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'The Last, the Most Dreadful Resource of Nature': Economic-historical Reflections on Famine

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‘The Last, the Most Dreadful Resource of Nature’:

Economic-historical Reflections on Famine[1]

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ABSTRACT

The lecture paper focuses on some topics that remain current in famine studies. First, it reviews the link between food prices and the severity of famines as reflected in excess mortality. Second, it places the death tolls from several recent famines in sub-Saharan Africa in historical context. Third, it reviews the impact of famines on fertility. Famines are always associated with a reduction in births; but to what extent are those births lost or births postponed? Fourth, it reviews the literature that invokes famines as a testing ground for the foetal origins hypothesis. Finally, it reviews the prospect of a near future in which famines have been consigned to history.

KEYWORDS: famine, malnutrition

[1] Robert A. Mundell Distinguished Address at the conference of the International Atlantic Economic Association, Lisbon, 18 March 2016. Thanks to Jessica Dijkman and Nico Roeling (CBS) for help with Dutch data on births and marriages and to Tom Arnold and Grainne Moloney for advice on Somalia in 2011-12.

Introduction

'In every State in Europe, since we have first had accounts of it, millions and millions of human existences have been repressed… from distress, either directly or indirectly, for want of food': so claimed Thomas Malthus in his *Essay on Population* [1798]. That was the Malthusian principle of population at work. The 'repression' was the product of a variety of positive checks: disease, malnutrition, and civil strife.

Malthus, however, believed that the most 'dreadful' of those checks, 'gigantic, inevitable famine', was a relatively rare occurrence in early modern Europe. Indeed, famines occurred only when his principle of population was not doing its work as an equilibrating mechanism. Pre-1846 Ireland and pre-1868 Finland, where populations were growing fastest in those areas where the margins above subsistence were narrowest, might be considered examples of this (Kelly and Ó Gráda 2015; Voutilainen 2015: 123). Yet it is an irony in the history of economic thought that although the Great Irish Famine is often seen as a classic Malthusian check, Malthus himself expressly ruled out such an eventuality for Ireland. What was certain, he predicted, was that population growth in Ireland would not 'suddenly come to a stop'. Instead a combination of preventive and positive checks would exert 'a gradually increasing pressure for a very long time' before population increase ceased (cited in Kelly and Ó Gráda 2015: 58).

On the basis of an analysis of data on disasters in *A Chronological History of the Air, and of Its Effects on Animal and Vegetable Bodies* (1749) by the Scottish-born medic Thomas Short, Malthus reckoned that the average interval between major famines in the past was 'about 7½ years'; but he added that 'plagues, violent diseases, and famines ha[d] become less frequent' over time. Indeed, in the first edition of the

Essay on Population he ventured that 'in some states' of Europe 'an absolute famine has never been known' (Malthus 1798, ch. VII; 1826: II, 308, 315). Adam Smith, too, believed that famines, as distinct from 'dearths' or shortages of food, were extremely rare in early modern Europe. Those that occurred, moreover, were all due to what Smith called 'the violence of government attempting, by improper means, to remedy the inconveniences of a dearth' (Smith 1776: Book, Ch. 5).

Smith's and Malthus's assertions that in late eighteenth-century Europe famines were a thing of the distant past had little basis in fact. True, at the time they were writing England and the Dutch Republic had already been virtually famine-free for nearly two centuries; but in the rest of Europe, in terms of widespread food insecurity and frequent famines, the seventeenth century had been the worst since the Middle Ages. The long list of major seventeenth-century famines ranges from Russia's 'Times of Troubles' in 1600-03, through the cataclysmic combination of war, famine, and plague that devastated Ireland in mid-century, to France's, Finland's, Scotland's, and Estonia's biggest famines on record in the 1690s (Alfani and Ó Gráda 2016).

Malthus's optimism would have been more in place in the eighteenth and nineteenth centuries when European subsistence crises were fewer and milder—although with some well-known devastating exceptions, including two (in 1740-1 and 1846-50) in Ireland. By the same token the return of famine in the late 1840s to parts of what was the richest economy in the world in the seventeenth century—the Netherlands—is a measure of how far the Dutch had fallen. The failure of the potato crop in the Netherlands in 1845 and 1846 was linked to high prices, food riots, hunger, and ultimately the deaths of perhaps twenty thousand people and the averted births of forty thousand more in 1846 and 1847 (Paping and Tassenaar 2007). Nor would that

be, as we shall see, the last Dutch famine. The era of famines in Europe did not finally end until 1946-47, when a major famine struck the Soviet republic of Moldova and pockets of Ukraine (Wheatcroft 2012).

Of course, many famines fit neither the Malthusian nor the Smithian templates. Forms of 'the violence of government' other than that envisaged by Smith—such as war, land collectivization, dictatorship, and ethnic cleansing—were responsible for several twentieth-century famines. War was a key factor in the Great Bengali Famine of 1943-44—a paradigmatic famine thanks to the work of Amartya Sen—though precisely how war mattered remains contentious. One view—associated with Sen—is that wartime disruption led to a market failure that compromised the entitlements of the landless, even though the decline in overall food availability was modest; another is that the colonial authorities felt unable or were unwilling—take your pick—to relieve a genuine food availability decline, because of more pressing wartime priorities (Sen 1981; Ó Gráda 2015). Malthus, of course, would have linked the likelihood of war with population pressure, but the historical record does not support him. Indeed, economic historians Nico Voigtländer and Joachim Voth (2013) have recently shown how the likelihood of war in early modern Europe was associated with *rising* living standards and *increasing* urbanization.

