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THE SPECTRE OF MALTHUS

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The spectre of Malthus:
Lessons from the 2007-08 food crisis

Mark Thirlwell

A new paradigm for a new, new world economy

The changing structure of the contemporary world economy – and in particular the growing economic weight and influence of developing countries in general and China in particular – is now a widely accepted fact. Coming to terms with what this new fact means for how the world economy operates, however, continues to challenge businesses, policymakers, and analysts alike. One facet of this challenge has been the search for stories – more formally, models – to describe our changed international economic order.

It's now a commonplace to assert that the fall of the Berlin Wall on 9 November 1989 and the subsequent collapse of the Soviet Union in December 1991 ushered in a new era for the world economy, marking the end of the ideological struggle with communism, and making the world (temporarily?) safe for global capitalism.[1] It also prompted a wave of books and articles attempting to explain the world that resulted, although one of the most provocative visions – Francis Fukuyama's *The End of History* – was penned a little before the Wall came down.[2] Perhaps the most popular of the commentators who attempted to describe this new world economic order is Thomas Friedman. His book *The Lexus and the Olive Tree*, first published in 1999, can be read as a paean to an emerging global capitalist world.[3] In it, Friedman describes a world dominated by the 'electronic herd' (vast flows of private capital across borders) where countries had to don a Golden Straitjacket (fiscal discipline, trade and investment liberalisation, privatisation) to keep markets happy and upgrade their economic 'operating systems' to DosCapital6.0, the version running in the United States and the United Kingdom. In *The World is Flat*, published in 2005, Friedman updated his vision to take into account the growing role of IT and the internet, and of outsourcing and offshoring.[4] Friedman's flat earth sought to capture some of the same kinds of concepts as earlier theories about 'the death of distance' and the 'weightless world'.[5] More recently, in June 2007 Martin Wolf of the

[1] 'Temporary' if some of the most pessimistic projections about the ultimate outcome of the 2007-08 financial crisis turn out to be correct. For a provocative alternative view on 1989 as a turning point for the future of the world economy, see Chrystia Freeland, The new age of authoritarianism. *Financial Times*, 12 August 2008.

[2] Francis Fukuyama, The end of history. *The National Interest* (16) 1989. The book-length version of Fukuyama's article was published in 1992.

[3] Thomas L Friedman, *The lexus and the olive tree.* London, HarperCollins, 1999.

[4] Thomas Friedman, *The world is flat: A brief history of the Twenty-First Century* New York, Farrar, Strauss and Giroux, 2005.

[5] Frances Cairncross, *The death of distance: how the communications revolution will change our lives.* London, Orion, 1997 and Diane Coyle, *The weightless world.* Oxford, Capstone, 1997.

Financial Times, one of the world's leading economic commentators, heralded the triumph of global financial capitalism.[6]

Now the world has changed again. The international financial crisis triggered by subprime problems in the United States has culled some of the electronic herd and cowed (sic) much of the rest. The golden straitjacket has been re-tailored as a threadbare Washington Consensus has been challenged by a brash new Beijing Consensus. With Western financial institutions busy deleveraging and merging as they discover that risk has not been banished after all (despite the complacency engendered by halcyon market days of 2004-2006), the balance of financial power has tilted towards developing country central banks, sovereign wealth funds (SWFs) and state owned enterprises: by October 2007, the *Financial Times's* Wolf was announcing a brave new world of *state* capitalism.[7] Financial crises in the United States and the United Kingdom – and the nationalisations and mammoth public sector bailouts that have followed, including the world's largest to date – have tarnished the image of Anglo-Saxon financial capitalism, suggesting to the rest of the world that DosCapital 6.0 comes with some fairly major bugs. Moreover, even before the onset of international financial crisis, the developed world's appetite for globalisation was on the wane, with rich world voters spooked by the competitive and environmental challenges posed by dynamic emerging markets.[8]

The world no longer looks particularly flat, either. Not only do geography and distance remain important economic determinants of trade, but rising energy prices since 2001 suggested that transport costs might be set to become *more*, rather than less important.[9] In the world economy of 2007 and 2008 'weightlessness' started to seem relatively less important than things you could drop on your foot – barrels of oil and bushels of wheat – which turned out still to have immense economic and geo-political relevance, albeit sometimes in new and sometimes surprising ways: Middle Eastern oil wealth and East Asian current account surpluses based on quasi-mercantilist policies enabled the dramatic 'reverse bailout' of late 2007 which saw SWFs pump more dollars into a struggling Wall Street than the IMF was able to deliver to Asia at the height of the financial crisis.[10] Granted, the deepening financial crisis of 2007-08 has certainly made a renewed case for the critical importance of the weightless part of national economies, but not in a good way. Meanwhile, on the political front, analysts have again rushed to declare 'the end of the end of history'

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[6] Martin Wolf, Unfettered finance is fast reshaping the global economy. *Financial Times*, 18 June 2007.

[7] Martin Wolf, The brave new world of state capitalism. *Financial Times*, 16 October 2007.

[8] Mark Thirlwell, *Second thoughts on globalisation: Can the developed world cope with the rise of China and India?* Lowy Institute Paper 18. Sydney, Lowy Institute for International Policy, 2007.

[9] On the importance of geography, and for a more general critique of *The World is Flat*, see Edward E Leamer, A flat world, a level playing field, a small world after all, or none of the above? A review of Thomas L Friedman's *The World is Flat*. *Journal of Economic Literature* 45 (1) 2007. On the implications of higher energy prices for globalisation, see for example, Jeff Rubin and Benjamin Tal, *Will soaring transport costs reverse globalization?* StrategEcon, CIBC World Markets Inc, 27 May, 2008 and Larry Rohter, Shipping costs start to crimp globalization. *The New York Times*, 3 August 2008. For a more sceptical take on the role of shipping costs, see David Jacks, Christopher M. Meissner and Dennis Novy, Globalisation and the costs of international trade from 1870 to the present day. *VoxEU www.voxeu.org*, 16 August 2008.

[10] Brad W Setser, *Sovereign Wealth and Sovereign Power.* Council Special Report No. 37. New York, Council on Foreign Relations Center for Geoeconomic Studies, September, 2008.

with the history-restarting challenges posed by terrorism now replaced by a new-found focus on the rise of a new 'authoritarian capitalist' or state capitalist model.[11]

The old new economy has gone, and the search for a new paradigm for a new, new world economy is on. Possible alternatives considered to date include variations on the (connected) ideas of a Great Convergence and a resource-constrained world.[12]

Learning from the food crisis

In 2007, and particularly in the first half of 2008, the world economy was faced with a major food crisis, as food prices soared. In the year to July 2008, the Food and Agriculture Organization of the United Nations (FAO)'s food price index rose by more than 50%. The price of rice more than tripled in the 12 months to April 2008. In 2007, the number of food-insecure people increased by between 50 million and 130 million as the global food import bill rose to its highest level on record.[13] Higher food prices may have pushed up the number of people in poverty by more than 100 million. There were riots and other food-related protests and disturbances in at least 30 countries and food security was once again being talked about in the same breath as national security. In 2008, the spectre of Malthus was once again haunting the earth.[14]

In the rush to grapple with the far-reaching consequences of the worst financial crisis in the post-war era, there is a risk that the lessons of the 2007-2008 food crisis are forgotten. That would be more than a shame, since the crisis has not only had profound consequences for many of the world's poor, but also tells us some important things about the workings of the world economy today. This Lowy Paper therefore takes a look at some of the lessons that can be drawn from the 2007-2008 food crisis. In particular, it assesses the food crisis in terms of the proposition that we are now living in a resource-constrained world economy, a theory that has received growing attention in recent years. The ingredients of the 2007-2008 food crisis include population growth and rising economic prosperity, urbanisation, water scarcity, soil degradation, climate change, technological innovation, energy prices and energy security, domestic and geo-politics, and international trade and investment. Understanding what contributed to the food crisis and analysing the policy response to date provide some useful evidence regarding the possible workings of a resource-constrained world.

[11] Fareed Zakaria, The end of the end of history. *Newsweek*, 24 September 2001, Robert Kagan, The end of the end of history. *The New Republic*, 22 April 2008, and Azar Gat, The return of authoritarian great powers. *Foreign Affairs* 86 (4) 2007.

[12] The two are linked: a resource-constrained world can be seen as either a product of, or exacerbated by, the Great Convergence.

[13] The lower estimate of the number of food insecure people comes from the FAO's forthcoming Report on Food Insecurity, cited in Jacques Diouf. The current food crisis: Challenges and opportunities for agricultural development. Havana, Cuba, 21 July 2008. The higher estimate is from USDA, *Food security assessment, 2007.* Washington, DC, United States Department of Agriculture, July, 2008.

[14] Mark Thirlwell, Food and the spectre of Malthus. *Financial Times*, 26 February 2008.

A Resource-Constrained World or A New Malthusian Age?

Prior to the recent, financial crisis-induced falls in commodity prices, one increasingly common description of our changed international environment starts from the proposition that we now live in a resource-constrained world, one in which the rapid industrialisation and urbanisation of the developing world - the *Great Convergence* – is now bumping up against natural resource and environmental constraints.[15] World energy markets, where oil prices had surged to a peak of US$147/barrel by early July 2008, seemed to at least some observers to be an obvious example of this process in action: on the one hand, growing demand from China and India; on the other, renewed concerns about future supply.[16]

In fact, there is a clear temptation to develop this proposition of a resource-constrained world even further, and conjure forth the spectre of the Reverend Thomas Malthus.[17] The sharp rises in food prices that occurred during the first five months of 2008 seemed to provide just such an opportunity: after all, the prospect of food scarcity cuts right to the heart of the most fundamental of human needs, and has potentially profound social, economic and political consequences.

Malthusian-style pessimism about the future of the world has a long history. In 1798, Thomas Robert Malthus published (anonymously) *An Essay on the Principle of Population.*[18] Famously, Malthus wrote about the inability of agricultural productivity to keep pace with population growth:

> *"Population, when unchecked, increases in a geometrical ratio. Subsistence increases only in an arithmetical ratio. A slight acquaintance with numbers will shew the immensity of the first power in comparison of the second.*
>
> *By that law of our nature which makes food necessary to the life of man, the effects of these two unequal powers must be kept equal.*
>
> *This implies a strong and constantly operating check on population from the difficulty of subsistence. This difficulty must fall somewhere; and must necessarily be severely felt by a large portion of mankind."*

Malthus thought that, in practice, most populations would be checked for most of the time, but that under certain circumstances a population could temporarily outgrow its

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[15] See for example Justin Lahart, Patrick Barta and Andrew Batson, New limits to growth revive Malthusian fears. *The Wall Street Journal*, 24 March 2008. Also Jeffrey D. Sachs, *Common Wealth: Economics for a crowded planet.* Camberwell, Allen Lane Penguin Books (Australia), 2008. In this regard, it should probably come as no surprise that a major subject of Thomas Friedman's new book *Hot, Flat, and Crowded: Why We Need a Green Revolution--and How It Can Renew America* is environmental stress.

[16] See for example IEA, *World Energy Outlook 2007: China and India insights.* Paris, International Energy Agency, 2007. Also Carola Hoyos, Running on empty? Fears over oil supply move into the mainstream. *Financial Times*, 19 May 2008.

[17] Thirlwell, Food and the spectre of Malthus.

[18] Thomas R Malthus, *An essay on the principle of population, as it affects the future improvement of society with remarks on the speculations of Mr. Godwin, M. Condorcet, and other writers.* London, J. Johnson, 1798. The *Essay* is available online in various forms. See for example http://www.econlib.org/library/malthus/malPop.html.

