loss and measures of prefamine backwardness, such as housing quality and literacy, was very high (Cormac Ó Gráda 1999). Across Bengal's twenty-six rural divisions in 1942–43, excess mortality and population density were also highly correlated.[4]

In this context, the extreme backwardness of China on the eve of the Great Leap Forward (GLF) famine bears noting. In 1950, Chinese GDP per head (measured in international 1990 dollars) was less than that of *any* African country in 2003, with the exception of the Democratic Republic of the Congo (formerly Zaire); and in the mid-1950s it was less than half today's African average. Chinese GDP per head in 1950 was

[2] The distinction, which is not watertight, echoes that of Cornelius Walford (1879) between "natural" and "artificial" causes of famine.

[3] E.g., northwest England in the 1620s, Anhui and Sichuan in China in the 1950s, northwest Finland in the 1860s, North Hamyong province in North Korea in the 1990s.

[4] Using 1931 population data and mortality estimates in Arup Maharatna (1996), the associated elasticity is 0.57.

also only about one-fourth that of U.K. GDP per capita in 1820 (of which Ireland was an integral part when the potato famine of the 1840s struck) (Angus Maddison 2006).

Poverty also helps explain why infectious disease still looms large in famine mortality in sub-Saharan Africa today. It makes the cost of medical care prohibitive; more important, the associated remedies are difficult to implement in crisis conditions (Joel Mokyr and Ó Gráda 2002). Even in normal times in sub-Saharan Africa, the world's main remaining famine-prone region, infectious and parasitic diseases alone were responsible for nearly half of all deaths in the 1980s, with diarrheal diseases accounting for nearly one quarter of those (C. J. L. Murray, A. D. Lopez, and D. T. Jamison 1994). In such areas, diseases endemic in normal times still account for much of the excess mortality during famines.

The availability—at a price—of the technology to prevent and treat diseases, such as malaria, typhus, and dysentery, compounds the anachronistic character of present-day famine. Much of sub-Saharan Africa has yet to experience fully the "epidemiological transition"; public health lags rather than leads medical science. This is no longer because of ignorance of low-cost primary health care, such as immunization, prophylactics, and rehydration, or even because of the lack of medical personnel. Missing are the resources and the political capabilities to put what is available locally or obtainable from abroad (through NGOs and international institutions) to most effective use.

2.2 *Crop Failure*

Most famines in poor economies are associated with the impact of extreme weather—droughts, excessive rain, or a combination of the two—on the harvest, although, as will be shown in the following sections, dramatic crop failures are neither a necessary nor a sufficient condition for famine. Even the "man-made" famines in the Soviet Union in 1932–33 (see section 4.1) and in China in 1959–61 (see section 4.3) were due in part to crop failures.

However, even the most backward economies often have the resilience to cope with once-off harvest shortfalls; in Africa today, "a visitor can only see a single year of drought, and that is not enough to cause famine" (Alex de Waal 1997, p. 115).[5] Historically, the worst famines have been the product of back-to-back shortfalls of the staple crop. Ireland offers a well-known example: had *phytophthera infestans* not struck the potato crop twice in a row in 1845 and 1846, there might have been no Great Irish Famine. Other well-known famines associated with back-to-back harvest failures include the Great European Famine of the 1310s, the Deccan famine of 1630–32, the Finnish and Scottish famines of the late 1690s, the Berar famines of the 1890s, the Soviet famine of 1932–33, and the Chinese famine of 1959–61.[6] Thus, the probability of back-to-back poor harvests should provide some sense of the likelihood of famine in the past.

This suggests the strategy of identifying "bad" harvests in historical data as those less than some percentage of their expected or trend value, and then calculating $p(s)$, the probability of such a shortfall, and $p(s).p(s)$, the likelihood of a back-to-back shortfall if such events were random. The expected and actual incidence of repeat failures can then be compared (Peter Solar 1989; H. H. Lamb 1995). Back-to-back events could spring from "natural" or "unnatural" causes. The former would include the effect of serial autocorrelation in the weather (defined by some combination of temperature or rainfall), and that of low yield ratios and poor storage capacities. The latter would include war.

How common were back-to-back poor harvests in the past? Agricultural output data

[5] The frequency of famines in the past is discussed in, e.g., John Iliffe 1990; John C. Caldwell 1998; Peter Boomgaard 2001.

[6] Compare Tim Dyson 2002; Eric Vanhaute, Richard Paping, and Ó Gráda 2006.

TABLE 1
Back-to-Back Harvest Shortfalls

			HARVEST FAILURES OF >20%		HARVEST FAILURES OF >10%	
Country	Period	Crop	Actual	Ratio	Actual	Ratio
India	1890–1947	Wheat	.018	2.4	.018	0.4
India	1914–1946	Barley	.000	.	.000	0.0
India	1891–1947	Rice	.018	6.4	.054	1.2
Madagascar	1923–88	Maize	.077	3.4	.200	1.6
Algeria	1875–1970	Wheat	.000	0.0	.0625	3.5
Algeria	1875–1970	Barley	.052	10.0	.115	4.1
Egypt	1909–88	Wheat	.000	0.0	.050	1.1
Egypt	1909–88	Maize	.0125	8.9	.0875	2.5
Egypt	1909–88	Rice	.125	0.6	.2125	1.7
France	1815–1914	Wheat	.010	1.5	.040	0.9
France	1815–1914	Potatoes	.040	3.3	.090	2.0
Germany	1846–1914	Rye	.000	0.0	.029	1.1
Germany	1846–1914	Wheat	.000	0.0	.029	1.2
Germany	1846–1914	Barley	.0145	17.3	.058	2.3
Germany	1846–1914	Oats	.0145	2.8	.0145	0.6
Germany	1846–1914	Potatoes	.000	0.0	.0435	0.7

Note: Ratio is the ratio of actual to "expected" frequencies. The data are taken from Mitchell 1975 and Mitchell 1995.

offer some insight, although such data are also scarce before the nineteenth century. The renowned estate accounts of the medieval bishopric of Winchester in southern England provide one straw in the wind: on the assumption that yield ratios fifteen percent or more below average implied crisis harvests, the accounts for the 1283–1350 period returned only two back-to-back crisis harvests, in 1315–16 and in 1349–50.[7] Both were due to excessive rains and flooding (Jan Z. Titow 1960; Bruce M. S. Campbell 2000).

Crop output data are preferable to crop yield data since the latter fail to take account of the likely impact of low yields on acreage sown in the following year (compare Sherwin Rosen 1999). Table 1 reports the outcome from fitting a range of nineteenth and twentieth-century agricultural output data to an appropriate polynomial, and then identifying "bad" years as those with shortfalls of over ten or twenty percent. The results suggest that such back-to-back events are "rare," although more likely than might be expected on a random basis. Since the underlying patterns are unlikely to change much over time, the results may be interpreted as tentative evidence that famines were less common in the past than claimed by Malthus. On reflection, this is not implausible: given that life expectancy was low even in noncrisis years, frequent famines would have made it impossible to sustain population.

Since most harvest shortfalls are caused by extreme weather, meteorological evidence is also worth considering. Monthly mean temperature data are available for central England since 1659 (Gordon Manley 1974). Temperature was subject to serial correlation: running the annual average on its lagged value and a time trend

[7] In 1349, in the wake of the Black Death, corn seems to have been plentiful despite the low yields (William Farr 1846).

TABLE 2
Extreme Droughts and Floods in India, 1871–2002

Area	Drought		Flood	
India	Frequency	Back-to-Back	Frequency	Back-to-Back
India	20	1	18	2
E. Rajasthan	21	0	20	5
W. Rajasthan	14	1	17	4

Source: http://ipcc-wg1.ucar.edu/meeting/Drght/restricted/present/Pant.pdf.

gives a coefficient of + 0.204 ($t = 3.71$) over the 1660–1980 period. However, extreme temperatures matter more for harvests than annual averages and, when the focus is switched from average temperature to the coldest and the warmest months of each year, the autocorrelation disappears. For the mean minimum temperature, the coefficient on the lagged term is −0.025 ($t = -0.45$); for the mean maximum temperature, the coefficient is + 0.076 ($t = 1.36$). Moreover, the probability of back-to-back *bad* years is more relevant than the mere incidence of autocorrelation. Fitting mean temperature series to a three-degree polynomial, and defining "bad" years as those deviating by more than ten percent from expected values, gives the following probabilities and actual frequencies of back-to-back bad years of extreme cold or heat:

	Low	*High*
Expected	.00513	.0039
Actual	.0062	0

There were only two incidents of back-to-back cold years over the whole period[8]—in 1694–95 and 1697–98—and none where the temperatures were more than ten percent above trend in both. Indian monsoon rainfall data tell a similar story. The frequencies of drought and flood years (defined as those at least one standard deviation less or more than the average) between 1871 and 2002 in both India as a whole and in the northwestern state of Rajasthan are described in table 2, along with the number of back-to-back extreme events. In general, all the probabilities were low.

2.3 *Entitlements*

Political institutions and wars often blur the link between living standards and famines, however. In nineteenth-century India and Ireland, for example, concerns about moral hazard constrained famine relief and increased mortality (David Hall-Matthews 2005; Peter Gray 1997). Wars have exacerbated famine throughout history; to take a recent example, in 1944–45 wartime occupation resulted in a famine in the western Netherlands, where productivity was quadruple that of Malawi or Niger today. Moreover, in the twentieth century, totalitarianism greatly increased the cost of policy mistakes and mayhem wrought by governments. When famine struck the former Soviet Union in 1931–33, its GDP per head was about three times that of the most famine-prone countries in Africa today (Maddison 2006). On the eve of a serious famine in the mid-1990s, North Korea was at a similar advantage relative to those same African countries. On the other hand, better communications and the globalization of relief mean that Africa's most backward economies today face far fewer risks than equally poor countries in the past. Such examples highlight the impact of governance and human agency on the occurrence of famines and their effective relief—and on

[8] These two episodes might well be considered part of a single prolonged crisis. The 1690s were a decade of hardship and famine in much of northwestern Europe. In Scotland they were remembered as the "ill years."

the likelihood of their prevention in the future.

Recent famines differ from historic famines in two other important respects. First, as highlighted by Amartya Sen (1981), is the enhanced role of distributional shifts or entitlement losses, rather than output declines per se, in producing famine. Sen's work has prompted research on the functioning of food markets during famines, and on broader issues of governance and optimal relief policy. A second change in the nature of famines concerns the shifting importance of starvation relative to disease as the immediate cause of death. Effective public health systems, once in place, have probably reduced famine deaths overall, while increasing the proportion of excess deaths attributable to literal starvation.

Wars, blockades, poor governance, and civil unrest can also lead to famines; panics about the food supply and poorly performing markets can exacerbate them. In such cases, as Sen (1981) has argued, factors other than crop shortfalls reduce the purchasing power or "entitlements" of vulnerable sections of the population: the size of the loaf matters less than its distribution.