Famine and Food Prices:

Defining 'famine' is not straightforward. Malthus clearly meant more than chronic malnutrition, something 'gigantic'—his word—but some today would define as famines events that he would certainly have ignored. My own definition of famine as 'a shortage of food or purchasing power that leads directly to excess mortality from

starvation or hunger-induced diseases' (Ó Gráda 2009: 4) envisages famines as *killing* events. It implicitly distinguishes between famines and 'dearths', and between famines that happen and famines that are averted by public action. It also leaves room for two different characterizations of the causes of famines, as man-made or as 'natural'.

It is also important to distinguish between famine, on the one hand, and endemic hunger or malnutrition, on the other. The distinction is not just semantic: the former requires immediate remedies in terms of relief, whereas the latter requires investment in capital and people, and perhaps institutional reform, in order to increase agricultural productivity in the medium- and long-term.

As I have pointed out elsewhere, it is much easier for relief agencies to solicit sympathy for a crisis like a famine than for an endemic condition like malnutrition. And thus there is a temptation for private and public aid agencies to blur the distinction between famine and hunger; indeed, in the past they have sometimes exaggerated threatened or actual food shortages for this reason. That they must not do so is crucial, however, because while most economists would support food aid as disaster relief, they would also argue that it can cause a lot of damage when it becomes institutionalized and crowds out domestic food production. So conflating steady-state underdevelopment and famine risks not just resource misallocation but economic retardation as well.

An added danger of conflating the two is that it will make an already sceptical public ever more sceptical and less willing to donate in times of true crisis. NGOs, then, far from blurring the distinction between famine and malnutrition, should strive

for better data on prices and production. Such data should act as a signal as to where scarce resources should be directed.

High food prices usually entail the shortage of purchasing power, and the steeper the rise, the worse the crisis. Famines without food price increases are as rare as Giffen goods, though theoretically possible: a reduction in the purchasing power of the landless, for whatever reason, could mean starvation in the absence of harvest shortfalls and price increases. Amartya Sen cites the case of Wollo in Ethiopia in 1972-73 when the poor lacked the 'market command' needed to push up prices or to attract in food from other, less affected provinces.

In many historical cases neither the requisite price nor the mortality data are available to test the link between them. All too often, only crisis level prices are recorded, but without a sense of how high they were or how long they lasted. Annual wheat price series for early modern European cities are plentiful although, alas, many of them contain gaps. A comparison of the best of them suggests that only very rarely indeed did annual prices more than double during famines; and this is almost never the case for two years in succession. Given that in famine-prone countries, up to one half of people's income goes on food, the outcome is not surprising.

There are exceptions: Naples, where the price of wheat rose from a non-crisis norm of 12-14 *carlini* to 29 *carlini* in 1647 and 46 *carlini* in 1648; Ireland in the late 1840s, where the price of potatoes leapt from an average of 2.6 pence per stone in 1840-45 to 3.9 pence in 1846, 7.3 pence in 1848, and 6.2 pence in 1849 (Ó Gráda 1999: 140); and Bengal where the price of common rice rose from 4 rupees per maund in 1769 to 15.33 rupees per maund in 1770 (Hussain 1976: 274; compare Bayley 1818). But the price of rye in rural Finland in 1868, a year of severe famine when about 90,000 out

of a population of less than two million died, was less than one third higher than the 1861-67 average. So, in general, in early modern Europe it did not take an enormous rise in prices to cause a famine (Pitkänen 1993: 90, 149-50).

Famines Are Not What They Used to Be

A series of famines in 1972-75 cost about two million lives globally and famine in Cambodia cost a further 0.3 million lives (Gerlach 2015; Heuveline 2001: 124). In the 1980s famines in Ethiopia and in western and southern Sudan cost about another million. Since then the tolls exacted by famine have been smaller, but the 1990s endured famine in the Bahr El Ghazal region of southern Sudan in 1998 and in the Ogaden region of Ethiopia in 1999-200. During the former, insurgency and counter-insurgency led to large numbers of internally displaced persons—who accounted for almost two-thirds of all excess mortality—and the balkanization of food markets (Deng 1999). Deng reckoned aggregate mortality in Bahr-el-Ghazal at 70,000; on the basis of a sample survey of households Salama *et al*. (2001) estimated that six thousand died in the Gode district in 1999-2000, which they extrapolated to a total of 98,000 in the Somali region of the country. That extrapolation probably exaggerated the mortality toll, which Devereux (2009) has put at 'between 10,000 and 100,000', but Devereux's caution highlights the difficulty of getting at the human tolls of such famines.

The new millennium has witnessed some threatened famines but all have been averted with the exception of Somalia in 2011-12. Excess deaths in Malawi in 2002 were

few, in Niger in 2007 they were fewer still. Figure 1 points to one likely reason for the retreat from famine: the very rapid growth in incomes in sub-Saharan Africa in the new millennium. In those economies on which there are data, GDP per capita rose in the median economy by 0.1 per cent annually between 1985 and 1999, whereas between 2000 and 2014 the increase was 6.5 per cent. In other words, income per capita doubled. In both periods the correlation between population growth and GDP growth was weak, but positive. Figures 2 and 3, describing malnutrition rates and GDP per capita in three famine-prone countries, tell the same story.