The Great Convergence

In the first chapter of his book *A farewell to Alms,* Gregory Clark shows how the basic outline of world economic history is simple enough to be contained in one diagram.* Before c.1800, the world was caught in a Malthusian trap, defined by the absence of any trend growth in average income per person.** After 1800, the industrial revolution brought sustained gains in income per person for a sub-group of countries by triggering the onset of modern economic growth. Other countries got left behind, producing a growing gap in living standards that has been described as the Great Divergence.*** As far as world economic history goes, then, there are just three key facts to remember: (1) the Malthusian trap; (2) the industrial revolution; and (3) the Great Divergence.****

By the end of the previous century, it was clear that these three facts needed to be supplemented by a fourth: the spread of sustained economic growth in income per head to the great populous countries of Asia: India, and particularly China. The Great Divergence was finally being followed by a Great Convergence.

The Great Convergence has produced a series of ongoing supply and demand shocks which in turn have contributed to significant shifts in relative prices and rates of return. These shifts can help explain several of the trends of recent years, including the recent commodity price boom (part of a global relative price shift) and the associated scramble for resources / quest for resource security; the increase in profit shares and the squeeze on labour income in many developed economies (a product of the expansion of the effective global labour force); and global current account imbalances (propelled by changes in global savings and investment rates).

* See Figure 1.1 in Clark, *A farewell to alms: A brief economic history of the world*. (2007).
** Angus Maddison's work suggest that there was significant growth in income per head between 1AD and 1820, albeit at a much slower rate than after than Industrial Revolution. Maddison, *The world economy: a millennial perspective*. (2001).
*** Pomeranz, *The great divergence: China, Europe and the making of the modern world economy*. (2000).
**** This schema arguably neglects one other major transition: the Neolithic Revolution (the transition from hunter-gatherer bands to a more settled, agricultural society).

food supply. Under such circumstances, famine would provide the ultimate check to population growth. In the centuries following the publication of his *Essay*, Malthus's name has become inextricably tied to the fear that a growing world population would eventually exceed the planet's capacity to produce food, triggering massive famines.[19]

Yet, and as many subsequent critics have happily and repeatedly pointed out, Malthus turned out to be writing at a time shortly before a series of major developments – the acceleration of the industrial revolution, a dramatic expansion of international trade, the emergence of new agricultural producers in North America, Argentina and Australia, and the onset of the demographic transition – would allow a progression of countries, led by his own, to break free from the Malthusian trap he had just identified.[20]

Fears about Malthusian constraints to growth have been a recurring phenomenon. They re-emerged in the late 1960s and early 1970s, when the world experienced a

[19] Tim Dyson, World food trends: A neo-Malthusian prospect? *Proceedings of the American Philosophical Society* 145 (4) 2001.
[20] See for example, The Economist, Malthus, the false prophet. *The Economist*, 15 May 2008. For a good description of the Malthusian trap, see Chapter 2 and also Chapter 3 of Gregory Clark, *A farewell to alms: A brief economic history of the world.* Princeton, Princeton University Press, 2007.

period of rising nominal and real food prices.[21] Then, thanks in large part to the Green Revolution, rising world agricultural productivity allowed food output to run comfortably ahead of population growth, and food prices began a decades-long fall in real (inflation-adjusted) terms. Indeed, economists often cite both Malthus's original predictions and the failure of the more pessimistic forecasts of the early 1970s such as those contained in *The Limits to Growth* as cautionary lessons regarding the failure to account properly for the impact of technological change.[22]

Neo-Malthusianism got another run in the mid-1990s when, following a period of virtual stagnation in global production of cereals during the first half of that decade, food stocks declined and (nominal) world market prices rose sharply.[23] But once again the run-up in prices proved temporary and was followed by an extended period of cheap food. An old and familiar adage – the best cure for high prices is high prices – continued to hold.

Yet the spectre of Malthus was never completely banished: in the 1990s, analysts at the University of Toronto and the American Academy of Arts and Science warned that scarcity of renewable resources (water, forests, and especially fertile land) had been an important driver of conflicts in the developing world and could become even more important in the future. More recently, Jared Diamond, for example, has argued that the problems caused by population growth outstripping available resources have played out with tragic consequences in Rwanda.[24] More recently still, Jeffrey Sachs has emphasised that, without new technologies, current rates of resource use are unsustainable.[25] Drawing on the terminology of Paul Crutzen, Sachs argues that the dramatic growth of the world economy has had effects on the natural environment significant enough to warrant the description of our current era as the Anthropocene,

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[21] Lahart, Barta and Batson, New limits to growth revive Malthusian fears. The classic reference is Donella H Meadows, Dennis L Meadows, Jorgen Randers and William W Behrens III, *The limits to growth: A report for the Club of Rome's project on the predicament of mankind.* New York, Universe Books, 1972.

[22] Another classic economic 'morality tale' in this regard is the 1980 bet between the biologist Paul Ehrlich and the economist Julian Simon over the price trajectories of five resources over the following decade. In a world of growing scarcity caused by population growth, presumably the price of raw materials would rise over time. The bet tested this proposition. Ehrlich chose five minerals (tungsten, nickel, copper, chrome and tin) and calculated how much of each could be bought with US$200 in 1980. The bet was that in 1990 they would calculate the price of the same quantities of the minerals. If the total price was higher than the US$1000 (after adjusting for inflation) paid back in 1980, Simon would pay Ehrlich the difference. If it was lower, Ehrlich would pay Simon. Famously, Simon won the bet hands down: the quantity of minerals that had cost US$1000 in 1980 was worth less than US$424 by 1990. For an entertaining description of the background to the bet, and of Simon's views more generally, see Ed Regis, The doomslayer. *Wired*, February 1997.

[23] Nikos Alexandratos, The world food outlook: A review essay. *Population and Development Review* 23 (4) 1997.

[24] Thomas F Homer-Dixon, Jeffrey H Boutwell and George W Rathjens, Environmental change and violent conflict. *Scientific American*, February 1993.Jared Diamond, *Collapse: How societies choose to fail or survive* London, Penguin Books, 2005. See in particular Chapter 10 Malthus in Africa: Rwanda's Genocide. For an interesting review of Diamond's work and the construction of a (very) simple economic model that captures parts of the story rather well, see Scott E Page, Are we collapsing? A review of Jared Diamond's *Collapse: How societies choose to fail or succeed*. *Journal of Economic Literature* 43 (4) 2005.

[25] Sachs, *Common Wealth: Economics for a crowded planet*. For a short overview, see Jeffrey D Sachs, A user's guide to the century. *The National Interest* (96) 2008.

given the scale of anthropogenic impacts.[26] One of Sachs's messages is that the current extent of natural resource use is historically unprecedented and he argues that while many early 'solutions' to resource constraints in practice involved new ways to extract resources, rather than resource-saving innovations, this approach is no longer sustainable. For Sachs, Malthusian-style constraints may still be with us:[27]

> *"Yet one thing is certain: the current trajectory of human activity is not sustainable. If we simply do what we are doing on the planet with unchanged technology – but on a much larger scale as China, India and other large population centres experience rapid economic growth – the environmental underpinnings of global well-being will collapse."*[28]

Table 1: The declining ferocity of the 'third horseman'
Estimated death tolls for selected historical experiences of famine

Year	Country	Excess Mortality (million)	Observations
1693-94	France	1.5	Poor harvests
1846-52	Ireland	1	Potato blight, policy failure
1877-79	China	9.5-13	Drought, floods
1876-79	India	7	Drought, policy failure
1921-22	USSR	9	Drought, civil war
1927	China	3-6	Natural disasters
1932-33	USSR	5-6	Stalinism, harvest shortfall
1942-44	Bengal	2	War, policy failure, supply shortfall
1946-47	Soviet Union	1.2	Poor harvest, policy failure
1959-61	China	15	Drought, floods, Great Leap Forward
1975-79	Cambodia	0.5-0.8	Human agency
1984-85	Sudan	0.25	Drought
1985-86	Ethiopia	0.6-1	War, human agency; drought
1991-92	Somalia	0.3	Drought, civil war
1995-2000	North Korea	0.6-1	Poor harvests, policy failure
2002	Malawi	Negligible	Drought
2005	Niger	Negligible	Drought

Source: Extracted from Table 3 in O Grada, *Making famine history*. (2007). See also Table 1 in Devereux, *Famine in the Twentieth Century*. (2000) for major twentieth century famines.

Still, the prospect of famine, that ultimate Malthusian check, has without a doubt receded dramatically (Table 1). True, famine remained a potent killer in the twentieth century overall, with the aggregate cost of twentieth century famines in terms of excess mortality probably somewhere between 70 million and 80 million deaths, or roughly as many as the two world wars combined. (Strikingly, over 80% of all of these famine deaths are estimated to have occurred in China and the now defunct Soviet Union and all before 1965.)[29] Yet by the late 1990s, famine-induced deaths had been confined to poverty-stricken and usually war-torn pockets of the globe, with the result that a 2007 survey of the subject could conclude credibly that 'today major,

[26] Following Crutzen, some scientists use the term anthropocene to describe the recent part of world history on the assumption that over this period human influence has become large enough to constitute a new geological era.
[27] Jeffrey D. Sachs, The specter of Malthus returns. *Scientific American*, September 2008.
[28] See the introduction of Chapter 3 in Sachs, *Common Wealth: Economics for a crowded planet*.
[29] Stephen Devereux, *Famine in the Twentieth Century.* IDS Working Paper 105. Brighton, Institute of Development Studies, 2000

prolonged famine anywhere is conceivable only in contexts of endemic warfare or blockade.'[30]

The 'other' GFC

The consequences of the rise in food prices have been profound:

- Panic buying by key importers and the imposition of export restrictions by at least 30 countries created significant dislocations in international grain markets, most particularly the market for rice.

- The number of food-insecure people worldwide increased by between 50 million and 130 million in 2007 due to higher food prices. Improvements in food security stalled in Asia while an already serious situation in parts of Africa was exacerbated.[31]

- The World Bank warned that as many as 33 countries were at risk of social upheaval due to rising food prices.[32] Bank economists estimated that the rise in food prices may have pushed up to 105 million people back into poverty.[33]

- Ratings agencies cautioned that higher food prices were damaging the creditworthiness of some (speculative grade) sovereign borrowers.[34]

- By June 2008 more than 30 countries had experienced some form of social unrest or domestic protest linked to high food prices, and analysts were warning that, as well as triggering a humanitarian crisis, the spike in food prices threatened political stability in several countries.[35]

By the start of July 2008, the Managing Director of the IMF was warning that:

> *'Some countries really are at a tipping point. If food prices rise further and oil prices stay the same, some governments will no longer be able to feed their people and at the same time maintain stability in their economies.'*[36]

The good news is that, at the time of writing, food prices (along with commodity prices more generally) had fallen back from the highs they reached earlier this year (Figures 2, 3). The not-so-good news is that there is a strong consensus across many official forecasters – including the World Bank, the Organisation for Economic

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[30] Cormac O Grada, Making famine history. *Journal of Economic Literature* 45 (1) 2007

[31] USDA, *Food security assessment, 2007.* . Annex 1 lists the countries covered by the Food Security Assessment.

[32] Bob Davis and Douglas Belkin, Food inflation, riots spark worries for world leaders. *The Wall Street Journal*, 14 April 2008.

[33] Maros Ivanic and Will Martin, *Implications of higher global food prices for poverty in low income countries.* Policy Research Working Paper 4594. Washington DC, World Bank, April, 2008.

[34] Standard and Poor's, *Is food the new oil? Credit Implications of the unfolding food-price shock.* New York, Standard and Poor's, 2008.

[35] Carolin Hoyos and Javier Blas, West rethinks strategic threats. *Financial Times*, 20 June 2008.

[36] Quoted in IMF, Price surge driving some countries close to tipping point - IMF. *IMF Survey Magazine* 2008

Cooperation and Development (OECD) and the FAO, and the US Department of Agriculture (USDA) – that food prices over the coming decade will remain significantly higher than they were in the previous one (Figure 4).[37] Moreover, some forecasters also judge that price volatility is also likely to be appreciably higher than in the past.