The claim that even during famines there is usually enough food around to feed everyone is not new. An official inquiry into the Indian famine of 1860–61 described Indian famines as "famines of work [more] than of food," while according to the 1880 Famine Commission: ". . . as a general rule, there is abundance of food procurable, even in the worst districts in the worst times; but when men who, at the best, merely live from hand to mouth, are deprived of their means of earning wages, they starve not from the impossibility of getting food, but for want of the necessary money to buy it" (cited in de Waal 1997, p. 22; see also Mike Davis 2001). Such statements make the case for food redistribution mechanisms, but there is no denying that Food Availability Declines (FADs) also played a part in those same and other famines (Sanjay Sharma 2001; Malabika Chakrabarti 2004). Ironically, in the paradigmatic case of Bengal in 1943–44, the state of crops and food supplies remains controversial.

Ellman's adaptation of Sen's model to an analysis of the frequently overlooked Soviet famine of 1946–47 distinguishes between FAD1 and FAD2 famines. Mortality during FAD1 famines is largely unavoidable, whereas alternative policies could prevent or reduce the mortality associated with FAD2 famines. By this reckoning, the 1946–47 famine, coming in the wake of a harvest one-sixth below its already low 1945 level, was in the FAD2 category. Although the global shortage of cereals in 1946–47 probably ruled out the option of seeking supplies from abroad, all or most of the resultant 1.2 million deaths could have been prevented by relaxing procurements and halting exports. Although most of the Soviet Union experienced privation, the epicentre of the "provisioning problems" of 1946–47 was in Moldova where they led to the deaths of about five percent of the population (Michael J. Ellman 2000; Elena Zubkova 1998).

The entitlements approach to famine reverses the relative importance of nature and human action posited by Malthusian analysis. It highlights the impact of human agency on the distribution of food. Yet, on closer inspection, it turns out that even "man-made" famines in the Soviet Union in 1932–33 (on which more below) and in China in 1959–61 contained significant FAD elements. The paucity of evidence for "pure" entitlement famines—famines with no FAD dimension—suggests that modern scholarship may underestimate the role of food supply. It also bears noting that to the extent that a "pure" entitlements famine is akin to a zero-sum game, the gainers and their gains should be readily identifiable.

2.4 *War, Totalitarianism, and Famine*

Today, given good will on all sides, famine prevention should be "easy." Transport costs have plummeted since the nineteenth

century, information travels fast, storage is inexpensive, international disaster relief agencies are ubiquitous, nutritional requirements and medical remedies are better understood (David S. Jacks 2005). The combination certainly reduced the incidence and duration of famine in the twentieth century. Why, then, did and does famine persist? A feature of twentieth century famines is that excess mortality was more often linked with wars and civil strife than with harvest shortfalls per se: familiar examples include the Soviet Union (1918–22), Bengal (1943–44), Vietnam (1945–46), and Ethiopia (1984–85). Warfare impedes both production and trade; the accompanying breakdown in social order and forced migrations may lead to the spread of epidemic diseases. In these and several other instances, human action matters more than, or greatly exacerbates, acts of nature.

A distinguishing feature of the past century is that the rise of totalitarianism greatly increased the cost of policy mistakes and the damage wrought by government. What Adam Smith (1976 [1776], p. 526) claimed, incorrectly, for famines in early modern Europe—that they never arose "from any other cause but the violence of government attempting, by improper means, to remedy the inconveniences of a dearth"—rings much truer for the twentieth century than the seventeenth or eighteenth. In the 1930s and again in the 1950s, not only did totalitarian regimes engage in policies that placed millions at risk, but they also managed to keep the consequences of their actions largely hidden from the outside world (David C. Engerman 2000). Analyses of twentieth-century famines accordingly have tended to dwell less on economic factors such as the background level of development and the extent of the crop shortfall, and highlight instead the role of human agency—be it the ruthlessness of warlords or the incompetence of officialdom.

Sen's reminder that famine and democracy are virtually incompatible is a special case of the more general claim that democratic institutions promote economic justice and reduce inequality (Sen 2001; e.g., Francisco L. Rivera-Batiz 2002; Edward L. Glaeser et al. 2004). Democratization reduces the incidence of famine by speeding up the spread of information and criticism, by reducing corruption, and by penalizing governments that fail to avert disasters and prevent excess mortality. Public action may be rarely disinterested, but democratization buttresses general accountability and forces elites to contribute more to saving lives.

Exceptions to Sen's rule seem few: Ireland in the 1840s (restricted franchise and a free press), India in 1972–73 (when famine produced an estimated 130,000 deaths in Maharashtra), and Niger in 2005 (semi-democracy) are marginal examples. Banik's analysis of press reports of starvation deaths in Kalahandi in the Indian state of Orissa confirms Sen's findings insofar as famines are concerned but highlights the inability of a free press and collective action to prevent mass malnutrition and "many, many deaths" (Dan Banik 2002).

An added complication is that, in poverty-stricken, ethnically divided, low-literacy economies, democracy may not be sustainable. Nonetheless, the exogenous element in democratic institutions surely matters. Meanwhile, evidence on the progress of democratization and economic deregulation in Africa in the recent past is mixed, but on balance positive. Between 2000 and 2005, the widely used "Freedom Index" rose in 28 out of 40 African countries and, between 1995 and 2000, it rose in 16 out of 28 cases documented, while between 1980 and 2003 the average of the "Polity Index" (http://www.cidcm.umd.edu/inscr/polity/), a measure of good governance, for the 41 African nations for which data are available rose from – 4.7 to 0.7.

2.5 *Markets and Famines*

Economists have long argued that, since crop failures nearly always vary in intensity

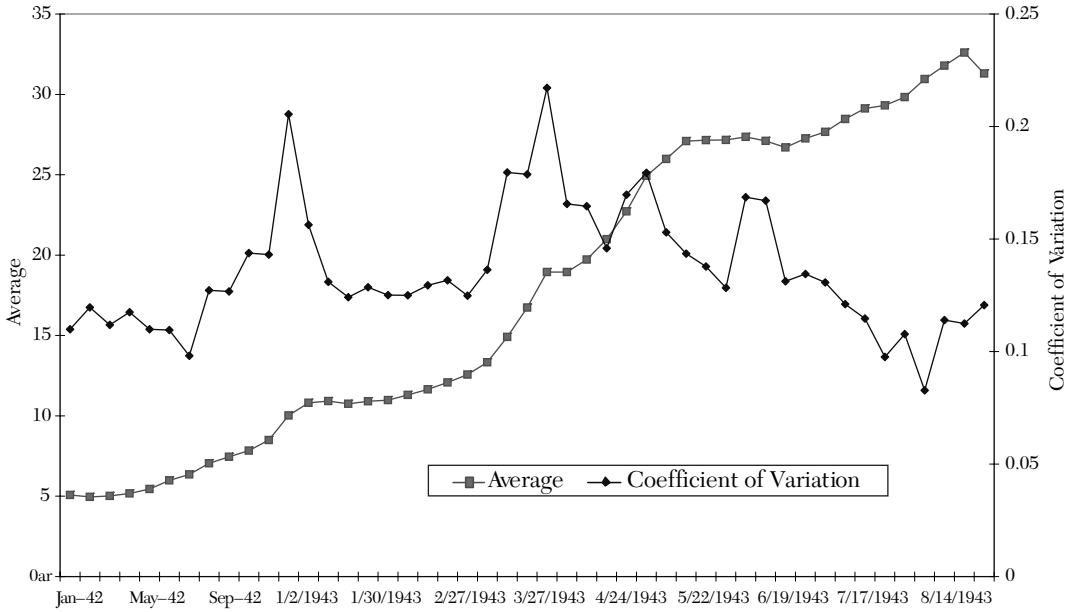

Figure 1. Rice Prices in Bengal, 1942–43: Mean and Coefficient of Variation

across regions and countries and, as noted above, major back-to-back failures are few, spatial and intertemporal arbitrage should help mitigate or reduce the cost of famines (Karl Gunnar Persson 1999; Smith 1976). However, natural (poor communications) and artificial obstacles (war, trade restrictions and price controls, civil unrest) have often impeded the scope for arbitrage. Collective resistance (as in Ireland in 1846–47 and in France in 1709) and local administrators (as in different Indian provinces in 1943) may seek to protect consumers in would-be exporting regions.

Research on Bengal in 1942–44 and Bangladesh in 1974–75 shows that food markets worked poorly in these instances in the double sense of inadequate regional arbitrage and "excessive" hoarding on the part of producers and traders. Sen (1981) found that farmers and grain merchants had converted a "moderate short-fall in *production* . . . into an exceptional short-fall in *market release*" (p. 76, emphasis in original). The famine was due in large part to "speculative withdrawal and panic purchase of rice stocks . . . encouraged by administrative chaos" (Sen 1981, p. 76). Such speculation exacerbated the deterioration in the exchange entitlements of the poor, already hit by inflationary rises in the price of food. Ravallion's study of Bangladesh in 1974–75 broadly corroborated Sen's findings for Bengal, and found that excess mortality in Bangladesh was "in no small measure, the effect of a speculative crisis." Rice prices rose dramatically because merchants badly underestimated a harvest that turned out to be normal. Ravallion also found evidence of "significant impediments" to trade between the capital city, Dhaka, and its main sources of supply during this famine (Ravallion 1987a, pp. 19, 111–13; 1997, pp. 1219–21; Charles Becker and Munir Quddus 2000; Raisuddin Ahmed, Steven Haggblade, and Tawfiq-e-Elahi Chowdhury 2002).

The Law of One Price implies that, as long as transport costs remain constant, the variation in food prices across markets should decline during famines. Figure 1 describes the variation in rice prices across Bengal between January 1942 and August

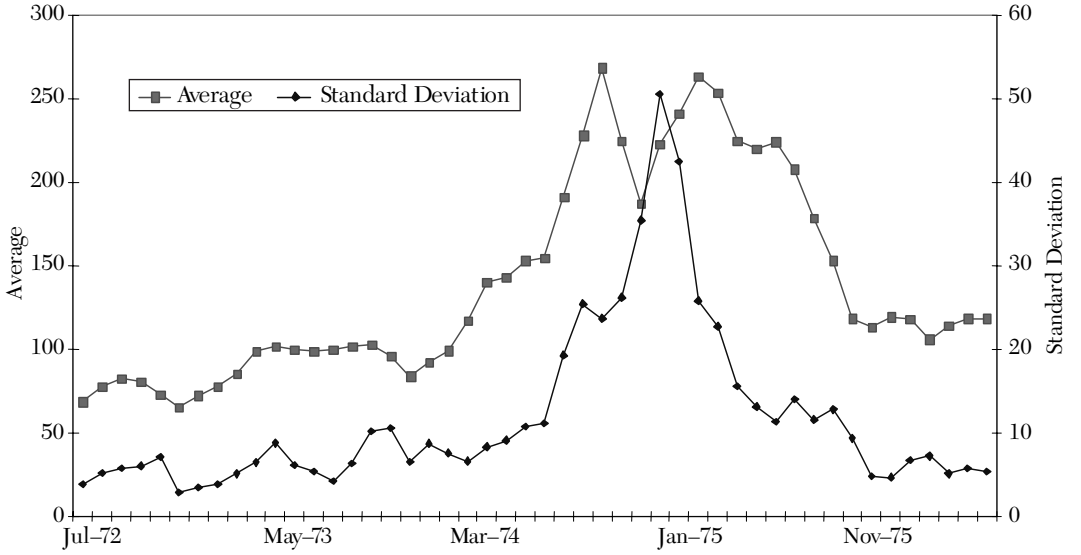

Figure 2. Regional Variation in Rice Prices in Bangladesh 1972–76

1943. It suggests that, given the disruption of traffic due to wartime restrictions, markets became more segmented during the famine, but only marginally so, apart from brief intervals in November 1942 and March 1943.[9] Figure 2 describes quite a different outcome in Bangladesh three decades later: the spike in the standard deviation in late 1974 and early 1975 reflects the balkanisation of markets at the height of the crisis.