—Figures 1, 2, and 3 about here—

In 2007-08 the price of basic foodstuffs rose sharply throughout the globe (Figure 4). This resulted in widespread food rioting in places as far apart as Central America, South Asia and sub-Saharan Africa. So much so that in April 2008 a senior UN official warned against the danger of worldwide unrest and political instability, while the director of the UN's WFP warned of 'a new face of hunger… [with] food on the shelves but people being unable to afford it'. [2] The crisis generated its own literature (e.g. Patel and McMichael 2010; Berazneva and Lee 2013; Bellemare 2014), and there were fears that the price peak represented the beginning of a new regime of high food prices, a prediction partly borne out by subsequent data. But the key point here is that in the past such a price rise would have resulted not just in privation but also in excess mortality through famine. Nor is there much evidence either of another hallmark of famine: a reduction in the birth rate.

[2] *The Guardian*, 'Food price rises threaten global security' 9 April 2008.

—Figure 4 about here—

The Somali famine of 2011-12 is a different story. Somalia has suffered two major famines in the recent past, both linked to civil war. The first began in the second half of 1991 and lasted until the end of 1992; the UN declared a second in two provinces of south-central Somalia on 29 July 2011 and declared it over on 3 February 2012. Hansch *et al*. (1994: 14, 21-24) prefaced their estimate of the demographic toll of the 1992 famine—212,000-248,000 out of a population of 5.1 million—with the surmise that 'Somalia's total population is perhaps the least accurately known of any in the world'. Checchi and Robinson's study of excess mortality in the wake of 2011-12 crisis put the total at some 260,000, with the deaths of children under 5 being responsible for half of this. This figure implies that 3 per cent of Somalia's entire population died from the famine and that the death rate rose by 160 per cent.[3]

Is Checchi and Robinson's estimate too high? The household surveys on which they are based, conducted by FSNAU before and during the famine, produce some puzzling outcomes; but so far this is the best we have got, and it makes grim reading.

The Impact on Births

The reduction in conceptions and births, which is a universal feature of famines, is a form of preventive check; without it infant mortality would be much higher. The reduction is often attributed to physiology in the form of famine amenorrhoea (Le Roy

[3] On the basis of WHO estimates that put the population at 8,696,000 in 2012 and a pre-crisis death rate at 16 per thousand [http://rho.emro.who.int/rhodata/node.country.country-SOM-stats?lang=en#].

Ladurie 1969), but spousal separation and reduced libido are also likely factors. There can also be a cautionary aspect to this: couples may postpone births rather than lose them outright. While most famines in the past show few signs of such an effect, the very different patterns revealed in the three western provinces badly affected by the Dutch Hongerwinter of 1944-45—Noord-Holland, Zuid-Holland, and Utrecht—and the remaining eight provinces are consistent not only with a dip in births during the famine—albeit modest in comparative terms—but also with a sharper recovery in the three affected provinces. Regressing the extent of the recovery in the birth rate in 1946 on the fall in the birth rate in 1945 produces (standard errors in parentheses):

$$\underset{\quad (0.387)}{RECOVERY = 5.129} - \underset{\quad (0.213)}{1.808FALL}$$

N = 11
F(1, 9) = 72.11
Adjusted R2 = 0.877
Standard errors in parentheses

If the rest of the country is an indication of where the affected provinces might have been in the absence of a famine, the added rebound in the three provinces in 1946 more than compensated for missing births in 1945.

The data on China in Figure 5, which are based on fertility surveys conducted by the Chinese authorities in conjunction with the International Statistical Institute in the mid-1980s, suggest that the post-famine rebound was greatest in rural areas where the reduction in births had been greater; they also imply that illiterate couples rebounded more than those with a high school education. The Chinese data are good

because they refer to fertility per woman, while the birth rate data do not correct any shift in the proportion of women in the population due to the famine.

Yong Cai and Wang Feng (2010) have shown that the famine coincided with an increase of about ten per cent in the length of the breast-feeding period, which reduced the likelihood of becoming pregnant. They also provide evidence of marriage postponement, reporting that the marriage rate dropped sharply in 1959, before returning to its 1958 level in 1960. The averted marriages were not compensated for until 1962. But for the preventive check in action, the number of deaths would have been even greater.

—Figure 5 about here—

Famine's Afterlife: the Fetal Origins Hypothesis

In late January 1849 the hard-nosed English economist Nassau Senior wrote to his friend Alexis de Tocqueville that 'We are to have committees in each house [of parliament] on the Irish poor laws. They will contain illustrations valuable to a political economist. Experiments are made in that country on so large a scale, and pushed to their extreme consequences with such a disregard to the sufferings which they inflict, that they give us results as precious as those of Majendie' (Simpson: Senior to Tocqueville, Jan 29 1849). The 'Majendie' in question was Ashhurst Majendie, a man very much after Senior's own heart. In the early 1830s Majendie had produced a report on the administration of poor relief in France, as well as several reports from the south of England, for the famous Poor Inquiry. Majendie had reported

approvingly from Stanford Rivers in Essex that 'the introduction of Mr. Becher's improved workhouse system… had nearly abolished pauperism from that place'[4] but complained that in Lenham in Kent, over-generous relief had led to 'a man lately marr[ying] a girl, who left her place for that purpose on Wednesday, they applied for relief on the Saturday'.[5]

Senior was referring to the Irish famine as a natural experiment. But it was inevitable that famines would later attract interest as a form of kinder natural experiment, a testing ground for the fetal origins hypothesis (FOH), which claims that conditions *in utero* affect adult health and wellbeing, variously defined. Indeed one strand of FOH research—that on the fetal origins of cognitive underdevelopment—has its origins in famine studies. In 1967 two South African-born, US-based epidemiologists came on the idea that the subjects of a famous analysis of fetal growth during the Dutch *Hongerwinter* (Hunger Winter) of 1944-45 (Smith 1947) would by then have reached adulthood. In this way a 'small' famine in the western Netherlands in 1944-45 gave rise to an influential literature on the FOH that continues to expand. Later, in the 1990s, David Barker and his collaborators (Barker 1995; Barker *et al.* 1989), who were the first to identify the fetal origins of adult heart disease, joined forces with a team Dutch researchers. Research using famines as testing grounds for the FOH has since spread globally, with the long-term consequences of being born towards the end

[4] The Rev. J.T. Becher's proposals anticipated those adopted under the new Poor Law of 1834.