Uncertainties regarding the longer term outlook for food prices

If the immediate prospects for food prices have improved, what about the longer-term outlook? As noted back at the start of this Paper, the consensus across many official forecasters at the time of writing was for nominal food prices over the coming decade to be higher than over the previous one. The latest World Bank assessment at the time of writing, for example, suggested that 'prices for most major food crops are expected to remain well above 2004 levels through 2015'.[38] A review of the demand and supply trends set out above would suggest that there are some good reasons to suspect that global food markets will remain tighter than they were in the decades following the successful implementation of the Green Revolution, and, partly as a consequence, be subject to a greater level of volatility. An important caveat here, however, is that all these forecasts were made at a time of high prices, and there is a well known tendency for forecasts to be strongly influenced by prevailing conditions.

It is also important to remember, again as noted above, that high prices contain a self-correcting element. Some empirical estimates, for example, suggest that typically global agricultural supply increases by 1 - 2% in response to a 10% rise in prices.[39] Many of these estimates of price elasticity are based on 1980s and 1990s data, however, and the supply responsiveness of agriculture in the future may turn out to be materially different from in the past two decades. In this regard, at least four key questions need to be answered when thinking about future supply and demand – and hence price – trends: How will governments manage food security in the future? Will energy, land and water constraints become (more) binding? How will climate change alter the picture; What is the scope for technological and scientific advances to trigger a new Green Revolution and loosen some of these resource constraints?

[37] See for example OECD and FAO, *OECD-FAO Agricultural Outlook 2008-2017*. Paris, Organisation for Economic Cooperation and Development and Food and Agriculture Organization of the United Nations, 2008.

[38] World Bank, *Rising food and fuel prices: Addressing the risks to future generations.* Washington DC, World Bank, 12 October, 2008

[39] Cited in Joachim von Braun, Akhter Ahmed, Kwadwo Asenso-Okyere, Shenggen Fan, Ashok Gulati, John Hoddinott, Rajul Pandya-Lorch, Mark W Rosegrant, Marie Ruel, Maximo Torero, Teunis van Rheenen and Klaus von Grebmer, *High food prices: The what, who, and how of proposed policy actions.* Washington DC, International Food Policy Research Institute, 2008.

Table 9: Countries facing food security crises as of October 2008 *GIEWS listing of countries in crisis requiring external assistance*	
Nature of food insecurity	Main reasons
Exceptional shortfall in aggregate food production/supplies	
Iraq	Conflict and insufficient rainfall
Lesotho	Low productivity, HIV/AIDS pandemic
Somalia	Conflict, economic crisis
Swaziland	Low productivity, HIV/AIDS pandemic
Zimbabwe	Deepening economic crisis, adverse weather
Widespread lack of access	
Afghanistan	Conflict and insecurity, inadequate rainfall
Eritrea	IDPs, economic constraints
Korea, Democratic People's Republic of	Economic constraints and effects of past floods
Liberia	War-related damage
Mauritania	Several years of drought
Myanmar	Cyclone
Sierra Leone	War-related damage
Severe localised food insecurity	
Bangladesh	Floods and cyclone
Bolivia	Past floods
Burundi	Civil strife, IDPs and returnees
Central African Republic	Refugees, insecurity in parts
Chad	Refugees, conflict
China	Earthquake in Southwestern China
Congo, Democratic Republic of	Civil strife, returnees
Congo, Republic of	IDPs
Cote d'Ivoire	Conflict related damage
Cuba	Hurricane
Ethiopia	Insecurity in parts, localised crop failure
Ghana	After-effects of drought and floods
Guinea	Refugees, conflict
Guinea-Bissau	Localised insecurity
Haiti	Hurricane
Iran	Past drought
Kenya	Civil strife, adverse weather, pests
Nepal	Poor market access and drought/floods
Philippines	Typhoons
Sri Lanka	Conflict
Sudan	Civil strife (Darfur), insecurity (Southern Sudan), localised crop failure
Tajikistan	Winter crop damage, poor market access, locusts
Timor-Leste	IDPs, high food prices
Uganda	Localised crop failure

Note: IDP is Internally Displaced Person
Source: FAO, *Crop prospects and food situation, No. 4*. (2008)

How will governments manage food security in the future?

The agricultural sector is heavily influenced by government policies, and the likely path of those policies is crucial to thinking about the future trajectory of food prices. We have already argued that one consequence of the food crisis has been to turn policymakers' minds back to the importance of agriculture. For some countries, this means that food security is now being equated with national security. This is a change that is likely to have both positive and negative consequences for the sector. For a start, there is likely to be more government money – and more government

policies – directed at agriculture, particularly in developing countries. To the extent that this means more support for agricultural research and development, and for important supporting rural infrastructure, this should be good news for yield prospects. A renewed engagement from the aid agencies and international institutions like the World Bank should also be positive. Australia, with its strong research and development capacity in agriculture, should be well placed to play a significant role here, and Canberra has already pledged to direct increased development assistance to agriculture and rural development. Australia has also been involved in the multilateral response to the food crisis, including through increased contributions to the World Food Program.[40] It should be noted, however, that the financial burden on governments as a result of the financial crisis may now serve to limit some of the expected public sector investment response.

The implications of an increased government focus for international agricultural trade look much more mixed. Global agricultural markets have long been distorted by government intervention: subsidies and trade protection provided by the developed world to its farmers averaged a third of gross farm receipts from the mid-1980s to the early 2000s, and contributed to pushing down world prices and so discouraged agricultural investment and production in many developing economies.[41] Several observers had hoped that the rise in food prices would help jump-start the moribund Doha multilateral trade negotiations and contribute to reform of the global agricultural system.[42] After all, high food prices seemed to undermine the case for continued generous subsidies to farmers in the developed world, and developing country governments had found themselves slashing import barriers to food. All in all, it seemed an opportune time to lock in some agricultural liberalisation. Such hopes proved to be forlorn, however. The US Farm Bill barely changed in response to the food crisis and while the EU's Common Agricultural Policy (CAP) is due for reform in 2013, opponents of radical change have seized on the food crisis as evidence for the need to continue to support domestic production to maintain national food security. At the same time, many of the same developing countries that have lowered food import tariffs have continued to argue that they should be able to put them back up again, stressing that the lesson from the food crisis was that world markets could not be trusted to meet their food security needs. Instead, they pressed their need to boost domestic production, and to this end, retain the ability to protect their own farmers.[43] Moreover, some of the key issues relating to the crisis – especially export restrictions and subsidies for biofuels – weren't really part of the Doha agenda anyway.[44] As a result, the hoped-for push to the Doha round not only failed to materialise, but one of the proposed mechanisms for protecting 'vulnerable' agricultural sectors, the Special

[40] Nicholas Brown, Judith Laffan and Mike Wight, *High food prices, food security and the international trading system.* Canberra, Department of Foreign Affairs and Trade (DFAT), 2008

[41] Kimberley Elliot, *Delivering on Doha: Farm trade and the poor.* Washington DC, Center for Global Development and the Peterson International Institute for International Economics, 2006.

[42] See for example Jagdish Bhagwati and Arvind Panagariya, How the food crisis could solve the Doha round. *Financial Times*, 22 June 2008.

[43] Alan Beattie, As food costs rise, farmers cling to their subsidies. *Financial Times*, 13 May 2008.

[44] Nancy Birdsall and Arvind Subramanian, Food and free trade. *The Wall Street Journal*, 25 April 2008.

Safeguard Mechanism, proved to be a major stumbling block in the (final?) breakdown in negotiations.[45]

The previous discussion emphasised the major role played by export restrictions on driving price rises earlier this year. Governments continue to intervene in this manner: in September, China imposed taxes on fertiliser exports ranging from 150 to 180%. The result has been a sharp rise in fertiliser prices which is reportedly deepening the food crisis in Kenya, Tanzania, Ethiopia and Somalia.[46]

Given the role played by government support for biofuels in the form of mandates and subsidies in driving up food prices, the future of government policy in this area is another important consideration. Policymakers have found themselves facing a trade-off between energy security and food security, and this has already produced a rethink in terms of priorities in several countries: in response to the food crisis, China and South Africa announced that they would restrict the use of grains for ethanol production on food security grounds.[47] How governments resolve this trade-off in the future, and the consequent level of continuing public policy support for biofuel use and production, will have an important influence on future food prices.

Several issues are important here. First, energy prices will clearly have a significant influence, since over the long run prices of biofuel feedstocks such as maize will be constrained by the level of energy prices if they are to remain an attractive alternative. And at the time of writing, oil prices had fallen sharply. However, some analysts reckon that for as long as oil prices exceed US$55-US$60/barrel, biofuels may remain an important element in at least some countries' energy strategies. Moreover, it is possible that political interests in some key countries, including the US, China and the EU, will see biofuel production sustained even in the face of significant short-run changes in the oil price, with motives including the regeneration of rural economies and securing political support in agricultural constituencies.[48] Second, the land intensity of biofuel production is not a given. At present, the amount of biofuel that can be generated from one acre of land varies from 100 gallons for EU rapeseed to 400 gallons for US maize and 660 gallons for Brazilian ethanol. The use of second-generation biofuels from cellulosic ethanol could potentially raise ethanol yields to more than 1000 gallons per acre, significantly reducing land requirements relative to current practice. For now, however, the technology behind this option is not yet commercially viable, with experts predicting that mature technology for the large-scale deployment of cellulosic biofuels production is at least 10 years away.[49] Third,

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[45] FAO, *The breakdown of the Doha Round negotiations - What does it mean for dealing with soaring food prices?* Economic and Social Perspectives Policy Brief 3. Rome, Food and Agriculture Organization of the United Nations, August, 2008.

[46] Ariana Eunjung Cha and Stephanie McCrummen, Financial crisis worsens food crisis. *Washington Post*, 26 October 2008.

[47] FAO, *Soaring food prices: Facts, perspectives, impacts and actions required.* Paper prepared for the High-Level Conference on World Food Security: The challenges of climate change and bioenergy Rome 3-5 June 2008. Rome, Food and Agriculture Organization of the United Nations, April, 2008

[48] Rosamond L Naylor, Adam J Liska, Marshall B Burke, Walter P Falcon, Joanne C Gaskell, Scott D Rozelle and Kenneth G Cassman, The ripple effect: Biofuels, food security and the environment. *Environment* 49 (9) 2007.

[49] Cellulosic ethanol is made by breaking down the cellular material that gives plants rigidity and structure and then converting the resultant sugar into ethanol. Cellulose is the most widely available biological material, present in wood chips, wood waste, and grasses and crop residues. William Coyle,

there are now signs of a major bust in the ethanol market following on from the previous boom, with significant financial losses for some investors. The consequences for political support remained unclear at the time of writing, however.[50]

Finally, with regard to official policy towards the agricultural sector more generally, Paul Collier has argued recently that some government responses to the food crisis in the rich world have been influenced not just by pressure for more farm subsidies and a willingness to resort to trade restrictions, but also by what Collier calls a 'retreat into romanticism', based on what he describes as the 'strange allure' of rural simplicity.[51] Collier argues that the 'romantics' have portrayed the food crisis as demonstrating the failure of scientific commercial agriculture as opposed to organic, small-scale farming, when what the world really needs is more commercial agriculture (Collier likes the Brazilian model of large, high-productivity farms) and more science (in the form of transgenic crops).

How binding are supply constraints for energy, land, and water?

Another key uncertainty regarding the outlook for agriculture and for food prices relates to the extent of future energy, land, and water constraints. The energy-intensive nature of modern agriculture has already been discussed, so the future trajectory of energy prices will matter well beyond their implications for biofuel demand.[52] The connection between food and energy security that has been established by the 2007-2008 food crisis looks set to persist. This means that issues regarding the stability of future energy supply - including the possibility of so-called geopolitical peak oil – will also be seen as important determinants of food security.[53]

We also noted earlier that the availability of arable land was an important issue. It seems almost inevitable that continued urbanisation and industrialisation will maintain pressure on the supply of agricultural land in many parts of the world, particularly in East Asia. Furthermore, agriculture itself is sometimes part of the problem. The productivity of existing agricultural land has been damaged in some cases by excessive use of fertiliser or poorly managed irrigation schemes, and it is clear that in some parts of the world intensive agricultural methods have now run into diminishing returns (Table 10).