The evidence from sub-Saharan Africa in the 1980s is also of interest. Jean Drèze and Sen's comparison of markets in famine-threatened Botswana and Kenya in the early 1980s shows that across eighteen markets in Botswana, where the average price of maize meal rose from 3.53 to 4.74 *pula* per bag between August 1980 and April 1983, the standard deviation fell from 0.25 to 0.23, whereas across eighteen markets in Kenya, where the average retail price of maize rose from 2.42 to 4.61 Kenyan shillings per kilo between January and November 1984, the standard deviation increased from 0.36 to 2.07 (Drèze and Sen 1989, pp. 138–46, 152–58).

According to Patrick Webb and Joachim von Braun (1994; see also von Braun, Tesfaye Teklu, and Webb 1999), famines in Sudan and Ethiopia in the mid-1980s were also exacerbated by weak spatial market integration. In normal times in Ethiopia, prices moved in tandem, but in the mid-1980s and again in 1988 the prices of sorghum and teff (the staple crop of the Ethiopian highlands) in Dessie, capital of Wollo province, soared above prices in other regional capitals. Von Braun and Webb link such anomalies to restrictions on private traders, buttressed by quotas and roadblocks. Trends in the spreads of teff and sorghum prices across Ethiopia in 1981–85 tell a slightly different story, however. The rise in the coefficient of variation of teff prices across ten of Ethiopia's provinces,

[9] Figure 1 refers to the coefficient of variation to adjust for wartime inflation. The Bengali data are taken from the Pinnell Papers (British Library, Indian Office Records, Mss. Eur. D911/8, "Further information desired by the Commission on 3rd Sept 1944: Prices"); the Bangladeshi data are taken from Mohiuddin Alamgir (1977).

from an average of 0.24 in 1981–83 to 0.28 in 1984 and 0.34 in 1985, was significant but less than that occurring in Kenya over roughly the same years. The coefficient of variation of sorghum prices changed little during the same period: 0.43 in 1981–83, 0.41 in 1984, and 0.45 in 1985 (derived from B. G. Kumar 1990).

Formal studies of how markets worked during pre-twentieth century famines are few, although evidence from nineteenth-century Ireland and Finland and from ancien régime France suggests that they functioned no worse than in normal times (Ó Gráda and Jean-Michel Chevet 2002; Ó Gráda 2005). These studies employ annual and monthly price data to estimate (1) whether famines led to increasing price dispersion between regions; (2) whether markets were slower to adjust to disequilibria during famines; and (3) whether markets systematically overestimated the harvest shortfall in times of famine and, therefore, led to excessive storage.

On the evidence of these famines, in preindustrial Europe the variation in prices either fell or, at most, rose little. Moreover, monthly price data from a range of French, Finnish, and Irish towns imply strong comovements between pairs of markets in crisis years and, in general, speeds of adjustment to disequilibria no slower than in noncrisis years. Finally, the particularly sharp seasonal price rises recorded during famines in preindustrial Europe fail to support the view that producers and traders held back supplies early in the season in the hopes that prices would rise later.[10] The asymmetry in speculators' expectations implied by the findings of Sen and Ravallion—overpessimism in the event of a harvest shortfall—is absent in the data (Ó Gráda 2005). Why did markets work "better" in nineteenth-century Ireland and Finland than in twentieth-century Bengal and Bangladesh? A key difference is the political context: Bangladesh was emerging from civil war in 1974–75, while Bengal was under threat of invasion in 1943–44.

That is not to say that markets worked like clockwork in preindustrial Europe—far from it—merely that their responses to spatial and intertemporal disequilibria were no slower than in noncrisis times. In practice, markets may adjust too slowly: in the mid-nineteenth century, for example, before the telegraph and long-distance bulk carriage by steamship could have made the difference, global grain markets could not prevent mass mortality in Ireland and India (Ravallion 1987b; Ó Gráda 1999; see also Walter H. Mallory 1926). Nor does this mean that well-functioning, integrated markets always benefit the poor: as Sen's classic contribution emphasizes, it is easy to imagine how they might allow inhabitants of less-affected areas, endowed with the requisite purchasing power, to attract food away from famine-threatened areas. Much depends on the extent to which such exports are used to finance cheaper imported substitutes (e.g., maize for wheat) and on the speed with which food markets adjust. Dogmatic generalizations are not warranted.

Free markets may mitigate the impact of famines in two other respects. First, migration arguably limits the damage wrought by poor harvests, since the migrants reduce the pressure on scarce food and medical resources where the crisis is deepest.[11] This is probably true even when the poorest lack the resources to migrate. In Ireland in the 1840s, emigration to America was a particularly appropriate form of famine relief, given the large and permanent productivity shock to agriculture. It was hardly ideal, insofar as it did not help those most at risk directly, but famine mortality would surely have been

[10] The same could be argued for the failure of prices to plummet below their prefamine norm as hoarded stocks were sold off.

[11] Forced migration, such as that associated with the Soviet Gulag in 1932–33, has the opposite effect (Oleg V. Khlevniuk 2004).

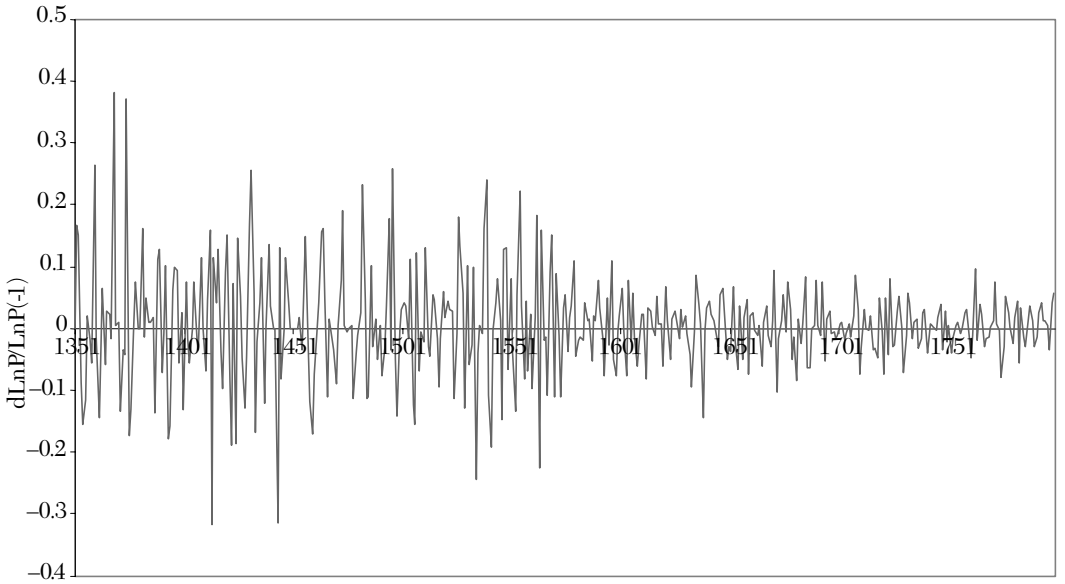

Figure 3. Year-to-Year Variation in the Price of Wheat in Pisa, 1351–1799

higher without it, with more people competing for scarce food supplies. In addition, some migration would have been diverted to the already crowded cities of Ireland and Great Britain. Migration undoubtedly exacted a cost in terms of the spread of infectious disease in host countries, but on balance it saved lives (Ó Gráda and Kevin H. O'Rourke 1997).

Second—as first emphasized by eighteenth-century French economists—the regional specialization that follows free trade increases aggregate output, with a resultant reduction in the risks attendant on any proportionate harvest shortfall. Increasing commercialization also means better spatial and intertemporal arbitration in the markets for food. The latter is evident in the data from Pisa and England describing year-to-year differences in the natural log of wheat prices over several centuries prior to 1800 (figures 3–4).[12] The implied reduction in the cost of holding carryover stocks and of transport greatly reduced the vulnerability of the Italian and the English poor in the early modern era (compare Persson 1999).

2.6 *Government Action*

Throughout history, a shifting mix of solidarity and fear has led ruling classes to accept a degree of responsibility to those at risk during famines.[13] Most analytical attention has focused on how relief from the central authorities has been allocated, rather than how much relief was given. Since human interventions almost always give rise to principal–agent problems, choosing the appropriate yardstick for effective famine relief is an abiding issue. In the past, because governing elites were remote from those at risk,[14] they often relied on sub-bureaucracies and landowners to identify worthy recipients of relief. History is full of

[12] The price data are taken from Gregory Clark 2003 (England); Paolo Malanima n.d. (Pisa).

[13] However, some famines stem from a determination *not* to transfer relief to targeted groups. Famines resulting from scorched earth warfare fall into this category: so are famines caused or exacerbated by narrow dogmatic visions of a better life for future generations at the expense of the present—be they in Ireland in the 1840s or in the Soviet Union in the 1930s.

[14] In urban settings, where the threat of food riots during famines was real, the challenges were different.