[5] *Extracts from the Information Received by His Majesty's Commissioners as the the Administration and Operation of the Poor Laws* (London: Fellows, 18330, pp. 2-3. 'Notes on the administration of the relief of the poor in France', in *Report from His Majesty's Commissioners… Poor Laws, Appendix: Foreign Communications*. Sessional Papers 1834, no. 44.

of World War 2, or in its wake, being the focus of particular attention. These studies have investigated health (physical and mental), educational, and employment outcomes; all claim to have identified a long-run impact of famine. The results they yield have implications for our understanding of the long-run impact of earlier famines.

The Hongerwinter

Thanks in large part to the insight of the husband-and-wife team of Zena Stein and Ezra Susser, the so-called Dutch *Hongerwinter* has become the *locus classicus* for famine-related research on the link between fetal exposure to malnutrition, on the one hand, and adult health and disease susceptibility, on the other. The specialist literature based on the *Hongerwinter* is now huge (for an excellent recent survey see Lumey and Vaiserman 2013).

The Dutch famine struck towards the end of World War II, when access to outside food supplies in the German-occupied, heavily urbanized western Netherlands was severely restricted for several months (Banning 1946; Dols and van Arcken 1946). Stein *et al*. (1975: 244-46) tracked birth weights by month in different parts of the country and those data offer quite a precise guide to the famine's duration and intensity.

Although mortality was already rising before the famine, which makes estimating excess mortality tricky, it is likely that the famine resulted in about twenty thousand excess deaths in a population of 4.5 million. Age and gender mattered: in the Hague, for example, nearly four-fifths of all deaths from malnutrition in the first

half of 1945 were of people aged 55 years and above, while those aged 20-39 years accounted for less than four per cent of the total.

Moreover, nearly two-thirds of those who died in the Hague at the famine's peak during the first three months of 1945 were male. The gender gap in mortality was much greater than usual during famines. The wartime context must partly account for the marked male disadvantage. There was a class aspect to this too; in the Hague the female share of deaths was 31.5 per cent in working-class households, 40.2 per cent in middle-class households, and 46.8 per cent in the relatively small number of upper-class households. Those who suffered most, relatively speaking, were prime-age males from working-class households. Deaths in working-class households were also more likely to be from malnutrition, although the share of all deaths in the Hague due to malnutrition was also significant in middle-class households, reaching two-fifths at the peak in April (Banning 1946; Human Mortality Database).

Stein and Susser's quest for a study that would overcome two difficulties with testing any version of the FOH—that of being able to study the required individual nutritional levels in 'free-living populations' and the long interval between fetal exposure and adulthood—germinated with an initial research proposal and visit to the Netherlands in 1968. The cooperation of the Dutch government and military was secured along with research funding from the U.S. National Institutes of Health.

A shortcoming of Dutch research on the FOH is that the food consumption levels of individuals exposed at different stages of the famine are not known. That the average mother was malnourished may be inferred from the low weights of full-term births during the famine but there is no hard evidence on how badly off were individual mothers. This is an awkward but unavoidable shortcoming of the Dutch

studies. Some studies attempt to plug the gap with self-recall measures of individual-level nutrition, but that shifts the focus from fetus to early childhood.

The Susser-Stein project yielded its first fruits in 1972 and their much-cited monograph followed in 1975. It compared measures of cognitive development for Dutch conscripts exposed to famine *in utero* to conscripts born before and after the famine and to conscripts born in non-famine regions of the Netherlands. It concluded that 'in a large population of young men there were, with one exception, no detectable effects on exposure of famine on various measures of mental performance, nor on physical stature, nor on disorders of health', and with an acceptance that 'poor prenatal nutrition cannot be considered a factor in the social distribution of mental competence among surviving adults in industrial societies' (Stein *et al*. 1975: 229, 236).

Stein *et al*. attributed their finding that 18-year old army recruits conceived during the famine were *more* intelligent than both recruits from non-famine areas and recruits born just before and after the famine in the affected area to selection bias. This was because more resilient and better-resourced parents, whose children were on average brighter, experienced less of a fertility decline during the famine than the remainder: 'the variation in the effect of the famine on fertility among social classes was large enough to alter the level of adult mental performance among successive cohorts' (Stein et al. 1975: 231). In other words, a selection effect swamped the scarring effect that they sought to identify.

Stein *et al*.'s work would spawn an enormous literature featuring rival teams of researchers, with claims straddling a wide range from mental disorders to cancer, and from heart disease to diabetes. By the end of 2011 the literature on the *Hongerwinter* had already generated over 150 papers in professional—mainly medical—journals and

the flow shows little sign of receding since. Amid conflicting claims and rival, non-replicable results it is hard to paint a consistent picture of the outcome.