Finally, water scarcity in particular is set to represent an increasingly binding constraint in many countries. Once again, increased competition from urbanisation and industrialisation is likely to influence future water availability, and changing diet patterns will also matter: producing meat, milk, sugar, oils and vegetables typically

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The future of biofuels: a global perspective. *Amber Waves* 5 (5) 2007 Naylor, Liska, Burke, Falcon, Gaskell, Rozelle and Cassman, The ripple effect: Biofuels, food security and the environment.

[50] Kevin Allison and Stephanie Kirchgaessner, Biofuels: From hope to husk. *Financial Times*, 21 October 2008.

[51] Paul Collier, The politics of hunger. *Foreign Affairs* 87 (6) 2008.

[52] The FAO estimates that it requires 6,000 megajoules (MJ) of fossil energy (equivalent to 160 litres of oil) to produce one tonne of maize in the United States. In contrast, it takes just 180 MJ (4.8 litres) to produce a tonne of Maize in Mexico using traditional methods. Cited in World Bank, *World Development Report 2008: Agriculture for development.* Washington DC, World Bank, 2007

[53] On geopolitical peak oil, see for example Jad Mouawad, As oil giants lose influence, supply drops. *The New York Times*, 18 August 2008.

requires more water than producing cereals.[54] In Asia as a whole, per capita water availability has declined by between 40% and 65% since 1950.[55] In East Asia, an estimated 500 million people already live in absolute water scarcity.[56] Water scarcity, drought stresses and declining irrigation availability are forecast to lower expected yields in Asia in coming years.[57] According to the OECD's latest environmental report, almost half the world population (47%) will be living under severe water stress by 2030 if no new policies are introduced, with the absolute number of people living in water stress increasing from 2.8 billion today to 3.9 billion people by 2030. Most of these people will be living in developing countries. Already 63% of the population in Brazil, Russia, India and China together are living under medium to severe water stress; according to the OECD, this share will increase to 80% by 2030 if no new measures to better manage water resources are introduced.[58]

An important consideration here is that existing irrigation programs are problematic in many cases. According to the World Bank, for example, large areas of China, South Asia, the Middle East and North Africa currently maintain irrigated food production by relying on the unsustainable extraction of water from rivers or underground aquifers. Globally, somewhere between 15% and 35% of total water withdrawals are estimated to be unsustainable, in the sense that water use exceeds renewable supply. The groundwater overdraft rate exceeds 25% in China and 56% in parts of Northwest India, and more than a fifth of groundwater aquifers are over-exploited in three of India's four leading 'Green Revolution' states. Excessive use of groundwater has seen water tables in many aquifers fall to levels that make pumping too difficult and costly. Other problems include contamination by municipal and industrial users, and salinisation due to overpumping.[59]

What will be the consequences of climate change for food security?

Along with oil, soil and water, another important resource constraint is the environment more generally, and in particular, the implications of climate change for the agricultural sector (Tables 11 and 12). It should also be noted here that the causality between agriculture and climate change runs in two directions: agriculture (14%) and deforestation (17%) between them account for almost one-third of global greenhouse gas emissions from human activities.[60]

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[54] Comprehensive Assessment of Water Management in Agriculture, *Water for food, water for life: A comprehensive assessment of water management in agriculture.* London and Colombo, Earthscan and International Water Management Institute 2007

[55] Cited in Alan Dupont and Graeme Pearman, *Heating up the planet: climate change and security.* Lowy Institute Paper 12. Sydney, Lowy Institute for International Policy, 2006.

[56] Cited in Milan Brahmbhatt and Luc Christiaensen, *Rising food prices in East Asia: Challenges and policy options.* Washington DC, World Bank, May, 2008

[57] Mark W Rosegrant, Claudia Ringler, Timothy B Sulser, Siwa Msangi, Tingju Zhu, Rowena Valmonte-Santos and Stanley Wood, *Agriculture in Asia: Challenges and opportunities.* Reducing Poverty and Hunger in Asia: Focus 15 Brief 6 of 15. Washington DC, International Food Policy Research Institute, March, 2008.

[58] OECD, *OECD Environmental Outlook to 2030.* Paris, Organisation for Economic Cooperation and Development, 2008.

[59] World Bank, *World Development Report 2008: Agriculture for development.*

[60] Specifically, 25% of carbon, 50% of methane and over 75% of nitrous oxide emissions. Cited in FAO, *Climate change mitigation and adaptation in agriculture, forestry and fisheries.* Information sheet for the High-Level Conference on World Food Security: The challenges of climate change and bioenergy Rome 3-5 June 2008. Rome, Food and Agriculture Organization of the United Nations, 2008

Many experts judge that climate change could have major consequences for agricultural productivity, with the Consultative Group on International Agricultural Research predicting that food productivity in Asia could decline by as much as 20% as a consequence of global warming.[61] The FAO projects that the impact of climate change on global crop production is likely to be slight up to 2030, but thereafter warns of the possibility of widespread declines in potential productivity.[62] For example, on some estimates arid and semi-arid land in Africa is projected to increase by 5%- 8%.[63] Some projections suggest half of all agricultural land in Latin America could be affected by desertification and/or salinisation by 2050.[64] Studies that have attempted to quantify the impact of climate change on overall food security suggest that anywhere between 5 million and 170 million additional people could be at risk of hunger by 2080 as a result of climate change, depending on the precise projections used.[65]

Potential impacts on agriculture from climate change could come from several adverse developments: changes in temperatures, shifts in growing seasons and alterations in rainfall patterns could all depress agricultural yields; rising ocean and sea-levels could lead to the loss of coastal land and the saline infiltration of coastal groundwater aquifers; changes to global water systems could exacerbate water security problems; more extreme weather events could disrupt agricultural production and distribution; and new pressures could arise from pests and pathogens.

Climate change will raise global average temperatures over comings years, with implications for plant growth: beyond a certain range of temperatures, warming tends to reduce crop yields because it encourages crops to speed rapidly though their development, producing less grain in the process. Higher temperatures also interfere with the ability of plants to get and use moisture.[66] A projected increase in temperature of 2º-3ºC over the next 50 years is expected to have only modest effects on *overall* agricultural productivity: moderate warming is expected to increase crop yields in temperate areas and reduce them in tropical areas, with the net effect of an increase in *global* production in warming scenarios of less than 3ºC.[67] At forecast horizons beyond 50 years, however, temperature rises are likely to be greater, and the impact on overall agricultural productivity is likely to become more adverse. On

[61] Cited in Box 2.1 in Dupont and Pearman, *Heating up the planet: climate change and security.*
[62] FAO, *Climate change and food security: A framework document.* Rome, Food and Agriculture Organization of the United Nations, 2008.
[63] Table SPM.2 in Intergovernmental Panel on Climate Change, *Climate Change 2007: Synthesis report. Summary for policymakers.* Geneva, Intergovernmental Panel on Climate Change, 2007.
[64] Cited in FAO, *Climate change mitigation and adaptation in agriculture, forestry and fisheries.*
[65] In nearly all of these projections, the negative effects of climate change are more than offset by forecasts of robust economic growth and slowing population growth, so socio-economic trends dominate the effects of climate developments. Josef Schmidhuber and Francesco N Tubiello, Global food security under climate change. *Proceedings of the National Academy of Science* 104 (50) 2007
[66] See William R Cline, Global warming and agriculture. *Finance and Development* 45 (1) 2008. For a more detailed version, see William R Cline, *Global warming and agriculture: Impact estimates by country*. Washington DC, Center for Global Development and Peterson Institute for International Economics, 2007.
[67] World Bank, *World Development Report 2008: Agriculture for development.*

some estimates, temperature increases of more than 3ºC could cause food prices to increase by up to 40%.[68]

One clear message from simulated effects of temperature rises is that the biggest losses to productivity are likely to be concentrated in developing countries, as the latter tend to be located closer to the equator, where temperatures already tend to be close to crop tolerance levels.[69] So, for example, on some estimates by 2020 in some African countries yields from rain-fed agriculture could be reduced by up to 50%.[70]

A potentially important complicating factor is the role of carbon fertilisation, as carbon emissions can boost yield growth by enhancing photosynthesis in many important (so-called C3) crops, such as wheat, rice, and soybeans. William Cline, for example, estimates that the overall impact of baseline global warming by the 2080s is a reduction in agricultural productivity of 16% without carbon fertilisation, compared to a reduction of 3% if carbon fertilisation benefits materialise.[71]

The effects of climate change on agriculture will not just be limited to higher temperatures. Water scarcity has already been identified as a potential constraint to future agricultural supply responses, and it is likely that climate change will exacerbate some of these problems. Major implications for the seasonal distribution of rainfall are possible, with dry periods getting drier, wet periods wetter, and a worsening of floods and droughts.[72] According to one observer, 'while reducing greenhouse gas emissions is all about energy, adapting to climate change will be all about water'.[73] Climate change could similarly produce greater variability in rainfall patterns – with direct consequences for rain-fed agriculture and with potentially important second-order effects on stream-and river-flow, groundwater, lake and dam storage levels and hence irrigated agriculture. By shrinking glaciers, climate change will also reduce the availability of run-off for irrigation from snow melt systems.[74]

There is also a risk of an increase in the incidence of extreme climate events such as droughts or floods. Indeed, some argue that this is already happening: on one count an estimated 500 weather-related disasters are now taking place each year, compared with 120 in the 1980s, while the number of floods has increased sixfold over the same period.[75]

Finally, while most studies have concentrated on the implications of climate change for agricultural productivity (and hence food availability), it could also influence other

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[68] Cited in Joachim von Braun, *The world food situation: New driving forces and required actions.* Washington DC, International Food Policy Research Institute, 2007.
[69] Country elevation also matters, with higher elevation implying lower losses. Cline, Global warming and agriculture.
[70] Table SPM.2 in Intergovernmental Panel on Climate Change, *Climate Change 2007: Synthesis report. Summary for policymakers.* .
[71] Cline, Global warming and agriculture.
[72] Frank R Rijsberman, Every last drop: Managing our way out of the water crisis. *Boston Review*, September/October 2008
[73] Ibid.
[74] FAO, *Climate change, water and food security.* Technical background document from the expert consultation held on 26 to 28 February 2008. Rome, Food and Agriculture Organization of the United Nations, 2008
[75] Cited in FAO, *Climate change and food security: A framework document.*

elements of food security. The stability of food supplies (more climate variability leading to larger and more frequent short-term fluctuations in food production), food utilisation (by changing the conditions for food safety and changing the disease pressure from vector, water and food-borne diseases) and access to food (both through increased prices but also via the impact of extreme weather events) could all be affected.[76]

While it may be possible to mitigate some of these various effects through relatively inexpensive changes, including shifting planting dates or changing to an existing crop variety, other measures are likely to involve substantial costs, including the development of new crop varieties and expanding irrigation. According to a recent study of 94 crop-region combinations, such mitigation efforts are likely to be particularly important in Southern Africa and South Asia by 2030.[77]

Can science and technology loosen these resource constraints?