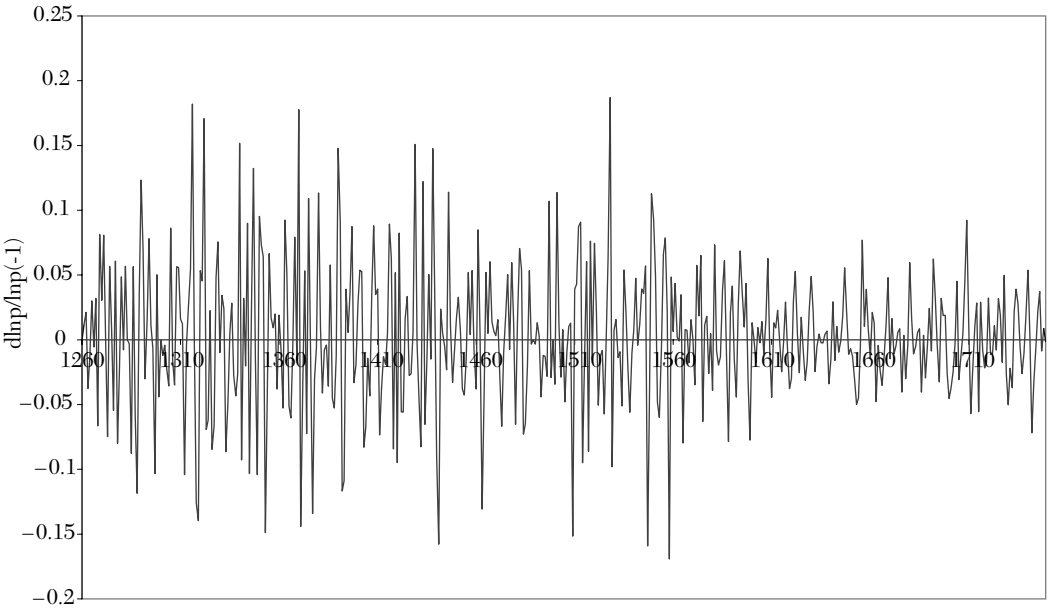

Figure 4. Year-to-Year Variation in the Price of Wheat in England, 1260–1749

examples of trade-offs between red tape, on the one hand, and corrupt agents, on the other (Ó Gráda 2007). Consider Qing China, where the venal and rapacious character of village chiefs was taken as given by the central government; for relief to have any hope of success, the central bureaucracy needed to bypass them at local level (Pierre-Étienne Will 1990). At first sight, the finding that during the Kangxi emperor's reign (1662–1722) the size of a province's grain stocks varied inversely with the amount of relief granted suggests a well-functioning relief mechanism responding to the scale of shortages facing the provinces and their relative backwardness. It turns out, however, that in crisis after crisis the provinces receiving relief were most likely the richest (Carol H. Shiue 2004, 2005). The central bureaucracy relied on corrupt local agents to identify and relieve those most at risk, and the resultant allocation reflected a moral hazard problem arising out of asymmetric information. Periodic monitoring of grain stocks and penalties against officials mitigated the problem but did not eliminate it.

The choice of appropriate public action in the presence of such agency problems has been amply discussed in Drèze and Sen (1989), Ravallion (1997), and elsewhere.[15] Transfers of food at below market prices may risk corruption and hoarding; hence the frequent focus on the provision of nontradable and highly perishable food rations. Income transfers (e.g., through wages paid on public work schemes) are less likely to distort food markets, though if linked to work performance, they discriminate against those in most need. Public works schemes also risk spreading infectious disease. A further problem with public works is that fiscal stringency or fears of distorting labor markets, as in Ireland in the 1840s and in southern India in the 1870s, may entail below-subsistence wages and consequent excess mortality (Hall-Matthews 2005; Pat McGregor 2004; compare Gray 1997). In India, mass mortality in 1896–97 and 1899–1900 was also in part the product of fiscal parsimony and

[15] E.g., Timothy Besley and Stephen Coate 1992; von Braun, Teklu, and Webb 1999; David Coady 2004.

penal wages earned on relief works (Maharatna 1996; B. M. Bhatia 1967; Davis 2001). The rhetoric of famine relief policy softened thereafter, and José Antonio Ortega Osona (2001) attributes the reduction in year-to-year fluctuations in mortality in Bengal after 1900 to a combination of better weather and more effective social safety nets.

Local histories of the Irish famine of the 1840s highlight the mismanagement of the public works, the impossible burden placed on local taxpayers, and the appalling conditions facing workhouse inmates (e.g., Ciarán Ó Murchadha 1997; Andrés Eiríksson 1997). Measurable yardsticks of workhouse performance are available: a poorly managed workhouse might have been relatively slow to begin admitting paupers; or might have been associated with relatively high mortality from infectious diseases or a high overall death rate; or its executive board might have been dissolved for incompetence. High mortality from infectious diseases meant either that conditions in the workhouses deterred the destitute from entering until they were already ill or else that they became infected in the workhouse. In either case, workhouse managements were culpable. During the famine, nearly one board in four was dissolved, mainly for failing to collect taxes required for workhouse upkeep. However, the "success" of a workhouse was also a function of location: the incidence of disease varied by location and boards relied on local taxes, which were easier to collect in, say, Belfast than in the devastated west. In an econometric analysis of workhouse management, Timothy W. Guinnane and Ó Gráda (2002) model the likelihood of a board being dissolved as a function of a range of economic and locational variables. The outcome suggests that some boards were unfairly dissolved for the severity of conditions beyond their control, while other poorly performing boards were indulged.

In Ireland, the soup kitchens that fed more than one-third of the population at their peak in mid-1847 are deemed to have been more successful than the public works or the workhouses in saving lives (Ó Gráda 1999). In Bengal in 1943–44, where soup kitchens were the main means of relief, their reputation is more controversial. The rough, disorderly ethos of official soup kitchens deterred many women and children from attending, and the food supplied was of little nutritional value in any case (Paul R. Greenough 1982). In Bengal, delays in relief supplies mattered more than their misappropriation, however.

2.7 *NGOs and International Aid*

The globalization of disaster relief highlighted by Live Aid and the response to the Asian tsunami of December 2004 has its origins in the nineteenth century. Since the end of World War II, the number of nongovernmental organisations (NGOs) specialising in emergency and development aid has mushroomed (Akira Iriye 2002).[16] NGOs have been effective at highlighting the link between third world poverty and the risk of famine, and have excelled at fund-raising in the wake of highly publicized crises. Nonetheless, their record in mitigating and averting famine raises several issues.

In a dispute about famine relief in China in the 1920s, the American Red Cross criticized the permanence of a rival NGO on the basis that "inasmuch the life of the organization depends on receipts from relief contributions there must always exist, perhaps unconsciously, an urge to discover in every period of serious crop deficiency a reason for calling on the public for contributions." It also berated its rival for diverting funds originally raised for famine relief to uses not intended by donors (Andrew James Nathan 1965, pp. 17–19).

[16] In late 2005, an internet directory targeting NGOs and development research organizations worldwide listed 47,500 organizations (private, public, academic) with an interest in development (www.devdir.org). Membership of British Overseas NGOs for Development numbered 295, while an internet site for employment in the development field (devjobsmail.com) receives 145,000 visits monthly.

The same points apply to many NGOs today (de Waal 1997; Paul Seabright 2002).[17] The tendency for agencies originally founded as vehicles for famine relief to reinvent themselves as bureaucracies is exemplified by Oxfam, which began as a Quaker-inspired committee to relieve famine in Greece in 1941–42, and by Concern International, formed during the Biafran war–famine of 1968. Such organizations must balance the public's wish to relieve disasters as they happen with their own need for bureaucratic sustainability. This has entailed focusing more on development than on famine relief per se. Budgetary pressures have also tempted NGOs to exaggerate the risks or gravity of famine, as in the Horn of Africa in 2000, in Southern Africa in 2002, and in Niger in 2005, or to claim the credit when the crisis is "averted" (Howe and Devereux 2004). Given the likely long-term costs of such tactics and the increasing dependence of NGOs on public funding in the recent past, independent monitoring of their activities is essential (Iriye 2002).

Typically, NGO interventions lag, rather than lead, media reports; instead of drawing on previously accumulated reserves, they rely on crises to solicit aid. The Niger crisis of 2004–05 is a good case in point. Before the end of 2004, the U.S.-funded Famine Early Warning System (FEWS) had already listed Niger as "requiring urgent attention" and the Niger authorities had a "national emergency plan" in place. The UN's World Food Programme drew attention to the unfolding crisis in March 2005 but failed to attract donors. In April, Médecins sans Frontières was the first NGO to warn of the crisis, which FEWS upgraded to an "emergency" in June. Media coverage in July resulted in a stampede of NGOs toward Niger, but it was August before food and medical supplies began to reach the affected regions in volume. By late 2005, millet prices had fallen by almost half from their summer peak and the ratio of livestock to cereal prices—a measure of the terms of trade facing vulnerable pastoralists—had risen significantly. A crisis that had been described in July–August 2005 as one of gargantuan proportions that threatened to starve 0.8 million people to death had virtually evaporated (FEWS 2005).

Moreover, NGOs' overreliance on emergency-generated funding has led them to locations where they lack the detailed expertise and connections essential for effective famine relief. Most NGOs continue to spread themselves too thin and are too small to offer the insurance required for a rapid response against famine. Both the Emergency Response Fund of $500 million sanctioned by the UN General Assembly in December 2005 and the trial scheme approved by the World Food Program in November 2005 to use weather derivatives or "catastrophe bonds" as a means of shielding at-risk countries against unlikely but high-impact weather events implicitly acknowledge the limitations of the fire-brigade methods of international aid hitherto.[18]

3. *Famine Characteristics*

3.1 *Counting the Dead*

Soaring food prices and poor harvests are often harbingers of famine, but they are neither necessary nor sufficient conditions for one. On the one hand, appropriate relief policies may prevent famine; on the other, as discussed above, not all famines result from aggregate food deficits or inflated food prices. An abnormal jump in mortality is a more reliable signal of famine and is often regarded as its defining feature.

For most historical famines, however, establishing excess mortality with any precision is

[17] Compare Stephanie Strom, "Poor Nations Complain Not All Charity Reaches Victims," *New York Times*, January 29, 2006.

[18] The scheme is explained in detail at http://www.wfp.org/eb/docs/2005/wfp077056~3.pdf.

impossible,[19] and inferences derived from incomplete data are often controversial. Compare the 150,000 "famine related" deaths conceded by the Governor of Bombay in 1876–78 with the five million revealed by an official inquiry in the wake of the crisis; or the claim by the Secretary of State for India at the height of the Bengali famine of 1943–44 that the weekly death toll was about one thousand—although "it might be higher"—at a time when the true figure was about forty thousand. Subsequent estimates of mortality in Bengal range from 0.8 million to 3.8 million; today the scholarly consensus is about 2.1 million (Hall-Matthews 2005; Sen 1981; Maharatna 1996). In the case of the North Korean famine of the 1990s, a toll of three million, or one-seventh of the entire population, gained wide currency, but the true figure seems to be well under one million (Meredith Woo 2006; Hazel Smith 2005).

Even more controversial are estimates of excess famine mortality in the Soviet Union in the early 1930s and in China in 1959–61. In the Soviet case, research based on archival material released in the 1990s has revised estimates of mortality in 1931–33 downwards somewhat, from the 7 million claimed by Robert Conquest to between 4 million (Serguie Adamets 2002) and 5–6 million (R. W. Davies, Mark Harrison, and Stephen G. Wheatcroft 1994; Davies and Wheatcroft 2004). Much hinges on assumptions about the underregistration of deaths at the time. Academic estimates of excess mortality in China in 1959–61 range from 15 million to 43 million (Basil Ashton et al. 1984; Shujie Yao 1999; Daniel Houser, Barbara Sands, and Erte Xiao 2005).

[19] For example, only the crudest guess is possible for Ireland in 1740–41, when mortality may have matched or exceeded that in the 1840s in relative terms. In the absence of civil registration, as in the case of the Great Irish Famine of the 1840s, estimates of excess mortality simply subtract postfamine population from a counterfactual based on assumed noncrisis birth, death, and emigration rates (Mokyr 1980; Ó Gráda 1999).