Most of the early Dutch studies of the FOH, the product of medical and epidemiological rather than economic or economic historical research, did not correct for the selection bias that Stein *et al*. posited, but could not identify. Selection bias is the original sin of analyses of the FOH. Lumey and Stein (1997; see too Stein et al. 2009; Lumey *et al.* 2007) were the first *Hongerwinter* researchers to address selection bias head on; they pioneered comparisons of same-sex siblings, comparing one who was exposed to one who was not. While this offers a way around some selection due to time-invariant factors, it cannot—as they readily note—control for other confounding factors such as the weather or other impacts of the occupation.

A recent survey of Dutch *Hongerwinter* studies returns a cautious (and cautionary) verdict on fetal origins. It rejects claims for an impact on cognition; on self-reported health or depression; on heart disease; and on blood pressure. It reckons that the evidence for links to height, diabetes, and schizophrenia is more robust. It also reports some evidence of epigenetic effects (Lumey and van Poppel 2013).

A striking feature of research on the Hongerwinter is how little involvement there has been so far by Dutch economists and economic historians in FOH studies of the Dutch famine. This seems a pity, since some of the Dutch research has been rather insensitive to worries that matter more in the social sciences such as the small size of samples, various selection issues (likelihood to respond to questionnaires, socio-economic background of parents), the role of historical context, and replicability.

China

In 1959-61 China suffered the greatest famine ever in terms of numbers of lives lost. In recent years a number of studies based on party archives and oral history have greatly increased understanding of the famine's extent and causes, though much remains unresolved and controversial.[6]

China has become a fertile field for FOH analysis (see Appendix). The outcomes range from finding that 'by and large, people are resilient to extreme nutrition shocks' (Tan, Tan, and Khang 2014) and that 'evidence supporting the fetal origins hypothesis was weak' (Xu *et al*. 2015) to claims that 'the great famine caused serious health and economic consequences for the survivors, especially for those in early childhood during the famine' (Chen and Zhou 2007) and that 'higher famine intensity… was associated with greater risk of being illiterate, out of the labor force, marrying later (men), and marrying spouses with less education (women)' (Almond et al. 2010).

The first studies in this tradition to use Chinese data relied on hospital records. They focused on the link between exposure to famine and schizophrenia and, like several early Dutch studies, simply compared hazards by birth cohorts (Liu et al. 2003; St. Clair *et al*. 2005). Selection was not raised as an issue, although the second, better known of these studies relied on data from Anhui province, where the birth rate plummeted by four-fifths during the famine. Of course, it could be argued that not adjusting for selection generates a lower-bound estimate of the true loss.

[6] Ó Gráda (2015: 130-73) reviews some of the recent literature; see too Garnaut 2013; Wemheuer 2014; Meng *et al*.; Kung 2014.

Several studies of the Great Leap rely on anthropometric measures in early adulthood, but they produce discordant outcomes. For example, Meng and Qian find that *in utero* exposure reduced height by 2.8 cm and weight by 1.42 kg, and that early childhood exposure reduced height by a 2.7 cm and weight by a whopping 3.03 kg (Meng and Qian 2009). Gørgens et al. (2012) find that rural Chinese survivors aged 0-5 during the famine 'lost' between 1 cm and 2 cm in height. But such findings are contradicted by Kim *et al*. (2015), who find that although fetal exposure had manifold impacts, it did not impact substantially on height or weight.

An innovative feature of the study Gørgens *et al*. is that it seeks to get around selection by exploiting what it describes as the 'fact that children inherit parents' genotype, not their actual height (phenotype)'. Thus famine might reduce the adult heights of exposed children, but if it does not also affect the heights of their children in turn, the latter can be used to correct for selection bias. However, this would not hold in the presence of second-generation epigenetic effects, effects that would be impossible to disentangle from selection effects.[7] Ironically, Gørgens *et al*. dismiss what is the precise focus of some recent work on famines: 2G epigenetic effects.

Studies use a variety of strategies to address selection. Kim *et al*. (2015) uses province- and year-specific death rates as proxies for famine severity. Wang *et al*. seek to adjust for selection by using socio-economic characteristics—but these refer to the present rather than during the famine. Chen and Zhou (2007) use measures of how

[7] Lumey and Stein (1997) may have been the first to identify such epigenetic effects when they compared the birth weights of siblings born to mothers exposed (or not) during the *Hongerwinter*. Their analysis led them to speculate that there might be 'long-term biological effects, even into the next generation, of maternal intrauterine nutrition, which do not correspond to the effects on the mothers' own birthweights'.

famine varied across cohorts and regions to construct a difference-in-difference estimator, knowing that selection in births may results in 'a lower-bound estimation of long-term effects of famine'. But a worrying feature of this study is a different type of selection bias. In the working paper version they explore and report on the differences in the predicted impact on adult height in the five different surveys. These are reproduced in Figure 6. In the published version, they admit that 'the choice of one particular survey year as the focus of the analysis is somewhat arbitrary', but opt for the 1991 survey since it provides 'the largest number of effective observations' (2007: 665). Yet note too that the estimated height coefficient is twice as big for 1959 and 1960 in the 1991 survey than in any of the others.

—Figure 6 about here—

Xu *et al.* (2015) analyse the results of using three approaches—comparing cohorts, differences-in-differences, and applying an instrumental variable—to estimate the impact of the Chinese famine on a range of health markers. They find that the effects identified by the first two approaches disappear with the third, which Xu *et al.* claim is the appropriate approach to take. This is an important paper with the negative implication that many of the claims made in the voluminous literature on China are overblown.