The final big question related to the outlook for food prices and food security is the possibility for scientific and technological advances to radically change the picture. After all, back in the late 1960s and early 1970s many observers felt that the world faced a Malthusian-style crisis. Instead, what the world actually got was the Green Revolution, where stepped-up government investment in infrastructure, including irrigation, fertilisers, and higher-yielding strains of seeds produced dramatic gains in food production and a sustained fall in food prices. High fertiliser use is estimated to have accounted for at least a fifth of output growth in developing country agriculture (excluding dryland agriculture) over the past three decades; hybrid rice varieties are estimated to have contributed half of the rice yield gains in China between 1975 and 1990; in India, investments in rural roads are calculated to have contributed to about a quarter of the growth in agricultural output in the 1970s.[78] For an earlier example of the power of technology, long before the Green Revolution there was the Haber-Bosch process, developed at the start of the twentieth century, which provides the vast stores of nitrogen needed to grow food for a booming world population.[79]

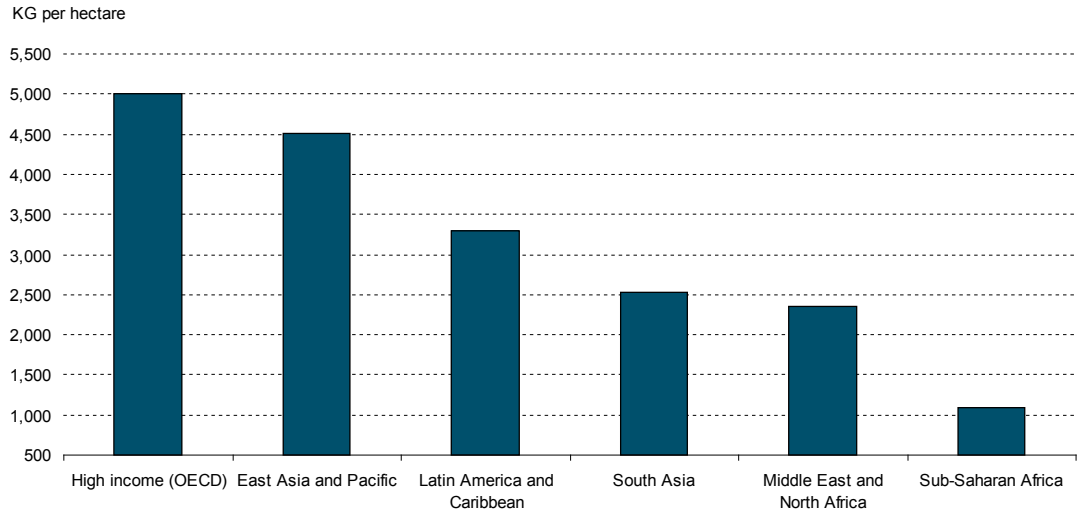
Technology could help loosen resource constraints in two important ways: by extending current best practice in world agriculture to lagging regions and countries; and by improving current best practice by introducing new technology and techniques.

To begin with, across large swathes of agriculture productivity still lies far behind global best practice (Figure 13). Closing this gap would do much to transform the global food situation. The ADB estimates that if the crop yields in major producing countries that are currently below the world average could be increased to the world average, global production of wheat would rise by about 17% and rice by 23%: in the case of India, it calculates that if all Indian states could close the gap between their

[76] Schmidhuber and Tubiello, Global food security under climate change.
[77] David B Lobell, Marshall B Burke, Claudia Tebaldi, Michael D Mastrandrea, Walter P Falcon and Rosamond L Naylor, Prioritizing climate change adaptation needs for food security in 2030. *Science* 319 2008.
[78] Javier Blas, The end of abundance: Food panic brings calls for a second 'green revolution'. *Financial Times*, 1 June 2008. World Bank, *World Development Report 2008: Agriculture for development.*
[79] Sachs, *Common Wealth: Economics for a crowded planet*.

potential and actual yields, this could allow India to produce an additional 13 million tonnes of wheat and 19 million tonnes of rice.[80] Similarly, the World Bank notes that a more widespread use of *existing* agronomic practices and techniques could increase rice yields in East Asia by 25-80%, while about 25% of the value of the total crop in Southeast Asia could be saved by improving post-harvest technology and infrastructure.[81] Significant gains in global yields are certainly possible by the improved application of existing techniques.

Figure 13: Agricultural yield differences remain large
Cereal yields, 2005



Source: World Bank World Development Indicators database

That said, simply replicating the first Green Revolution – at least outside Sub-Saharan Africa, which to a large extent missed out on the first go-around – looks difficult.[82] As described above, the outlook for key inputs such as water and energy is currently uncertain, and in some parts of the world intensive agriculture is running into significant environmental constraints: the World Bank thinks that as much as a third of productivity gains from technical progress in China and Pakistan have been negated by soil and water degradation, for example. The focus for many developing countries will probably have to be on reinvigorating government research and development spending programs, and investing in rural infrastructure and institutions, while *at the same time* trying to correct for the negative side-effects of past excessive subsidies to fertiliser and irrigation. Elsewhere, increasing agricultural productivity will require the application of *more* fertiliser and irrigation: fertiliser use in Africa is the world's lowest, for example, at about 8kg per hectare (ha), compared to 100kg/ha in India and 311kg/ha in the UK.[83]

[80] Asian Development Bank, *Food prices and inflation in developing Asia: Is poverty reduction coming to an end?* Manila, Asian Development Bank, 2008
[81] Brahmbhatt and Christiaensen, *Rising food prices in East Asia: Challenges and policy options.*
[82] Box 2.1 in World Bank, *World Development Report 2008: Agriculture for development.* discusses why there was no Green Revolution in Sub-Saharan Africa.
[83] Cited in DEFRA, *Ensuring the UK's food security in a changing world.* A Defra Discussion paper. London, Department for Environment Food and Rural Affairs, July, 2008

What about new technologies? Agricultural productivity could receive a boost from the use of transgenic or Genetically Modified (GM) seeds. GM varieties of maize and soybeans are estimated to have increased US yields by 15% over the past decade. By 2007, farmers in 23 countries had planted transgenic seeds on 114.3 million hectares (a bit less than 10% of the global crop area) – a tenfold increase in plantings in the space of a decade.[84] Optimists argue that biotechnology has the potential to trigger a new technological agricultural revolution and deliver a significant boost to yields.[85] Agricultural biotechnology is reportedly making significant progress in the areas of drought tolerance, salt tolerance and nitrogen use to help increase water productivity, with the potential for large benefits in terms of higher yields and less reliance on irrigation: drought-tolerant maize could be in US fields within six years and then be adapted for developing countries, while salt-tolerant rice is also under development.[86]

However, there are some significant uncertainties as to whether transgenic seeds will provide an effective solution to food security issues, at least in the near term.[87] First, on some estimates it might take up to two decades to develop the strains that will deliver big yield boosts. Second, much existing work on transgenics is directed towards commercial farmers in North and South America and may not be suitable for the smallholders that dominate poorer developing country needs. Third, despite strong scientific evidence on food safety – for example, a 2005 World Health Organization (WHO) report found that the GM foods then on the market were not likely to represent any more risk to human health than their conventional counterparts[88] - public concerns about both food safety and environmental risks remain high. This is particularly an issue for developing countries which lack the regulatory capacity to assess and approve biotechnology in an effective manner, and which might also fear loss of overseas markets in Europe if they adopt the new technology. Finally, there are important issues to be resolved around intellectual property rights and ownership that are crucial for poorer developing country farmers, an issue that has been of particular concern to many NGOs.[89]

Technology should also be able to help mitigate water scarcity problems. One potential solution is desalination, an existing technology where costs have fallen rapidly in recent years (although it remain a heavily energy intensive process which has implications in an era concerned about energy prices and climate change). Progress in nanotechnology is reportedly leading to specialised membranes grown at a molecular level that might reduce both the financial and energy costs of desalination, water purification and specialised waste-water treatment by three to five times within

[84] Javier Blas and Jenny Wiggins, Expensive tastes: Rising costs force food up the political agenda. *Financial Times*, 17 March 2008.
[85] World Bank, *World Development Report 2008: Agriculture for development.*
[86] Rosegrant, Ringler, Sulser, Msangi, Zhu, Valmonte-Santos and Wood, *Agriculture in Asia: Challenges and opportunities.*
[87] See in particular Paul Roberts, Food fight: The four barriers to the genetically modified food revolution - and why no one is talking about them. *Slate*, 8 August 2008. See also Focus E in World Bank, *World Development Report 2008: Agriculture for development.*
[88] WHO, *Modern food biotechnology, human health and development: An evidence based study.* Geneva, Food Safety Department, World Health Organization, 2005.
[89] See for example Raj Patel, *A critical review of the World Bank's World Development Report 2008.* Discussion Paper, ActionAid, October, 2007.

a few years.[90] And as already discussed, GM technology that involves breeding more drought resistant crops could boost water productivity.

Eight lessons for living in a Resource-Constrained World

What does the experience of the 2007-2008 food crisis tells us about the workings of the global economy today? In particular, what lessons can we draw from recent events about the challenges posed by a resource-constrained world economy? At least eight lessons can be drawn from the previous discussion.

Lesson #1. It's not a weightless world after all. In her 1997 book *The weightless world*, Diane Coyle wrote:

> *"People have the deeply ingrained habit of thinking about economic value as something with physical presence, with weight and mass. This is less and less true. Economic value is dematerialising."*[91]

Coyle was – quite correctly – drawing her readers' attention to the growing share of services in both the domestic and the global economy. That theme has since been echoed in the various books and articles that have trumpeted the IT revolution or the birth of the internet age or the rise of the service economy. It also remains a perfectly good description of the evolution of the structure of modern economies. And as noted earlier, the impact of the current international financial crisis serves as a reminder of the critical importance of some of the weightless parts of our national economies. Yet as a guide to the way the world economy works today, 'weightlessness' and its equivalents are inadequate: the idea has been oversold. It turns out that commodities – oil and cereals, metals and minerals, things that have real mass – still matter. A lot. This is true for economics and it is likewise true for politics, of both the domestic (think food riots, petrol protests) and international (the growing wealth of petro-state SWFs and the consequent shifting balance of global financial power) kind. The 2007-2008 food crisis serves as one powerful reminder of this, the sustained run-up in oil prices between 2001 and July 2008 as another.

Lesson #2. Prices for key resources will be higher than in the past, but also more volatile. This lesson is perhaps the most obvious. In a world where strong demand meets constrained supply, the result is higher prices. Higher prices are required to balance supply and demand in the short term, and to stimulate investment and production in the longer term. Yet – and as recent events have reminded us – it would be an elementary mistake to assume that prices will only move in one direction.

In the case of food, the FAO reckons that, given continued population growth and rising prosperity, global agricultural output will need to increase by more than 50% by 2030 and will need almost to double by 2050. Since this supply response will have to take place against a backdrop of continued urbanisation, fewer farmers will have to produce more food. This in turn means more investment in research and development, in infrastructure and machinery, and also in the future ability of the

[90] Rijsberman, Every last drop: Managing our way out of the water crisis.
[91] The quote is from Chapter 1 in Coyle, *The weightless world*

sector to deal with the implications of climate change.[92] Higher prices are an important signal that will help to deliver this response.

Importantly, however, higher prices will co-exist with greater price volatility. Yes, even in a resource-constrained world, commodity prices will continue to rise *and fall*, albeit around a higher trajectory. A look at the price history of any resource will confirm that price variability is nothing new. In part, this reflects the fact that – despite periodic claims to the contrary – the economic cycle is still with us. That this remains the case is evident from trends in commodity prices at the time of writing: as the outlook for the world economy has deteriorated, so commodity prices have fallen in response. More interestingly, however, reasons exist for expecting that price volatility will not only persist, but that it may *increase* relative to the recent past. As is pointed out in the latest OECD-FAO forecast, a continued low level of stocks, a possible decline in the price elasticity of demand due to rising prosperity and the growth of new (non-food) sources of demand (biofuels), and the greater involvement of financial players all point to the likelihood of increased food price volatility.[93] This will be even more the case to the extent that weather conditions become more variable as a result of climate change. Other sources of price volatility in the future could be panics about resource availability and the impact of government intervention. This brings us to . . .

Lesson #3. The world is now more vulnerable to supply shocks. A resource-constrained world economy is, by definition, one that is particularly vulnerable to disruption from supply shocks. In the case of the 2007-2008 food crisis, both a series of adverse weather shocks and the decision by several governments to restrict exports had important roles to play in the sharp spike in food prices in 2008. Neither shock would have had as big an impact if global food stocks had been higher and underlying demand and supply conditions less tight.