Table 3, which reports estimated death toll from several well-known famines, suggests that today's famines are, relatively speaking, far less costly in terms of human lives than earlier famines. Although noncrisis death rates in Africa remain high, excess mortality from famines in recent decades has been low. In Devereux's useful listing of major twentieth-century African famines, only two—Nigeria in 1968–70 and Ethiopia in 1983–85—are accorded tolls nearing one million (Devereux 2000), while in the Sahel in the early 1970s, in Darfur in the mid-1980s, and in Bahr el Ghazal (Sudan) in 1998, deaths were far fewer.

Note too the implications of focusing on relative rather than absolute mortality. The excess death rate of 23 per thousand in China in 1959–61[20] is modest compared to those of 120 per thousand in Ireland in the 1840s or 70 per thousand in Finland in 1867–68. The lower rate matters to the extent that it affected the characteristics of the famine, in terms of the proximate causes of death, the threat of social disorder, and other famine symptoms. Table 3 also begs the question of the appropriate denominator. Most of these famines were regionally concentrated but the denominators refer to larger political or geographical units. Finally, note that most famines lasted a year or two at most, Ireland in the 1840s, Cambodia in the 1970s, and possibly North Korea in the 1990s being exceptional in this respect.

Although famine had virtually disappeared from Europe by the mid-nineteenth century, thirty million is a conservative estimate of famine mortality in India and China alone between 1870 and about 1900, and "fifty million might not be unrealistic" (Paping, Vanhaute, and Ó Gráda 2006; Maharatna 1996; Davis 2001). A world total of one hundred million during the nineteenth century as a whole is not inconceivable. Therefore, given that global

[20] On which more in section 4.3 below.

TABLE 3
Estimated Death Tolls from Selected Famines

Year	Country	Excess Mortality (million)	% Death Rate	Observations
1693–94	France	1.5	7	Poor harvests
1740–41	Ireland	0.3	13	Cold weather
1846–52	Ireland	1	12	Potato blight; policy failure
1868	Finland	0.1	7	Poor harvests
1877–79	China	9.5 to 13	3	Drought, floods
1876–79	India	7	3	Drought, policy failure
1921–22	USSR	9	6	Drought, civil war
1927	China	3 to 6	1	Natural disasters
1932–33	USSR	5 to 6	4	Stalinism; harvest shortfall
1942–44	Bengal	2	3	War; policy failure; supply shortfall
1946–47	Soviet Union	1.2	0.7	Poor harvest, policy failure
1959–61	China	15	2	Drought, floods; Great Leap Forward
1972–73	India	0.1	0.03	Drought
1974–75	Bangladesh	0.5	0.5	War, floods, harvest shortfall
1972–73	Ethiopia	0.06	0.2	Drought; poor governance
1975–79	Cambodia	0.5 to 0.8	7 to 11	Human agency
1980–81	Uganda	0.03	0.3	Drought, conflict
1984–85	Sudan	0.25	1	Drought
1985–86	Ethiopia	0.6 to 1	2	War; human agency; drought
1991–92	Somalia	0.3	4	Drought, civil war
1998	Sudan (Bahr el Ghazal)	0.07	0.2	Drought
1995–2000	North Korea	0.6 to 1	3 to 4	Poor harvests; policy failure
2002	Malawi	Negligible	0	Drought
2005	Niger	Negligible	0	Drought

Sources: Lachiver 1991; de Waal 1997; Devereux 2001; Devereux 2002; Davis 2001; Ó Gráda 2007.

population rose from about 1.3 billion in 1870 to 2.5 billion in 1950 (Maddison 2006), in relative terms famines were much more lethal in the nineteenth century than in the twentieth.

The late nineteenth century saw a reduction in famine intensity in India due to a combination of better communications and improvements in relief policy; in Russia too famines became more localized. Japan, where famines were common in the seventeenth century, and less so in the eighteenth, experienced its last true famine in the 1830s (Michelle B. McAlpin 1983; Maharatna 1996; Mallory 1926; Adamets 2002; Osamu Saito 2002).

3.2 *Disease versus Starvation*

Although lack of food is the ultimate cause of most famine mortality, infectious diseases rather than literal starvation usually account for most famine deaths. Two broad classes of causes account for most deaths. The first are those directly related to

TABLE 4
MAIN CAUSES OF EXCESS DEATHS IN IRELAND IN 1846–50 (%)

Cause	Ulster	Connacht
Hunger sensitive:	20.2	26.5
Dysentery/Diarrhea	11.8	16.3
Starvation	2.4	5.2
Dropsy	2.3	1.9
Marasmus	3.8	3.2
Partially hunger sensitive:	49.7	40.4
Consumption	10.0	5.8
Others	39.7	34.5
Not very hunger sensitive:	30.1	33.1
Fever	19.3	23.7
Cholera	2.3	3.7
Infirmity, old age	8.5	5.7
Total	100.0	100.0

Source: Mokyr and Ó Gráda 2002.

nutrition, including actual starvation. Most victims of this class succumb to nutritionally sensitive diseases brought on by impaired immunity or to poisoning from inferior or unfamiliar foods, rather than to literal starvation. The second class of causes is indirect: it stems from the disruption of personal life and societal breakdown attendant on famine. Disease spreads with the increased mobility of the poor and the inevitable deterioration in sanitary conditions. Famines are also associated with outbreaks of seemingly unrelated diseases such as cholera, influenza, and malaria.

Cross-section evidence from the Great Irish Famine (see table 4 for a comparison of the relatively prosperous province of Ulster with impoverished Connacht) points to three lessons about the causes of excess mortality (Mokyr and Ó Gráda 2002). First, it suggests that the graver the crisis the higher was the incidence of starvation and dysentery–diarrhea, and the more likely were they to have been the proximate causes of death. Second, although the incidence of fever increased sharply in the worst hit regions, the proportion of famine deaths due to "fever" tended to be fairly constant across the island. Third, all categories of disease contributed to excess mortality.[21]

How the relative importance of starvation and disease may vary during famines is illustrated by the contrasting patterns in Leningrad (today's St. Petersburg) and Bengal during World War II. The Leningrad famine—the biggest ever in an industrialized urban setting—was the more intense of the two: about one-third of the city's population (0.8 million people) succumbed. In Bengal, infection loomed large (Maharatna 1996). In Leningrad, by contrast, infectious diseases were responsible for few deaths. Dysentery was inevitable, but there were only sporadic outbreaks of typhus and typhoid fever. Fewer Leningraders died of typhoid fever, typhus, and dysentery—the

[21] The incidence of the different causes of famine mortality also varies by age and gender. In Ireland in the 1840s, nearly half of all reported deaths from starvation and one-third of deaths from diarrhea/dysentery were of children aged less than ten years, compared to only one-fifth of those succumbing to "fever," while females accounted for 50.4 percent of cholera victims and 47.1 percent of "fever" deaths, but only 41.4 percent of deaths from starvation and 42.7 percent of diarrhea/dysentery deaths.

classic famine diseases in temperate climates—in December 1941, at the height of the crisis, than in December 1940, before the blockade began (Joseph Brojek, Samuel Wells, and Ancel Keys 1946).

Several factors contributed to controlling infectious diseases in Leningrad. The authorities acted energetically and ruthlessly: the case of Leningrad is one "where social organization, though sorely tried, nevertheless survives, [so that] increased mortality is imputable above all to the 'direct and final' consequences of starvation rather than to epidemic attacks" (Massimo Livi-Bacci 1991, p. 47). Advances in public health mattered: during the 1921–22 famine, epidemic diseases had been rampant in Russia and, before 1917, endemic in nonfamine conditions.[22] Although at the height of the crisis, during the winter of 1941–42, the cold weather helped to control some diseases (Harrison Salisbury 1969), the contrast with previous famines is a striking one. Leningrad's "success" was replicated, though on a much smaller scale, in the Warsaw Ghetto, in western Holland in 1944–45, and in Greece (Violetta Hionidou 2006; Ó Gráda 1999; Gerard Trienekens 2000).

The pattern just described applies to famines in which relatively developed societies faced abnormal conditions. Public health structures that prevented the spread of infectious disease had become part of their daily routine and continued to be so during the war. In settings like these, where literal starvation accounted for a high proportion of deaths, excess mortality is likely to have been both proportionately lower and more class-specific than in earlier famines because, unlike infectious diseases such as typhus, starvation always discriminates between rich and poor. In demographic terms, the Soviet famine of 1932–33 may have marked a transition from "traditional" to "modern" insofar as the main causes of death were concerned since typhus and typhoid fever were less common than in 1918–22 and cholera did not feature (Davies and Wheatcroft 2004; Adamets 2002).

In sub-Saharan Africa today, infectious diseases still loom large during famines because they remain endemic in normal times (Peter Salama et al. 2001; Ronald J. Waldman 2001). In the emergency refugee camps of Eastern Sudan in 1985, young children were more likely to succumb to measles, malaria, diarrhea/dysentery, and respiratory infections than to starvation (P. Shears et al. 1987). Cholera struck Somalia and Ethiopia in 1985: in the Sudan "acute gastroenteritis" and "001" were the official euphemisms for the same disease.

Although in the past (unlike today) male life expectancy usually exceeded female, the evidence for lower female mortality during famines is overwhelming (Richard F. Tomasson 1977; Hionidou 2006; Kate Macintyre 2002; Maharatna 1996; see also Kathryn Edgerton-Tarpley 2004; Leela Sami 2002). The main reason is probably physiological: females store proportionately more body fat and less muscle (an encumbrance in famine conditions) than males. Whether the female advantage has changed over time remains a moot point: there is some presumption that the more important is literal starvation as the cause of death, the greater the female advantage. This would imply that, during World War II famines, women were, *in relative terms*, at less risk in, say, Leningrad and Greece than in Bengal or Vietnam (Ó Gráda 1999; Macintyre 2002).

Most famine victims have always been young children and those beyond middle age, although the greatest *proportional* increases in death rates continue to be at ages at least risk in normal times (Kari J. Pitkänen 1993; Emil Roesle 1925; Maharatna 1996; Ó Gráda 2007). In contexts where population growth of two or three percent per annum is the norm, such age and gender biases in famine mortality are

[22] One of the first actions of the People's Commissariat of Public Health, established in 1918, was to make the notification of infectious diseases compulsory.

unlikely to have much impact and population growth may be expected to quickly fill the resultant demographic vacuum. Where noncrisis growth is slow, these biases may matter more and postfamine recovery is likely to be slower (Dyson and Ó Gráda 2002b).

3.3 *Ambiguities in Measurement*

For several reasons, the demographic consequences of famine are more complex than implied by the standard measure of excess mortality. First, it ignores the drop in births that usually accompanies famine. Second, it omits both the rebound in the birth rate and the decline in the death rate that sometimes follow once the crisis has passed. Third, it leaves out of account any longer-run impact on mortality and morbidity. These issues are discussed in turn below.