News from Elsewhere

There have been several studies of the impact of the famines of World War 2 on those born during them. In a study of the siege of Leningrad (1941-44) Stanner and Yudkin (2001) failed to find any impact on glucose tolerance, blood pressure, or insulin concentration, but they found evidence of a condition related to diabetes and a 'stronger interaction between adult obesity and blood pressure' (compare Khoroshinina 2005; Vågerö *et al.* 2013).

Juerges (2013) invokes 1970 West German census data to show that men and women born between November 1945 and May 1946 had 'significantly and substantially lower educational attainment and occupational status than cohorts born shortly before or after'. He deems this a confirmation of the FOH, and invokes Austrian data to corroborate. A study of the long-run impact of early life exposure to the Greek famine of 1941-42 is also limited to its effect on education. They find that exposure exacted an educational penalty, which was worse in urban than in rural areas, and more extreme for those aged 0-1 years than either those in utero or aged one year at the height of the famine (Neelson and Stratmann 2012).

Two recent studies take a multi-country approach to the impact of World War II, using the retrospective Survey on Health, Aging, and Retirement in Europe (SHARE). Kesternich *et al*. (2014) found that exposure to war in 1939-45 impacted on the likelihood of heart disease, diabetes, depression, and health generally. In the most extensive study so far on the impact of twentieth century wars on adult health outcomes, Havari and Peracchi (2014) also show that living in a war zone during childhood or adolescence in 1939-45 was linked to worse physical and mental health in later life. They too found an impact on life satisfaction, though not on happiness. Living in a war zone impacted more strongly on females than on males in these

respects, and the impact also increased with the length of the exposure. In an attempt to identify the pathways to these adverse outcomes, Kesternich *et al*. found that hunger, persecution, dispossession, and a father being absent, had strong explanatory power.

Dercon and Porter have studied the effects of the Ethiopian famine of 1984-85 on heights of young adults who endured the famine in utero or as very young children and found that the famine imposed a penalty of at least 5 cm in adult height is certainly dramatic. They also find that the famine cohort were less likely to have completed primary school and to be less healthy, and reckon that the overall impact was to reduce lifetime earnings by about 5 per cent. They overcome the selection bias issue by focusing on differences between infants aged 12-36 months at the peak of the famine and unaffected siblings.

To summarize: research on the Dutch *Hongerwinter* has moved from the 'not proven' verdict of those who were first to invoke it in the early 1970s, through a growing number of competing and conflicting claims by rival medical researchers, to the tempered understanding represented by Lumey and van Poppel (2013), which highlights both the limitations of famines as natural experiments and the robustness of a small number of findings. The story thus far of research based on the Great Leap Famine is one of strong claims followed by scepticism. The databases underpinning recent research by economists, who tend to be more sensitive to selection issues, broadly corroborate, while devoting particular attention to the impact of health insults *in utero* or in early childhood on economic wellbeing in adulthood. We will never be able to measure this effect for earlier, bigger famines but this literature casts some light on hidden long-run costs of earlier disasters.

The Future:

Prognoses for the more immediate future of famine span a wide range. On the one hand, you have a group of English experts (Haan, Devereux, and Maxwell 2012) arguing in the wake of Somalia 2011-12 that 'we are now in a set of circumstances under which the threat of famine is more pronounced than at any time in the past several decades'. They link this claim to increasing climate and price variability, and 'a highly polarized political situation, in which the prevention of humanitarian disasters is unfortunately not very high among the competing priorities'. On the other hand, you have Alex de Waal who has juxtaposed the downward trend in famines and the sharp rise in global population at a as a clear refutation of the pessimism of Malthus. My own assessment of prospects for the next decade or two, taking account of recent famine history, the globalization of disaster relief, and rapid economic growth in many of the countries most recently at risk, is guardedly optimistic: but that prognosis is predicated on peace within and between countries.[8]

The longer-term outlook is clouded by what our President has called 'the mother of all environmental disasters', global warming. It has to be said that the majority view among economists who have studied the subject recently is quite bleak. Using twentieth century data for insight, Melissa Dell and co-authors find that drought and hot weather have little impact on rich countries with small agricultural sectors, but lots on poorer ones (Dell, Elkin, and Jones 2012; Burke, Hsiang, and

[8] Compare Alex de Waal, who in 2003 was warning against the dangers of a 'new variant famine' linked to HIV/AIDS, is now proclaiming the end of famine (de Waal and Whiteside 2003; de Waal 2015).

Miguel 2015). Technological adaptation may offer some respite: in this new age of genetic mapping[9] is it too much to hope that flood-resistant and/or drought-resistant rice and wheat varieties will follow the example of wheat cultivation in nineteenth-century North America? That example, due to economic historians Olmstead and Rhode, shows how, as the American frontier moved west the epicentre of the wheat-growing region moved with it, although this involved cultivation in much colder and drier environments. But although Olmstead and Rhode treat their example as paradigmatic, sceptics place it in the 'unprecedented innovation' category, and it must be said that the institutional context and incentives facing American farmers and agricultural scientists were far more favourable than those facing agents in the areas most at risk today from global warming. Moreover, even Olmstead and Rhode concede that the offset will be 'partial', and the jury is out on how big is 'partial' (e.g. Burke and Emerick 2015; Dell *et al*. 2014; http://www.g-feed.com/2013/01/some-new-and-not-that-hopeful-evidence.html).[10]

It is possible that in a decade or two some combination of climate engineering and technological adaptation will hold global warming and attendant famines at bay. The scientific possibilities are exciting. But, given where we are now, the downside risks in terms of malnutrition and—yes—famine are too great to risk the gamble.