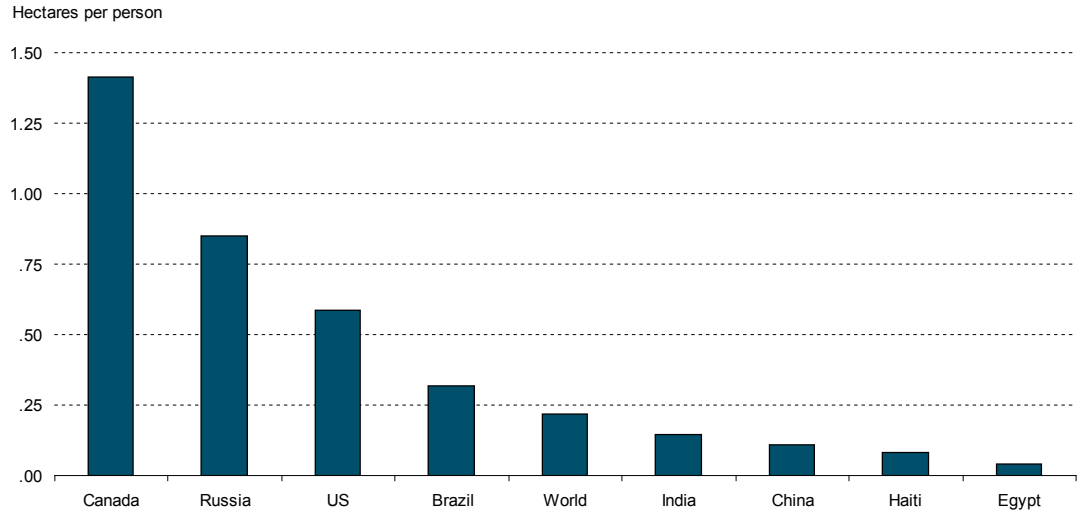
This vulnerability to supply shocks applies well beyond government policies or climatic conditions to encompass key risk factors such as disease. For example, with regard to agriculture, one potentially worrying issue is the outbreak of a new wheat rust, Ug99. Ug99 is a strain of black stem rust fungus, discovered in Uganda in 1999 (hence the name), which has serious consequences for wheat yields. (Black stem rust has been a major blight on wheat production since the rise of agriculture, with a 1954 epidemic in North America wiping out 40% of the crop.)[94] According to Naylor and Falcon, while losses due to Ug99 have been small to date, future losses could be 'immense' as few of the world's wheat varieties are resistant to the rust. They suggest that the growing threat of Ug99 to India's main cereal producing regions was one of the contributory factors (along with weather damage to the crop and the looming 2009 elections) to New Delhi's decision to introduce bans on the exports of non-basmati rice, the country's other staple crop.[95] In a resource-constrained world, monitoring these kinds of risks takes on an even greater degree of urgency.

Lesson #4. Geography isn't history. The food crisis has also served to confirm the importance of location in a resource-constrained world. Hitherto, this has perhaps

[92] Diouf. The current food crisis: Challenges and opportunities for agricultural development.
[93] OECD and FAO, *OECD-FAO Agricultural Outlook 2008-2017*.
[94] Debora MacKenzie, Billions at risk from wheat super-blight. *New Scientist*, 30 April 2007.
[95] Rosamond L Naylor and Walter P Falcon, Our daily bread. *Boston Review*, September/October 2008

been most apparent in the case of oil, where the concentration of proven reserves in the Middle East is well known, as are the attendant geopolitical consequences. While this kind of concentration is clearly not the case for global food production, nevertheless it is true that the supply of water and arable land is distributed unevenly across the planet. Land and water endowments differ significantly across countries, implying major differences in agricultural potential. According to World Bank data, for example, China needs to feed about 20% of the world's population on about 10% of the world's arable land. In 2005, China's estimated 143.3 million hectares of arable land (and falling) was the equivalent of just 0.11 hectares per capita, or about half the world average, and less than 10% of the per capita availability of arable land of an agricultural superpower like Canada (Figure 14). Similarly, China supports about 20% of the world's population with less than 7% of its renewable fresh water resources, with a (declining) per capita water availability of only about one-third of the global average (Figure 15).[96]

Figure 14: There are big international disparities in the supply of arable land
Arable land per person, selected countries, 2005



Source: World Bank World Development Indicators database

Moreover, as described above, climate change is likely to exacerbate some of these already large differences in agricultural potential across countries, with several projections suggesting that the period up until 2030 could bring declining agricultural productivity in tropical regions and improving productivity in more temperate latitudes. Granted, the application of technology can mitigate some of the effects of geography – via irrigation or drought-resistant seeds, for example – but it cannot abolish it: geography may not be destiny, but it certainly isn't history either.

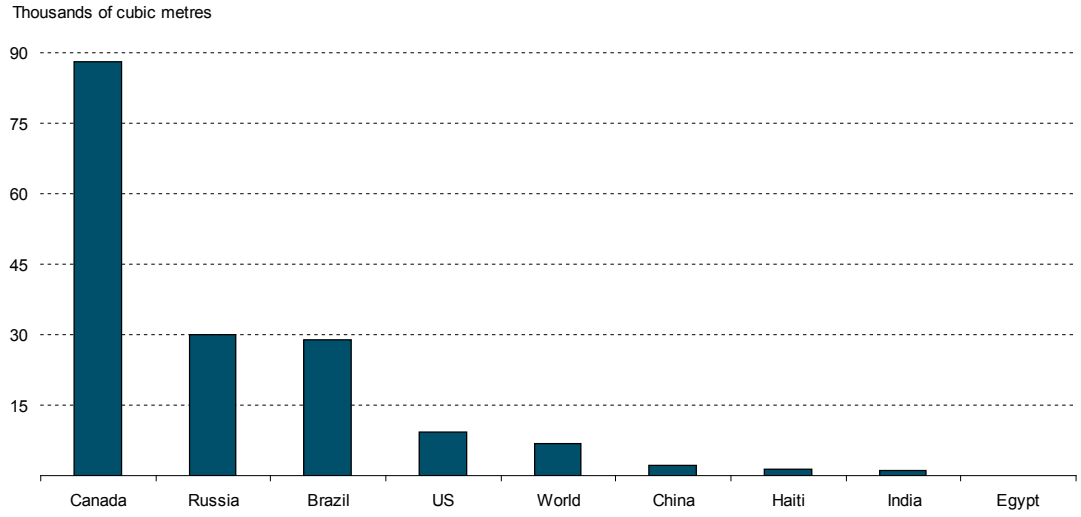
Lesson #5. International trade isn't an option for dealing with food security, it's a requirement. One implication of a resource-constrained world is often assumed to be a declining relevance for international trade, as countries seek to lock up key resources for their own use. Similarly, many governments seem to have interpreted the 2007-2008 food crisis as indicating an over-riding need for domestic self-

[96] Calculations for arable land and fresh water based on data for 2005 from the World Bank's World Development Indicators.

sufficiency in food production. Yet it follows from the discussion under lesson four that international trade – which in the case of agriculture is in large part about the effective cross-border exchange of land and water resources – is likely to become *more*, rather than less important when it comes to ensuring food security in the future. This will especially be the case in the longer term, when the projected consequences of climate change set in.

Of course, international trade is already a feature of global food production. According to data assembled by two World Bank economists, today about 131 out of 196 of the world's countries are net food importers (20 out of 33 industrial countries, 69 out of 105 middle-income countries and 42 out of 58 low-income countries).[97] Yet agricultural trade remains hobbled by a plethora of import tariffs and government subsidies: the free market ideal is even further away in international farm trade than in most other areas of international exchange (labour being an obvious exception). One consequence of these distortions is that the scale of international agricultural trade remains relatively modest compared to production: In 2007, the world produced about 2,100 Mt of grain, for example, of which only some 260 Mt, or about 15%, were traded internationally.[98] In contrast, the ratio of world merchandise trade to GDP stands at around 51%.[99]

Figure 15: There are also big international disparities in the supply of water
Renewable internal freshwater resources per person, selected countries, 2005



Source: World Bank World Development Indicators database

As described above, the food crisis looks like doing little to change this. Yes, one policy response was to reduce tariffs and other barriers to food imports. But another was the imposition of export restrictions. Furthermore, many of the countries that liberalised food trade have made it clear that they intend to unwind that liberalisation

[97] As the authors point out, this ratio is consistent with any other product group where the exporters tend to be more specialised than the importers. Francis Ng and M Ataman Aksoy, *Who are the net food importing countries?* Policy Research Working Paper 4457. Washington DC, World Bank, January, 2008.
[98] Food aid was about 6 Mt, or about 0.3% of production. Cited in Naylor and Falcon, Our daily bread.
[99] Although note that the presence of international supply chains and vertical specialization – with parts and components traded across borders – serves to boost this ratio for manufacturing.

in the future. At the same time, the potent demonstration effect of export bans means that many countries now – understandably – feel that they cannot rely on open markets to deliver food security.

One region where these various concerns come together is the Middle East and North Africa. This region faces a difficult combination of a shortage of fertile land, severe water scarcity and rapid population growth: on some estimates, availability of water per capita could halve by 2050. Growing water scarcity has forced a rethink of economic priorities across the region's economies: to take just one example, in the 1980s Saudi Arabia tapped its aquifers to become self-sufficient in wheat production, and by the early 1990s had even become a major wheat exporter. This year, the Saudis announced that they would phase out this project because it used too much water, and instead look to overseas investments to guarantee food security.[100]

The increase in food price inflation that was a by-product of the 2007-2008 food crisis is now seen as a major strategic challenge by the Gulf Cooperation Council (GCC) economies.[101] With their population forecast to almost double from 30 million in 2000 to nearly 60 million by 2030, and with conventional water resources predicted to last for no more than 30 years, several GCC countries are seeking to convert the financial power generated by higher oil prices into food security via agricultural investments overseas, often in African and Asian economies that are geographically close and where there are political and cultural ties, but also further afield.[102] Thus Saudi Arabia is reportedly looking to the Sudan, Ukraine, Pakistan and Thailand to set up large agricultural projects where the majority of crops would be exported back home. Similarly, the UAE is reported to be looking at Kazakhstan and Sudan, and Libya is looking to the Ukraine. This pursuit of 'equity food' is not just confined to the Middle East: China is reported to be considering similar arrangements with Southeast Asia. [103]

Lesson #6. It's getting harder to deliver international cooperation even as it is getting more important to do so. While the intuition that a resource-constrained world might reduce the *importance* of international trade is misplaced, it does seem true that it is hard and getting harder, to deliver substantive agreement on major international trade policies – or indeed to deliver international (economic) cooperation more generally.

At first glance, the problems created for global food markets by biofuels policies and export restrictions should have provided fertile ground for international cooperation on trade policy. As several observers pointed out, what the world needed was the removal of the distortions created by biofuel subsidies and mandates, along with new measures to deal with export restrictions and policies towards GM crops.[104] Particularly pressing in this regard was the treatment of export prohibitions,

[100] Andrew Martin, Mideast facing choice between crops and water. *The New York Times*, 21 July 2008.
[101] Eckart Woertz, Samir Pradhan, Nermina Biberovic and Chan Jingzhong, *Potential for GCC agro-investments in Africa and Central Asia.* GRC Report, Gulf Research Center, September, 2008.
[102] Ibid.
[103] Javier Blas, Foreign fields: Rich states look beyond their borders for fertile soil. *Financial Times*, 19 August 2008.
[104] See for example Arvind Subramanian, The global food crisis: A toolkit for audacious leaders. *VoxEU www.voxeu.org*, 30 June 2008.

restrictions and export taxes, all of which are technically legal under WTO rules.[105] In this regard, the World Bank and others have set out the case for a Grand Bargain for freer trade in food. The idea is that if importers could be made comfortable enough about the security of their future supply, then they in turn might be more willing to permanently lower their import tariffs. At the same time, if exporters were guaranteed open markets, then they might be willing to accept restrictions on their ability to ban or tax exports when prices are high. But while some food exporters, including Australia and New Zealand, have expressed their support for the Bank's idea, other exporters are not convinced.[106]

As noted earlier, hopes that the food crisis would help drag the faltering Doha round across the line failed to materialise. Those in favour of a Doha deal made the case that distortions in global agricultural markets – by depressing global food prices and so reducing the incentives for investing in increased food production in many food importing countries – had been an important contributory factor to the food crisis. But their opponents were able to highlight the fact that liberalisation would *increase* prices as surplus production (and exports) in subsidising countries fell, thus worsening the immediate situation for net food consumers. They also claimed that further reducing the 'policy space' available to developing countries to protect agriculture would produce further reductions in investment which would increase vulnerability to future crises.[107] A further problem was that many of the most pressing issues associated with the food crisis were not the subject of the Doha round of multilateral trade negotiations anyway.