3.3.1 *"Lost" Births*

Famines almost invariably entail significant reductions in births and marriages. There is a case for including the births deficit in the demographic reckoning. Mokyr put the number of births lost to the Great Irish Famine at about 0.4 million, whereas estimates for China in the wake of the 1959–61 famine run as high as 43 million (Mokyr 1980; Yao 1999). Using 1954–57 as a benchmark, Xizhe Peng (1987) estimates missing births in China in 1959–61 at 25 million.[23] The Chinese famine also produced significant increases in miscarriages and stillbirths in those years (Yong Cai and Wang Feng 2005). The decline in births during the blockade of Leningrad in 1942 is probably unparalleled in history; moreover, during the first half of 1942, two-fifths of births were premature and, during the blockade as a whole, one delivery in four was stillborn or perished within a month (A. N. Antonov 1947; Nadezhda Cherepenina 2005).

There are several reasons for such declines in the birth rate. Lower libido is a likely factor since testosterone levels depend on nutrition (Keys et al. 1950). The decline in libido conserves energy better devoted to seeking food. A further reason is spousal separation: men are more likely to migrate to seek work, women in order to beg. Thirdly, in the 1990s, nutritionists identified the link between the hormone leptin, which is lacking when food intake is low, and reproductive functioning (Rose E. Frisch 2002). This sharpened the link proposed by Emmanuel Le Roy Ladurie (1969) between reduced body fat deposits and sterility. Famines also usually entail fewer marriages although, clearly, in most situations marriage reductions have implications only for *first* births.

3.3.2 *"Postponed" Births and "Premature" Deaths*

The drop in births is often followed by a rebound once the crisis is over (e.g., Maharatna 1996). Figure 5 shows this for China in the wake of the GLF famine. Births in 1962 exceeded those in any year since 1951, and in the following three years the birth rate was also higher than in any other year in the 1950s and 1960s. Indeed, the surplus over trend in 1962–65—insofar as any pattern can be detected from these data—far exceeded the deficit in 1960–61. Therefore, to some extent at least, the "lost" births seem to have been "postponed" births.

Famines also "hasten" the deaths of some ill and elderly people who would have died soon in any case. The ensuing impact on the demographic structure entails a reduction in the death rate in the wake of famines (Dyson and Ó Gráda 2002b; for examples, see Lachiver 1991; Pitkänen 1993).

3.3.3 *Long-Term Health Effects*

To the extent that standard demographic measures take no account of the longer-term impact of famine on the health of survivors, they underestimate its true cost. There is

[23] However, using a 1955–58 benchmark yields 20 million "lost" births.

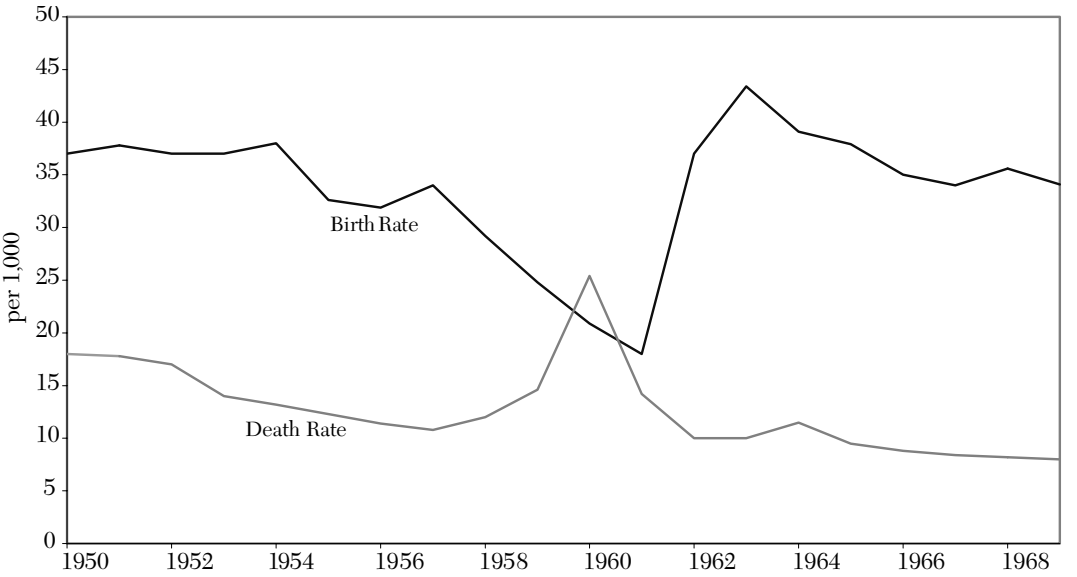

Figure 5. Birth and Death Rates in China, 1950–69

increasing evidence of a link between health and nutrition in utero and in early childhood, on the one hand, and adult health and longevity, on the other (David J. P. Barker 1992; N. S. Scrimshaw 1996; Gabriele Doblhammer 2004; Gerard J. van den Berg, Maarten Lindeboom, and France Portrait 2006). The implications for the long-term demographic and health effects of famines are obvious.[24] Research on Dutch and Chinese data links fetal exposure to famine to increased risks in later life of conditions ranging from schizophrenia to breast cancer, and from heart disease to antisocial personality disorders and defective teeth (David St. Clair et al. 2005; G. P. Ravelli, Z. A. Stein, and M. W. Susser 1976; Tessa J. Roseboom et al. 2000; Richard Neugebauer, Hans Wijbrand Hoek, and Ezra Susser 1999; Liming Zhou and Robert S. Corruccini 1998). Research in St. Petersburg—where famine was much more intense in 1941–43 than in either the Netherlands or China—shows that the siege affected the life expectancy of surviving children, the main contributory factor being the increased risk of arteriosclerosis (Pär Sparén et al. 2004; Lidiya Khoroshinina 2005).

There is evidence too that being born just before or during famines reduces expected adult height. In Leningrad, boys aged 10 to 13 years in 1945 were about 8 cm. smaller than boys of the same age in 1939; the gap for girls was less but still substantial. Famine also reduced the adult heights of those who were children during the GLF famine (Igor Kozlov and Alla Samsonova 2005; Khoroshinina 2005; Tue Gørgens, Xin Meng, and Rhema Vaithianathan 2005; Stephen L. Morgan 2006).[25] Such evidence

[24] True, the evidence is not unanimous. Kannisto et al. (1997) found no difference between the life expectancies of cohorts born before, during, and after the Finnish famine of 1868 and concluded that malnutrition before birth and during infancy was unlikely to be "crucial" to adult health, while Rebecca C. Painter (2005) could establish no connection between exposure to famine conditions in Holland in 1944–45 and life expectancy to age 57 years.

[25] Further corroborative evidence of the connection between deprivation in childhood and adult height is provided by David Sven Reher and Quiñones (2003), who examine the impact of losing a parent in childhood—a common occurrence during famines—on adult height in Spain.

suggests that the human cost of famines has been underestimated in the past. Finally, there is the further disturbing possibility—still unexplored—that famine-induced malnutrition in utero or early childhood placed the mental development of affected populations at risk.

4. *A Brief Reexamination of Major Recent Famines*

This section focuses on three of the most important and controversial of twentieth-century famines in the light of the above discussion. Two—in the former Soviet Union in the early 1930s and in China in 1959–61—are closely linked to totalitarian regimes. The third, the Great Bengali Famine of 1943–44, is familiar to economists through the classic work of Sen (1981).

4.1 *Stalin's Famines:*

The Soviet famine of 1932–33 is one of several notorious twentieth-century "totalitarian" famines. Denied or downplayed at the time by the regime, it has been the subject of heated controversy (Engerman 2000).[26] Outside accounts, culminating in Conquest's passionate and influential study, tended to place exclusive emphasis on human agency, holding that the "harvest of sorrow" was deliberately engineered and politically motivated, particularly against Ukrainians (Conquest 1986). Recent scholarship regards it instead as the outcome of a political struggle between a ruthless regime bent on rapid industrialization and an exploited and uncooperative peasantry (Davies and Wheatcroft 2004). The traditional verdict has been revised in several ways.

First, although the historiography has focused largely on the Ukraine, the crisis straddled a much larger area stretching from the northern Caucuses to the Urals. Worst hit of all was Kazakhstan (e.g., Mark Tauger 2001; Ellman 2002; Davies and Wheatcroft 2004).

Second, Ukrainian nationalists have long claimed that the famine "was designed and implemented by the Soviet regime as a deliberate act of terror and mass murder against the Ukrainian people."[27] Davies and Wheatcroft (2004) and Tauger (1998, 2001) find evidence for intent lacking but blame Stalin and his henchmen for prioritizing the balance of payments[28] and fast-track industrialization over preventing mass deaths. Without collectivization and excessive grain procurements, and the associated repression through the Gulag system, the famine would have been much less severe (Khlevniuk 2004).[29]

Third, there was a FAD dimension: the grain harvests of both 1931 and 1932 were genuinely poor. Davies and Wheatcroft blame this mainly on collectivization and excessive procurements, while Tauger places more stress on adverse weather conditions and plant diseases (Davies, Harrison, and Wheatcroft 1994; Davies and Wheatcroft 2004; Tauger 1998, 2001, 2004). Grain procurements were lower in 1932–33 than in any year after 1929–30 (Davies, Harrison, and Wheatcroft 1994; Tauger 2004). However, rural consumption may have been even less in 1932–33 than in 1931–32. The increase in procurements between 1928–29 and 1932–33 outstripped the growth of the urban population, so the crisis was mainly a

[26] The response of the late James Mace to recent research on the famine in indicative: "The issue is precisely one of Holocaust denial. Change the people, the place, and the time, but the issue remains the same: millions of people dead for political ends" (cited in *The Ukranian Weekly*, LXX(28), July 14, 2002).

[27] A resolution to this effect was passed unanimously by the U.S. House of Representatives on October 20, 2003.

[28] Grain exports in 1932–33 totalled 1.6 million tons, i.e., about 9 percent of procurements and 3 percent of output.

[29] However, Ellman provacatively adds, there was nothing unique in the focus on targets other than famine relief: in 1943, the British government in India "was more interested in the war effort than in saving the life of Bengalis" (Ellman 2002). But see also Ellman (2005) and Davies and Wheatcroft (2006).

rural one (Robert C. Allen 2003).

Fourth, fear and repression distorted information flows. In early July 1932, Moscow's representatives at Party meetings in the Ukraine "categorically refused" the reductions in planned procurements demanded by the Ukrainian leadership. As late as July 25, 1932, Stalin (on vacation in the south) believed that harvest prospects were "undoubtedly good for the USSR as a whole," while acknowledging problems in the Ukraine and Transcaucasia. Three weeks later the Politburo accepted his proposal to "slash . . . an average of 50 percent off the plan" for the worst-affected collective farms (Davies et al. 2003, pp. 155–56, 167–68). In the wake of the collectivization drives of 1929–30, the authorities and the peasantry engaged in an unequal and ultimately deadly game in which Moscow suspected the peasants of concealing grain, while the peasantry in turn employed the strategy of exaggerating local privation (Sheila Fitzpatrick 1994).