[9] Amy Kazmin, 'Asia races to find drought-resistant rice', *FT* 13 Jan 2016.

[10] E.g. Burke and Emerick 2015; Dell *et al*. 2014; http://www.g-feed.com/2013/01/some-new-and-not-that-hopeful-evidence.html.

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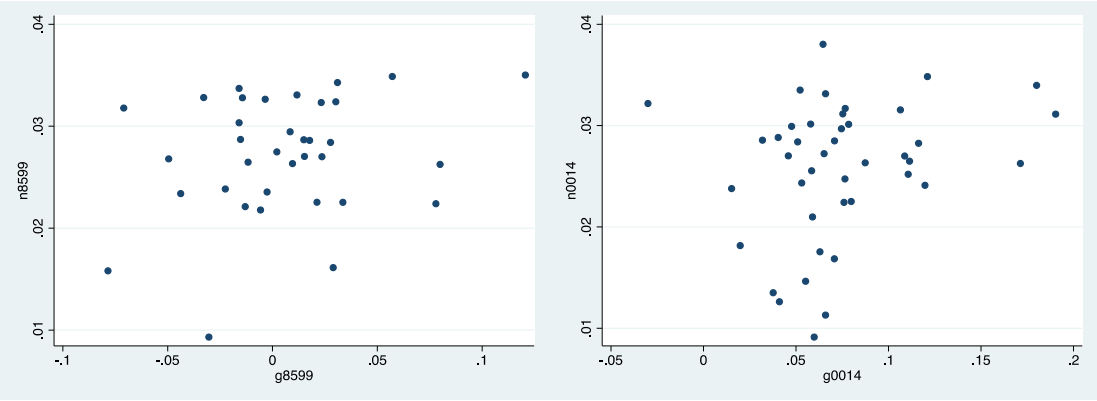

[a] 1985-99 [b] 2000-14

Figure 1. Population growth and GDP per capita growth across sub-Saharan Africa

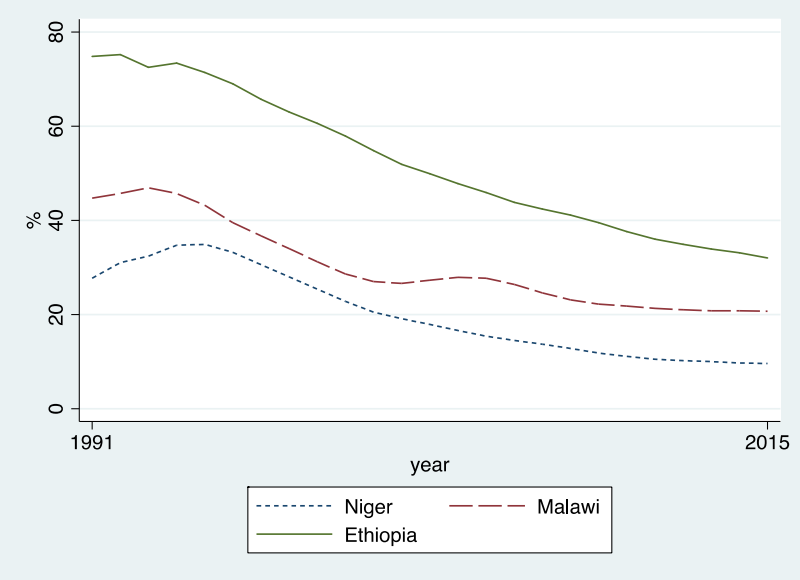

Figure 2. Malnutrition rates, 1991-2015(3-yr moving averages)