In the end, then, Doha's partisans and opponents drew two different and contradictory lessons from the food crisis. The advocates of freer trade in agriculture pointed to the surge in global food prices as clear and pressing evidence of the need for more trade liberalisation. "Look at these highly regulated, distorted and subsidised markets", they said. "It's no surprise they are vulnerable to price volatility since nobody knows what state intervention will come next. Liberalisation and deregulation is the answer. Countries around the world are already slashing their import tariffs to help bring down the price of food at home. Let's lock in those lower tariffs. And who needs generous farm subsidies when prices are so high?" Yet their opponents saw things very differently. "Look at this spike in food prices," they said. "Look at the millions now facing food insecurity, the millions pushed back into poverty, and look at the riots and food protests in more than thirty countries. And don't forget those export bans, just when countries were most reliant on imports. Of course we can't rely on the world market now; we need to build self-sufficiency at home. Anything else is just too risky. And this means that, while we may have cut tariffs for now, we certainly want to retain the ability to put them right back up again in order to protect our own farmers in the future." So in Europe, for example, while some countries like the UK and Denmark have seen the lesson of the crisis in terms of agricultural reform and trade liberalisation, others have argued that the lesson of the crisis was the need to continue

[105] FAO, *The breakdown of the Doha Round negotiations - What does it mean for dealing with soaring food prices?* See also Ramesh Sharma and Panos Konandreas, *WTO provisions in the context of responding to soaring food prices.* FAO Commodity and Trade Policy Research Working Paper No. 25. Rome, Food and Agriculture Organization of the United Nations, 2008.
[106] Beattie, As food costs rise, farmers cling to their subsidies.
[107] FAO, *The breakdown of the Doha Round negotiations - What does it mean for dealing with soaring food prices?*

to subsidise European farmers to produce basic staples, with the French Agriculture Minister arguing that the Common Agricultural Policy (CAP) was a cornerstone of Europe's food security.[108] Basically, the food crisis reinforced pre-existing positions.

A well known element of the general problem with respect to delivering effective international cooperation is the disconnect between much of the world's international economic architecture and the changing balance of economic power that is a consequence of the Great Convergence (although it should be noted that this critique does *not* apply particularly well to the WTO).[109] But another, less frequently discussed, issue is the conflict between *hypocrisy and reciprocity* at the international level. The charge of hypocrisy arises because the emerging economic powers feel that the rich world wants to change the rules of the global economic game just as they are becoming successful players. Thus the reluctance to liberalise agricultural trade coming from the countries that have championed the cause of open markets; the backlash against SWFs from nations that in the past have called for open capital accounts and defended the virtues of hedge funds; and the calls for responsible climate policy and environmental restraint from the economies that are responsible for the great majority of carbon in the atmosphere. "Do as I say, not as I do", is never an attractive proposition for those so advised. At the same time, however, and from the point of view of the developed world, the new economic powers seem to want to have it both ways. On the one hand, they – quite understandably – want to have a say in the world economy commensurate with their new and improved economic status. On the other, they are quick to remind the rich world of their developing country status which, they argue, precludes them from doing the same amount of heavy lifting when it comes to international agreements. Again, there is obviously more than a little truth to this claim, but the simultaneous demand for a greater say and special treatment makes international negotiations politically difficult, as has been clearly evident in the repeated collapses of the Doha round negotiations. It is also likely to remain a challenge when it comes to climate change negotiations.

The apparent inability to deliver a Doha agreement even given the impetus provided by the height of the food crisis suggests that the prospect for future international agreements to manage the policy challenges raised by a resource-constrained world is not good.[110] Faced with the possibility of a Grand Bargain, much of the world's response seems to be at best to seek to free-ride, and at worst to defect. If this is right, then there are also gloomy implications for the chances of getting an international deal on climate change: remember, Doha was supposed to be a positive-sum game, which should lend itself more easily to agreement than the current 'targets-and-timetables' approach to climate change, which involves the theoretically much tougher bargaining of a zero-sum game.[111]

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[108] James Kanter and Stephen Castle, Rising food prices sharpen a European debate. *The New York Times*, 20 May 2008.

[109] See for example the discussion in Mark Thirlwell and Malcolm Cook, *Geeing up the G-20.* Lowy Institute Issues Brief. Sydney, Lowy Institute for International Policy, April, 2006.

[110] For a discussion of some of the problems associated with reaching a Doha round agreement, and facing the global trading system more generally, see Mark Thirlwell, *The new terms of trade.* Lowy Institute Paper 07. Sydney, Lowy Institute for International Policy, 2005.

[111] For a review of some of the lessons from the Kyoto approach to climate change policy, see Warwick J McKibbin and Peter J Wilcoxen, *Building on Kyoto: Towards a realistic agreement.* Lowy Institute Working Papers in International Economics No. 3.08. Sydney, Lowy Institute for International Policy, July, 2008.

The obvious conclusion to draw from this – and of course, it is a conclusion that has been drawn repeatedly – is that the global economic architecture is in pressing need of renovation. While the food crisis itself has been unable to provide sufficient stimulus to this end, there is at least some possibility that the financial crisis might see some movement on this front. The recent recognition of the importance the G-20, a much more representative body than the G7, as a place to talk about the crisis, for example, is a useful start in this respect.

Lesson #7. Government is back. The food crisis has already seen price controls make a comeback as well as the reinstatement of food security as a component of national security. The sizeable political costs of resource insecurity – food riots and similar disturbances in perhaps 30 countries and the fall of at least one government in the case of the 2007-2008 food crisis – mean that many governments are not prepared to leave resource security to the market.

It has to be noted at this point that the food crisis is hardly the only, or indeed even a major, cause of the current global swing back to government. In part, this development is a consequence of the Great Convergence, which is delivering a greater role in the world economy to countries that typically grant the state a larger role in running their economies than is currently the case in most of the developed world.[112] The redistribution of global wealth towards the petro-states that is a product of the resource-constrained world is having a similar effect. It is these shifts that have led to the identification of a supposed new 'state capitalist' or 'authoritarian capitalist' model. This in turn has triggered an inevitable policy reaction in the developed world: the rise of state-controlled economic actors has called forth a regulatory response (think of the current response to SWFs and other state-controlled investment) that also injects government back into the economic action. Furthermore, it is almost certain that the magnitude of the current financial crisis will demand a stringent regulatory response, and hence yet more government involvement.

All that said, however, governments appear to be particularly sensitive to resource security concerns. This has long been the case with regard to oil, and one consequence of this is that today's world economy is marked by the growing domination of world oil reserves by national oil companies (NOCs): on some estimates, private companies now control only some 13% of global reserves, with NOCs accounting for all of the world's top ten holders of petroleum reserves.[113] While there are good reasons to believe that food production is unlikely to follow fully the pattern now being set by oil, there are already some intriguing parallels to be found: earlier this year, for example, press reports suggested that Russia, the world's fifth largest exporter of cereals, was planning to create a state grain trading company that would control up to half of its cereal exports.[114]

One particularly interesting aspect of the 2007-2008 food crisis in this respect has been the growing linkage between oil and food markets. We have noted before that

[112] Note that this is a point about comparisons *across* countries. *Within* many of these emerging markets – particularly in China and India – the role of the state in the economy has been *falling* over time.
[113] Mouawad, As oil giants lose influence, supply drops.
[114] Javier Blas, Moscow to seize grain export controls. *Financial Times*, 31 July 2008.

the modern food supply chain is heavily reliant on energy, from the production of fertiliser though the operation of farm machinery to transportation and delivery. Now, the rapid expansion in biofuels has produced an even closer degree of integration between the agricultural and energy sectors, creating what some analysts have described as a 'new era' in food policy.[115] The links between energy use, climate change and agricultural productivity are set to forge yet more links in the chain between food security and energy security: to take just one example, the environmental costs of food transportation appear set to become an increasingly important issue in coming years.[116]

The fear that financial market speculation was a major contributor to higher food and commodity prices has also prompted government intervention: the Indian government has banned futures trading on commodities including rice, wheat and lentils; US legislators have been considering measures to curb speculation in the oil market; and China has restricted foreign trading in its commodities markets.[117]

Government involvement has also been prompted by other elements of food policy. Last year brought arguments between the United States and China over contaminated Chinese food exports, for example, and scares over the quality of food production and imports have boosted public demand for greater regulation and oversight. The use of product standards has become an increasingly common tool to regulate international trade: according to trade analyst Peter Gallagher, the average number of new sanitary standards that governments report to the WTO has tripled since the start of this decade.[118]

A greater role for government policy faces several challenges. High among them are two other messages from the food crisis: the law of unintended consequences, and the complexity of the policy environment. With regard to the former, the dramatic and unexpected impact on food security of a rush to biofuels to promote energy security is a powerful example of the consequences of bad policy decisions. The complexity of the policy environment is similarly on display in the wide array of linkages between food prices, energy prices, biofuels, fertiliser supply, urbanisation, economic growth, SWFs and food security. Nevertheless, the broad conclusion still holds. In a world economy that is being reshaped by the interlinked forces of the Great Convergence and a resource-constrained world, when it comes to resources security, governments rather than markets are the default solution for many of today's key players.[119]

Lesson #8. And so is 'geoeconomics'. The final lesson follows on directly from the previous ones. In a world characterised by a greater role for government and increased international economic integration, geoeconomics – used here in the loose

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[115] Naylor, Liska, Burke, Falcon, Gaskell, Rozelle and Cassman, The ripple effect: Biofuels, food security and the environment.

[116] Elisabeth Rosenthal, Environmental costs of shipping groceries around the world. *The New York Times*, 26 April 2008.

[117] Zanny Minton Beddoes, When fortune frowned: Special report on the world economy. *The Economist*, 9 October 2008.

[118] Alan Beattie, Food safety clash tells of trade battles ahead. *Financial Times*, 31 July 2007.

[119] Some of the issues posed by energy insecurity in Northeast Asia are discussed in Anthony Bubalo and Mark Thirlwell, *New rules for a new 'great game': Northeast Asian energy insecurity and the G-20.* Lowy Institute Policy Brief. Sydney, Lowy Institute for International Policy, November, 2006.

sense of an entangling of economic, geo-political, and strategic aims – is making a comeback.[120] This is not good news for the future operation of the world economy.

Like the return of government, to some extent the return of geoeconomics is a product of the Great Convergence and the so-called rise of state capitalism discussed above. Lawrence Summers argued recently in the *Financial Times* that ' . . . much of the momentum in the global economy is coming from countries . . . that are pursuing economic strategies directed towards wealth accumulation and building up geopolitical strength rather than improving living standards for their populations . . . Nations are increasingly preoccupied with their relative economic standing . . . Issues of strategic leverage and vulnerability now play a bigger role in economic policy discussions.'[121] Granted, Summers takes this too far: in the case of China, for example, it seems clear that improving living standards *is* a major preoccupation for Beijing, even if their policy choices are not always those that Summers might approve. But there is still something to his claim about a relative change in priorities.