Fifth, the famine brought an escalation of protest, crime, and civil disorder, culminating in Stalin's draconian law of August 7, 1932, against the theft of socialist property (Davies et al. 2003; Fitzpatrick 1994), attempted mass migration to urban areas (Davies et al. 2003), and even instances of cannibalism (Davies and Wheatcroft 2004; compare Bruce M. Patenaude 2002).

Sixth, the authorities engaged in famine relief to a greater extent than previously thought (Tauger 2001; Davies and Wheatcroft 2004). Far too late, they adjusted planned procurements in the worst affected regions downwards, and relaxed restrictions on private trade.

Finally, the 1933, 1934, and 1935 harvests were good. Recovery from famine conditions thus came relatively fast, and living standards were higher on the eve of World War II[30] than before collectivization (Allen 2003). Birth-weight and height data capture the immediate and long-term effects of the famine, although they also suggest that World War II bore even more heavily on the population as a whole than the "years of hunger" (Wheatcroft 1999).

[30] Living standards in both rural and urban areas were lower than before collectivization but the relative size of the urban population was much bigger. I am grateful to Stephen Wheatcroft for this point.

4.2 *Bengal, 1942–44*

Sen's classic *Poverty and Famines* (1981) has ensured the Great Bengali Famine a special place in the historiography of famine. The famine was the product of wartime conditions. The fall of Rangoon meant that the supply of Burmese rice, albeit normally a small fraction of total needs, was cut off; fears of a Japanese invasion led to a series of measures (such as the requisition of rice stores in coastal areas and the destruction of shipping that might fall into enemy hands) that provoked panic and speculation; and the authorities worried about the military implications of declaring a famine (Henry Knight 1954; Sen 1981; Greenough 1982; Christopher Bayly and Tim Harper 2005).

Although wartime inflation lifted all prices during 1942, the rise in the price of rice in Bengal was disproportionate and greater than elsewhere in India. Individual provinces had the power to prevent the movement of food, and as one senior Bihari official confided to the Viceroy: "By conviction I hold with Adam Smith but in a crisis like this I am prepared to accept 100% control" (N. Mansergh 1971, p. 414). Attempts at controlling prices at unrealistically low levels in an order to "break the Calcutta market" were ineffective (Bhatia 1967, p. 327). Faced with more "manifestly speculative buying," in early 1943, the authorities abolished price controls in order to secure supplies. They remained convinced that there was enough food available; the problem was to "liquify" hoarded rice and guarantee its "equitable distribution" (*Star of India*, May 12, 1943). Despite official appeals to speculators, prices continued to rise—a maund (about 82 lbs.) of rice costing

about 5 rupees on the eve of the crisis, cost 9 rupees in January 1943, 21 rupees in April, and 30 rupees in July (Maharatna 1996).[31]

The relative importance of such factors, on the one hand, and natural events, on the other, remains controversial. In mid-October 1942, much of coastal west Bengal, including important rice-growing areas, was hit by a cyclone that resulted in considerable loss of life and the destruction of standing crops, livestock, and paddy stores. Moreover, the *aus* (summer) rice crop of 1942 was poor and there were rumours in November 1942 that a mysterious disease had struck the *aman* (winter) crop, which normally accounted for three quarters of total rice output.

Sen's reappraisal of the size of the 1942–43 harvest supported the majority verdict of the Famine Inquiry Commission that there was enough rice in Bengal to feed everybody for most of 1943 (Sen 1981; Famine Inquiry Commission 1945; see also Greenough 1982). Two factors complicate any assessment of supplies, however. First, the underlying crop estimates were based on "eye" estimates of the standing crop and offered only a rough guide to the harvest (P. C. Mahalanobis, Ramakrishna Mukerjea, and Ambika Ghost 1946). The second, related caveat is whether crop data adequately capture the impact of a fungus that attacked the rice crop just prior to the harvest. Tauger (2003) has redrawn attention to the devastating impact of the fungus on yields at two crop research stations located some thirty kilometres apart in 1942: how prevalent the problem was is unknown. Although plant pathologists have highlighted the role of plant disease, historians tend to dismiss or ignore it (e.g., S. Y. Padmanabhan 1973; G. L. Carefoot and E. R. Sprott 1969; M. K. Dasgupta 1984).[32] Political opinion during the crisis was divided as to the severity of a shortage of foodgrains: government spokesmen tended to blame hoarding, while opposition spokesmen claimed that this "minimized the gravity of the situation" (R. Batabyal 2005, pp. 106–07). If further research sustains Tauger's claim that plant disease was widespread, then the conventional wisdom that the famine was "market-made" or "man-made" will need revision. It would be ironic if the paradigmatic case study for the unimportance of FAD turned out to be a case of FAD, although a harvest shortfall on the scale of, say, Ireland in the 1840s or even the Soviet Union in 1931–32 is unlikely (D. R. Basu 1984; Peter Bowbrick 1986; Omkar Goswami 1990; Dyson 1996).

Both British officialdom and the colonial authorities blamed the unfolding crisis at first on hoarders, and the official inquiry into the Bengali famine found that the huge rise in rice prices was due to more than market fundamentals: "It was the result of the belief of the producers, traders, and consumers at the end of 1942 and the beginning of 1943 that an ever-increasing rise in prices was inevitable and could not be prevented. . . ." The rise in food prices was "more than the natural result of the shortage of supply that had occurred." Bhatia refers to "the prevailing psychosis of shortage," and blames the authorities for exacerbating the situation. He instances the Bengali Government's request that people keep two-month stocks of foodgrains in their homes, which was probably interpreted as a warning that people would have to rely on their own resources in the event of famine (Famine Inquiry Commission 1945; Bhatia 1967). Sen's conclusion that the famine was due in large part to "speculative withdrawal and panic purchase of rice stocks . . . encouraged by administrative

[31] If the price of rice is deflated by the cost of living, then its real cost doubled between late 1942 and mid-1943. Such an increase is mild compared to, say, that in potato prices in Ireland in 1846–47 or in wheat in France in 1708–09.

[32] A key policymaker also mentioned "the failure of the main rice crop" and "reports of widespread disease in the incoming crop," although "one was inclined to suspect that the reports might be exaggerated by speculators" (Leonard G. Pinnell 2002, pp. 94, 97).

chaos" tallies with the claim made by the official inquiry into the famine that forcible procurement of hoards might have worked (Bhatia 1967, pp. 323–24; Sen 1981, p. 76).

L. G. Pinnell, the official charged with managing food supplies in Bengal during the crisis, at first tried a combination of price controls and measures to "bring out any hidden surpluses," but the lack of results convinced him that "holding back" by traders was not the primary cause of the famine. During the spring of 1943, Pinnell offered a reward for evidence of "any concealed stock successfully disclosed to be of 10,000 maunds or more in one place"; nobody volunteered information, although a minimum reward of 2,500 rupees was "not a small sum for a common informer." This was not to deny the role of hoarding: myriad hoards, "individually small but collectively ruinous in a year of shortage," were held more out of fear than greed. Pinnell later regretted his own failure in late 1942 to emphasise the point "that there was definitely going to be a shortage in Bengal" instead of pinning hopes on the presence of carry-over stocks (Pinnell 2002, pp. 94–100; Ó Gráda 2007). Official attitudes in London also shifted and the role of maladministration, sectional interests, and the harvest were conceded.

The worsening crisis resulted in an increasing death toll in the countryside and in the arrival of thousands of starving migrants in Calcutta. The famine's incidence was very uneven, both regionally and socioeconomically. The authorities delayed declaring a famine in the belief that grain supplies were imminent and because they were pursuing a policy of "creating confidence." The prospect of a good *aman* crop in November 1943 and a drop in the price of rice (15 rupees in December 1943) prompted most surviving migrants to return home. Only in late 1943 was the crisis brought under control.

4.3 *China 1959–61*

Academic estimates of excess mortality in China in 1959–61, which range from 15 million to 43 million, rely on data released by the Chinese authorities in the early 1980s (Ashton et al. 1984; Houser, Sands, and Xiao 2005). The quality of those data has been questioned but, since their release was part of the official effort to discredit Maoist policies, they are unlikely to downplay the tragedy. The evidential basis for wilder estimates such as "figures of fifty and sixty million deaths . . . cited at internal meetings of senior Party officials" (Jasper Becker 1996, pp. 266–74, 293) is very flimsy.

A careful estimate by Peng (1987) put excess mortality at 23 million; more recently Yao (1999) has proposed a figure of 18 million. However, all estimates are very sensitive to assumed noncrisis vital rates (Carl Riskin 1998). The aggregate crude death rate for 1950–69 is shown in figure 1 (data from B. R. Mitchell 1995, pp. 71, 73). Fitting these data to a polynomial in time and time-squared with dummies for the crisis years 1959–61 translates into an estimated cumulative excess death rate of 23 per thousand. Assuming a population of 650 million on the eve of the 1959–61 famine implies a toll of about 15 million (see also Houser, Sands, and Xiao 2005). This would still almost certainly make the 1959–61 famine the biggest in history in absolute terms.

This estimate bears comparison with the estimated toll of famine in 1877–78—9.5 million to 13 million—when China's population was only one-half its 1960 level and real GDP per head was higher than in the 1950s.[33] In the same period, famine in India caused a further seven million deaths (Davis 2001; Maddison 2006). Aggregate famine mortality in China between 1900 and 1949 was 10.5 million to 13.5 million (Devereux 2000; see also John Lossing Buck 1937).[34]

[33] According to Maddison (2006), Chinese GDP per head, measured in 1990 international dollars, was $530 in 1870, $552 in 1913, and $439 in 1950. GDP per head was $630 in Ethiopia/Eritrea in 1973, $578 in 1990. It was $1,706 in the United Kingdom in 1820.

[34] Adding Devereux's estimates for 1920–21, 1927, 1929, and 1943.

The Chinese famine of 1959–61 is one of the least understood[35] and most studied of modern famines (e.g., Thomas P. Bernstein 1983; Y. Y. Kueh 1984, 1995; Peng 1987; Justin Yifu Lin 1990; Riskin 1998; Yao 1999; Wei Li and Dennis Tao Yang 2000; Cai and Feng 2005; Li and Yang 2005; Houser, Sands, and Xiao 2005). Footprints of its severity may be found in the lower average height and higher incidence of adult schizophrenia in the generation born just before or during it (Gørgens, Meng and Vaithianathan 2005; St. Clair et al. 2005). Its human cost, almost certainly the highest of any famine ever, and the relative importance of exogenous factors and human agency, remain highly controversial issues. The extent of public action to minimise deaths and the proximate causes of deaths remain uncertain.

The famine coincided with the Great Leap Forward and the two events were undoubtedly linked. Like Stalin's First Five Year Plan, the GLF introduced policies that diverted labour and capital from agriculture; put a premium on confusing signals between Beijing and the provinces; and wasted scarce food (e.g. Lin 1990; Yao 1999). That FAD was a factor is not in doubt: grain production was 15 percent less than its 1958 peak in 1959, and 28 percent less in 1960; the declines in net rural supply after requisitioning were even greater, 23 and 29 percent, respectively. In remote and backward Sichuan, the cumulative losses in grain output in 1959 and 1960 relative to 1958 were a devastating 70 percent; they were 59 percent in Guizhou and 64 percent in Liaoning. Li and Yang (2005), linking the famine to the failure of central planning, claim that policies of excessive grain procurement and the diversion of labor from the countryside account for three-fifths of the decline in output which led to the famine.