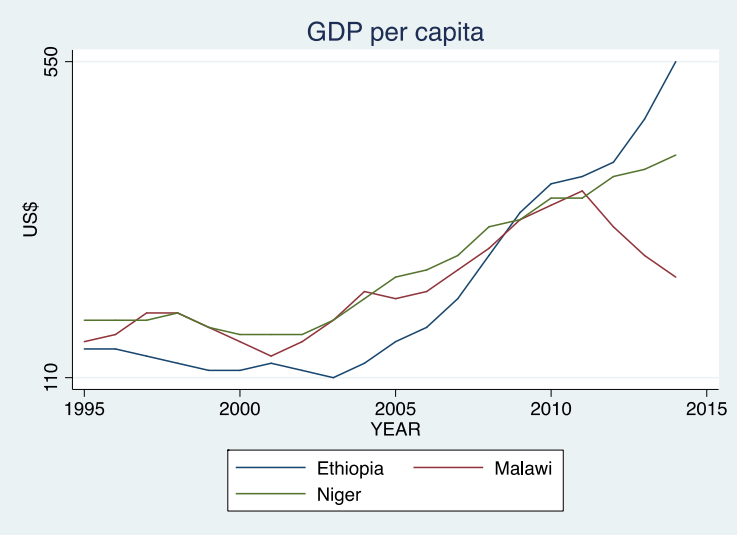

Figure 3. GDP per Capita, 1995-2014

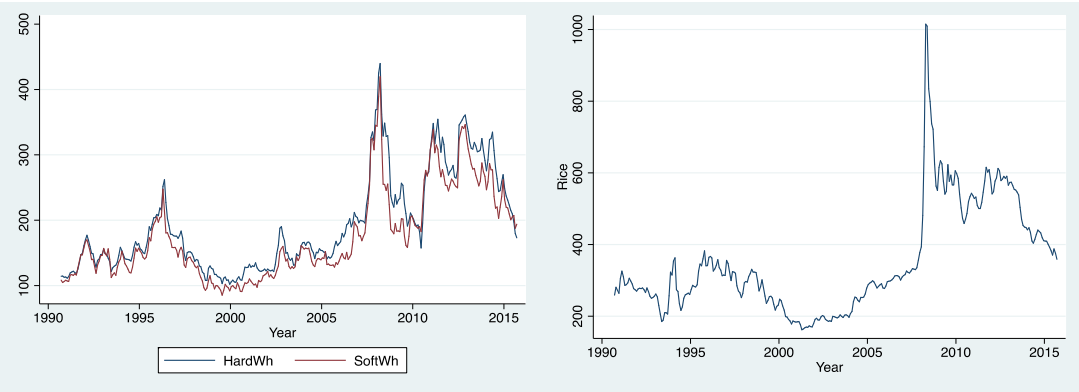

Figure 4. Monthly Wheat and Rice Prices 1990-2015 (US$ per metric ton)

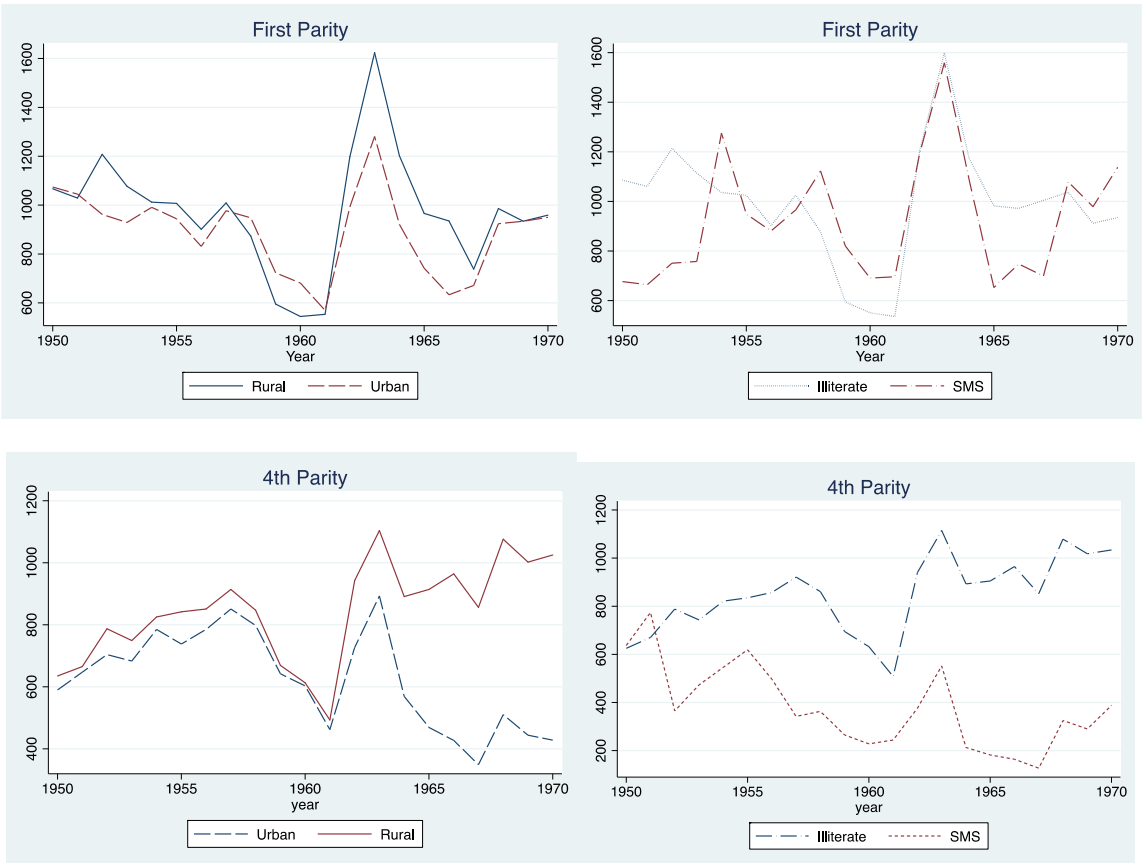

Figure 5. TFRs in China during the Great Leap Famine

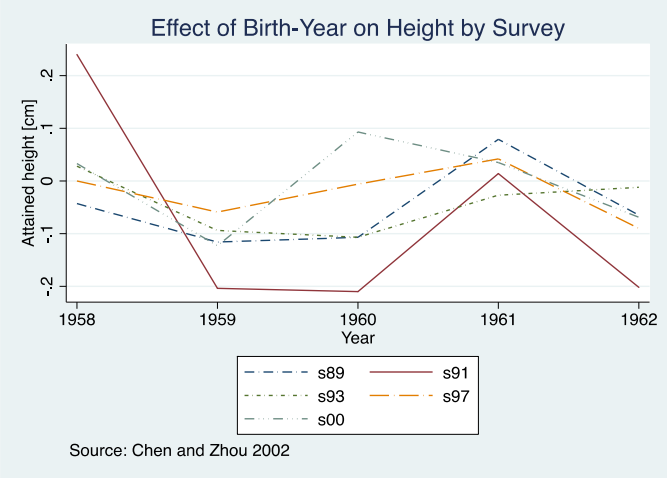

Figure 6. Height and Birth Year by Survey

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