An alternative interpretation argues that the combination of extreme weather, bad policy, and economic backwardness proved lethal in 1959–61.[36] Rainfall data from Chinese weather stations do not highlight the period as exceptional. While precipitation over most parts of eastern China was below normal in 1960 and particularly during the summer of 1960, with the Loess Plateau and the northern China experiencing severe drought, the data imply that the 1960 drought was mild compare to 1972 and 1997 (Prieler 1999). On the other hand, treering analysis suggests that at Huashan (in Shaanxi province, central China) rainfall in April–July 1960 was probably lower than in all years, or almost all years, between 1600 and 1988. Instrumental data from Huashan meteorological station confirm the lack of rainfall in 1960, and the records of other stations make it likely that these months were among the driest for that time of year for centuries over a larger region of north central China (Malcolm K. Hughes et al. 1994). Numerous more impressionistic accounts corroborate such data (Wilfred J. Smith 1960; Han 2003; Roderick MacFarquhar 1983; Dennis J. Dwyer 1974; Kueh 1995).

Li and Yang (2005) constructed their own index of weather conditions on the basis of retrospective interviews. Their econometric results are quite sensitive to this index: using official Chinese weather proxies instead reduces the impact of their policy variables to insignificance. Their claim that official data may have been tampered with in order to maximize the role of exogenous factors does not square with Kueh's (1995) verdict that Chinese data are not subject to bias. Why, moreover, should Chinese demographic and agricultural statistics be deemed satisfactory,

[35] An émigré leftist critic of the Maoist leadership deems the famine remarkable for the lack of grain riots, peasant rebellion, grain hoarding, and sales of women and children—all "normal occurrences" during earlier Chinese famines. He also notes that the disaster never threatened the authorities' ability to maintain law and order (Dongping Han 2003).

[36] Cold War accounts tend to ignore or deny the impact of the weather on harvests; Becker (1996, p. 273) asserts that "there were no unusual floods or droughts" in this period.

but not meteorological data? The precise impact of the weather on output requires further study; in the meantime, Kueh claims that a simple weather index can account for 72 percent of the yield shortfall in 1960 and 107 percent of the shortfall in 1961 (Kueh 1984; see also Kueh 1995). Moreover, provincial mortality data suggest that the GLF famine was regionally very uneven. Two traditionally famine-prone provinces, Sichuan in the south-west and Anhui in center-east, accounted for nearly half of all deaths but only one-sixth of the prefamine population.[37]

These considerations suggest roles for regional income and proportionate crop loss in accounting for the toll of the GLF famine. Indeed, measures of regional output (*YPOP*) and of proportionate crop loss (*PROPLOSS*) alone account for two-fifths of the variation in excess mortality (*RELDR*), and an even higher proportion of the variation in the birth rate (*RELBR*), across twenty-four of China's provinces in 1959–61. This suggests that economic backwardness and bad weather mattered. We find:[38]

$$(1)\quad RELDR = \underset{(0.216)}{1.455} - \underset{(0.0009)}{0.0037}YPOP + \underset{(0.378)}{1.767}PROPLOSS$$

($N = 24$; $R^2 = 0.412$; robust standard errors in parentheses)

$$(2)\quad RELBR = \underset{(0.062)}{0.632} + \underset{(0.0004)}{0.00119}YPOP - \underset{(0.127)}{0.533}PROPLOSS$$

($N = 24$; $R^2 = 0.449$; robust standard errors in parentheses).

The implied elasticities of the relative death and birth rates to income per head are – 0.5 and + 0.4, respectively. The outcome suggests a crisis as readily explained by geography and history as by politics.

The likely role of adverse weather and economic backwardness does not absolve the Chinese leadership of blame, however: the authorities might have saved millions of lives by acknowledging the extent of the disaster in public and appealing for foreign aid in 1959 and 1960—although such an appeal would have been unprecedented and out of character. Moreover, given the demands made on the countryside during the GLF, there would have been problems even if the weather had been normal (Kueh 1995).

Little is known about the mechanics of mortality in 1959–61. The relative economic backwardness of China—where diseases such as typhoid fever, scarlet fever, typhus, and tuberculosis were rife before 1949—would suggest infectious diseases as the predominant cause, yet most accounts of the famine emphasize starvation rather than disease (e.g., Becker 1996). By implication, the GLF famine was, in terms of our earlier discussion, a "modern" famine. However, on the eve of the famine, life expectancy was low (39.3 years in 1950–55) and infant mortality high (195 per 1,000 live births).[39] Could the post-1949 campaigns to improve water quality and personal hygiene have had such a dramatic effect within the space of a few years?[40] The issue requires further investigation.

5. *Conclusion*

In later editions of the *Essay on Population*, Malthus excluded few places from famine's past ravages. Not even the "shepherds of the North of Europe" were

[37] Based on provincial population data in Nai-ruenn Chen (1967). On Anhui, see Bernstein 1983; Becker 1996.

[38] The underlying regional output (representing the average for 1953–57) and excess mortality data were taken from National Bureau of Statistics (1999) and MacFarquhar (1997), respectively. Replaying *YPOP* by agriculture's share of GDP in 1957 also yields very similar results. The excess mortality is defined as the excess death rate in 1959–61, using the average of 1957 and 1958 rates as a base.

[39] *UN Demographic Yearbook 1997: Historical Supplement* (available at http://unstats.un.org/unsd/demographic/products/dyb/dybhist.htm).

[40] The evidence for dramatic improvements in the early 1950s in Cameron Campbell (2001) is striking, but refers to the Beijing region only.

TABLE 5
Life Expectancy in Selected African Countries, 1970 and 2003

Country	1970	2003
(a) Famine-prone		
Niger	37	46
Mali	38	49
Ethiopia	41	46
(b) HIV/Aids-affected		
South Africa	53	47
Botswana	55	39
Zimbabwe	55	33

Source: UNICEF.

safe, and the massive famines of the 1690s in France, Scotland, and Finland, 1708–09 in France, and 1740–41 in Ireland highlight the importance of famine in early modern Europe (Malthus 1992; compare Robert William Fogel 2004, pp. 5–6).[41] Elsewhere, with the possible exception of the New World, famines seem to have been more common, although the demographic record is thin.[42]

Famine's range began to narrow after 1800. A century later, Europe and its industrialized extensions, Latin America, and Japan were virtually famine-free, and today major, *prolonged* famine anywhere is conceivable only in contexts of endemic warfare or blockade. Compared to the persistent effects of HIV/AIDS on the population of sub-Saharan Africa, the damage wrought by famine is minimal (table 5; compare de Waal and Alan Whiteside 2003). Moreover, given that throughout most of history land hunger has been a powerful predictor of famine, recent trends in the balance between population and food offer room for cautious optimism about the near future. FAO data show that in both Asia and Latin America food production has grown much faster than population since the 1960s. In sub-Saharan Africa, the balance has been much closer, although the problem there has been very rapid population growth rather than sluggish food output growth. Moreover, some African countries, such as Burkina Faso and Niger, have walked a high demographic tightrope while others (e.g., Malawi and Zimbabwe) have performed poorly despite slower population growth. China's performance since the late 1970s, with population growth tapering off and the rate of food output growth accelerating, is particularly striking.

The few remaining countries still vulnerable to textbook Malthusian famine have experienced considerable improvements in life expectancy in recent decades (see table 5), but they lag behind in terms of fertility decline. Niger, whose total fertility rate (at 8.0 in 2003) is highest in the world and infant mortality (about 150 per thousand live births) about second highest, is a striking example. A key issue is how the fertility

[41] Fogel's claim, based on English data, assumes that all mortality peaks above trend were famine-driven. By making no allowance for outbreaks of disease, then (as long as the underregistration of mortality during crises was not disproportionate) his measure provides an upper-bound estimate of famine mortality. France yields as somewhat different outcome (Chevet and Ó Gráda 2002, pp. 709–10).

[42] Thus, data culled from the *T'u-shu chi-ch'eng* (*Complete Collection of Illustrations and Books*)—e.g. 610 years of drought between the founding of the T'ang and the end of the Ming dynasties (618–1662AD)—are often invoked to convey the endemic character of famine in China (Nathan 1965, p. 1). History is prone to "forget" famines in the more distant past. Thus the volume of the *Cambridge History of India* covering the 1750–1970 period contains a four-page chronology of famines, while that covering the previous 550 years contains a single paragraph on famines in south India.

transition, scarcely yet underway, unfolds in such vulnerable economies. The experience of posttransition economies worldwide is that declines in fertility were preceded by declines in mortality (Reher 2004). However, the length of the lag and the extent of the fertility decline are clearly crucial. A guarded historical lesson for countries like Niger is that the transition, once underway, has been more rapid in latecomers than in pioneers.[43]

Africa's laggard fertility transition, itself a function of economic underdevelopment, has increased its share of global population from only 8.8 percent in 1950 to 14 percent today; it is set to reach 21.7 percent by 2050. Even though a drop in the annual growth rate from 2.5 percent during the past half-century to 1.4 percent during the next in Africa as a whole is implied, population is predicted to treble by 2050 in famine-prone countries such as Niger, Uganda, and Mali.[44] When coupled with the problem of global warming, which is likely to impact disproportionately on the productivity of arid lands limited to a short growing season, the implied threat to living standards is clear (Dyson 2001, 2005).

A few decades ago economies sustaining population growth rates of 3 percent or more on slender resources were much more vulnerable to famine than they are today. Today, world public opinion alone may not eliminate underdevelopment but, unless civil strife intervenes, it can prevent harvest deficits from producing mass mortality.

The term "famine" is an emotive one, to be used cautiously. On the one hand, preemptive action requires agreement on famine's early warning signs; the very declaration of a "famine" may prevent it from becoming a major mortality crisis. On the other, overuse of the term by relief agencies and others may lead to cynicism and donor fatigue. In the recent past, some definitions of "famine" have included events and processes which would not qualify as famine in the catastrophic, biblical sense (Howe and Devereux 2004). The last such "biblical" famine was probably the Ethiopian famine of 1984–85. More recent famines have been smaller events, more restricted in place and time. Most have been "man-made" rather than the result of poor harvests; where harvest failure has been the main cause, as in Niger in 2005, food aid materialized and kept mortality low. Such changes have prompted John Seaman (1993, p. 31) to describe the likelihood of major famine today, even in sub-Saharan Africa, as "vanishingly small." All the more reason for making famine "history."

[43] In Niger, infant mortality has fallen significantly since the 1970s and life expectancy has risen, but the total fertility rate remains stubbornly high.

[44] According to the latest UN low variant long-range projection (http://www.un.org/News/Press/docs/2005/pop918.doc.htm).

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