The return of geoeconomics is also a product of the failure to deliver agreement at the multilateral level: the continued inability to get the Doha round across the line, for example, has encouraged more and more countries to turn to bilateral and regional trade agreements, where the objectives often have as much to do with foreign policy as they do with economic policy, and where the opportunity to exert direct political influence is appreciably greater.

In the case of the food crisis, the resort to export restrictions has caused significant alarm in several importing countries, emphasising as it did not only their vulnerability to higher food prices, but also that the dangers of outright supply disruption needed to be taken into account.

At least since OPEC wielded the oil weapon in the early 1970s, geopolitical considerations have always been close to the surface in terms of world oil markets.[122] As already mentioned, the food crisis has seen a tightening of the links between food security and energy security, and past experience suggests that food and energy prices can at times have major geopolitical consequences. Yegor Gaidar, for example, has argued that to some extent it is possible to explain the collapse of the Soviet Union in terms of grain and oil.[123] In his account, the Soviets' inability to produce enough grain domestically to feed Russia's growing cities meant that the Soviet Union became the world's largest importer of grain. These imports had to be paid for in hard

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[120] As a term, Geoeconomics, or often geo-economics, was briefly fashionable in the 1990s, but then largely dropped out of use. The term in its hyphenated form seems to have been introduced in Edward Luttwak, From geopolitical to geo-economics, logic of conflict, grammar of commerce. *The National Interest* (20) 1990. For a powerful criticism of Luttwak's arguments, see Raymond Vernon, The endangered American dream. *The National Interest* (34) 1993. The US Council on Foreign Relations hosts the Maurice R. Greenberg Center for Geoeconomic Studies http://www.cfr.org/thinktank/greenberg/mission.html.

[121] The author realises that more than a few readers at this point are likely to respond, "Nothing new there, then". The Summers quote is from Lawrence Summers, The global consensus on trade is unravelling. *Financial Times*, 24 August 2008.

[122] See for example Daniel Yergin, *The prize: The epic quest for oil, money and power.* New York, Free Press, 1992.

[123] Yegor Gaidar, *The Soviet Collapse: Grain and oil.* On the Issues. Washington DC, American Enterprise Institute for Public Policy Research, April, 2007.

currency, which given the failings of Soviet industry had to be generated by sales of oil and gas. Gaidar argues that the decision of Saudi Arabia drastically to alter its oil policy in the mid-1980s and dramatically increase production resulted in a fall in world oil prices that meant that the Soviet Union could no longer meet its import requirements. In the short term, the gap was met by loans, but by 1989 the money had dried up and the Party was over.

Is food security set to go the same way as energy security? Probably not, but once again, there are some interesting developments under way that indicate geoeconomics may now play a role in at least some countries food policies. As already noted, earlier this year Russia was reported to be planning to create a state grain trading company, prompting some to speculate that Moscow could seek to use food exports as a diplomatic weapon in the same way that Gazprom has been alleged to have manipulated gas sales.[124] Russia's minister of agriculture now speaks of food in national security terms, and sees the potential for Russia to be a major agrarian power as well an energy one.[125] The Gulf countries are clearly now taking a more strategic view of food security, mindful of the possibility that a reliance on imports at a time of tight food markets and export restrictions implies geoeconomic vulnerability. Some would go further and argue that such vulnerabilities are open to geopolitical manipulation: during the oil boycott of 1973, the US supposedly indicated the possibility of a retaliatory boycott of food deliveries to region. This prompted a plan to develop the Sudan as a breadbasket for Gulf. The plan was not activated back then but is now in operation.[126]

The pursuit of some version of 'equity food' inevitably injects political and strategic elements into food security. For example, issues of transport security – another obvious parallel with energy security debates and their focus on pipelines and maritime chokepoints – become relevant. There are other complications, too, particularly when the country that is the recipient of the foreign investment has food security issues of its own. Sudan is a clear example of this: the UN food programme is currently feeding 5.6 million people in the country.[127] In other words, Sudan is exporting agricultural products – wheat to Saudi Arabia, tomatoes for Jordan - while it is receiving more free food than anywhere else in the world.[128] Finally, if they become widespread, these sorts of bilateral deals might undermine confidence in global markets by making distorted food markets even narrower.

A Resource-Constrained World, but not (yet?) a New Malthusian Age

The 2007-2008 food crisis fits reasonably well within the paradigm of a resource-constrained world economy. Strong demand growth concentrated in the emerging markets and powered by a combination of continued population growth and rising prosperity has been pushing up against agricultural supply constraints. True, a large

[124] Blas, Moscow to seize grain export controls.
[125] Andrew E Kramer, Russia's collective farms: Hot capitalist property. *The New York Times*, 31 August 2008.
[126] This argument is advanced in Woertz, Pradhan, Biberovic and Jingzhong, *Potential for GCC agro-investments in Africa and Central Asia.*
[127] Blas, Foreign fields: Rich states look beyond their borders for fertile soil.
[128] Jeffrey Gettleman, Darfur withers as Sudan sells food. *The New York Times*, 10 August 2008.

part of the sharp price spike in 2008 reflected a series of (probably) temporary shocks including bad weather and bad government policies (subsidies to biofuels and a series of export restrictions). Another portion of the increase was the product of a prolonged upswing in the global economic cycle which, at the time of writing, was transforming into a global downturn of uncertain depth and duration. Still, it is clear that the underlying supply and demand conditions were crucial. Moreover, the outlook for global food security is similarly conditioned by resource constraints – energy, land, water and the climate – together with the potential for policy and technology to alleviate or overcome them.

A resource-constrained world is *not* the same thing as a New Malthusian Age, however. Agricultural production and investment have already shown signs of responding to the stimulus of higher prices. Indeed, as reported above, the FAO thinks that 2008 will see record cereal production of 2,232 Mt and a recovery in global stocks.[129] Thankfully, there is no real sign of the return of famine in any but the poorest and most vulnerable parts of the planet: an imperfect victory over Malthus, but a victory nonetheless.

All that said, in the longer term, the potential adverse consequences of climate change for agricultural productivity argue strongly against any undue sense of complacency.

Many economists tend to get a bit twitchy when presented with the proposition that resource constraints will serve to limit human prospects. As noted already, part of this reflects the spectacular failure of past forecasts based on resource pessimism, from Malthus onwards, failures which are often cited as cautionary tales in textbooks and lectures.[130] It also reflects economists' awareness of the powerful role that can be played by the price mechanism which in turn can help motivate substitution effects and technological progress.[131] In the case of agriculture, higher prices can be expected to bring forward an increase in production, for example, as farmers expand the amount of land under cultivation, while the substitution of labour and capital – in the form of irrigation and intensive cultivation – has already made land significantly more productive in the past, and is likely to do so again in the future, at least in those parts of the world where these has been a legacy of significant under-investment. Similarly, technological progress in the form of new seed varieties has raised crop yields, allowing greater crop output for a given amount of land.

Certainly, in the case of agriculture, good reasons exist for believing that once again high prices will prove to be a useful answer to high prices. Already, the output of wheat and rice is forecast to reach record levels this year thanks in part to higher prices encouraging more farmers to plant more crops, and in part to more favourable weather.[132] Higher prices have driven up the price of farm land in some countries, which may help at least a bit in terms of the competition with alternative uses. And

[129] FAO, *Crop prospects and food situation, No. 4.* Rome, Food and Agriculture Organization of the United Nations, October, 2008

[130] For an interesting argument that we may be generating too few, rather than too many, environmental false alarms, see Steven W Pacala, Erwin Bulte, John A List and Simon A Levin, False alarm over environmental false alarms. *Science* 301 (5637) 2003.

[131] See for example the discussion in Chapter 16 of David N Weil, *Economic growth.* Boston, Peason Addison-Wesley, 2005, especially pp 481-486.

[132] Chris Flood, Grain production to reach record levels. *Financial Times*, 9 May 2008.

higher prices are also encouraging various forms of new investment, some more innovative than others. For example, both local and foreign investors are reportedly expressing interest in investing in Russia to take advantage of that country's agricultural potential.[133] Others are looking to SSA, which is also attracting investors interested in its potential as source of future biofuels.[134] Meanwhile, financial market investors have reportedly been placing bets on big increases in the demand for food by buying farmland, fertilizer, grain elevators and shipping equipment. One investor is reported to have bought several ethanol plants, Canadian farm land, and storage space in the US Midwest, for example.[135] The consequences of the current financial crisis for at least some of these bets may have been ugly, however.

There are several important limitations regarding the ability of the price mechanism to solve all of our food problem. First, as described above, there are significant uncertainties about the future price responsiveness of agricultural *supply*. In the short term, this partly reflects issues related to energy, land and especially water constraints. In the long run, the potential impacts of climate change come into play. Second, the price responsiveness of food *demand* may also have declined. Third, in practice many governments are reluctant to allow the price mechanism full reign. To some extent, this is understandable: 'demand destruction' in response to high prices – an outcome that is already considered politically sensitive in the case of petrol – is hardly a concept that the government of any country with food security issues should be able to feel relaxed about. Failure to feed your population represents policy failure on a massive scale. Fourth, one consequence of the financial crisis is that food prices – and commodity prices more generally – have now fallen, blunting some of the earlier signal supplied by their sharp increase (although prices still remain above recent averages, and many official forecasts continue to project a higher level of prices for coming years).

The incentives that high prices should provide to farmers are often blunted by government actions aimed at protecting domestic consumers. This is particularly the case if food prices are controlled while the prices of key inputs, such as fertiliser, are not. As a result, policies aimed at improving short run food security issues can end up damaging food security in the long run: export restrictions or price controls help to lower prices for consumers today at the cost of discouraging production and investment tomorrow. Take the example of Asia and the rice trade. The fact that international rice markets have historically been thin and unstable has encouraged Asian governments to buffer both their farmers and their consumers from sharp price movements. As a consequence, their policies have arguably ensured that price fluctuations will be even sharper by ensuring that international rice markets remain thin and hence vulnerable to adverse shocks.[136]

Blind reliance on the price mechanism and market forces more generally is extremely unlikely to be a sufficient response to the food crisis. Past experience – for example,

[133] Robert Paxton, Grain boom tempts investors to Russia's open lands. *Reuters*, 6 August 2008.
[134] Horand Knaup, Green gold rush: Africa becoming a biofuel battleground. *Spiegel Online*, 9 May 2008.
[135] Diana B Henriques, Food is gold, so billions invested in farming. *The New York Times*, 5 June 2008.
[136] C Peter Timmer, *Poverty in Asia and the transition to high-priced food staples.* Reducing Poverty and Hunger in Asia: Focus 15 Brief 2 of 15. Washington DC, International Food Policy Research Institute, March, 2008

the Green Revolution – indicates that government policy has a crucial role to play, particularly in developing countries, in boosting agricultural productivity and encouraging private sector involvement. Similarly, the experience of SSA in the aftermath of the imposition of austerity packages and reform efforts suggests that expecting the private sector to step in and fully replace the government may turn out to be unrealistic in many developing countries. Focusing only on market signals can be problematic if it neglects the presence of significant social externalities or, as several NGOs have pointed out, if it fails to take into account the distorting impact of key factors such as a concentration of market power.[137]

All up, the signalling effects on output and investment from higher prices, combined with the increase in public sector support that will be now be called forth by the food crisis itself, means that we have not entered a New Malthusian Age. Current resource constraints are real enough, but they are (or at least, should be) manageable. That said, however, we have clearly entered a period of increased uncertainty regarding the future trajectory of food prices, and that in itself is more than enough to have profound consequences for the future of the world economy.

What of the long term, and why the weak qualification implied by the bracketed 'yet?' in the title of this chapter? By definition, contemplating the future involves a significant degree of uncertainty, and this is particularly the case given the extent of 'known unknowns' and 'unknown unknowns' associated with the impact of climate change on agriculture. At the time of writing, and taking into account the scientific evidence and projections currently available, it seems probable that climate change will have major consequences for agricultural productivity in coming decades, and especially after 2030. Policymakers *should* still be able to meet the challenges involved, including through greater international trade and cooperation. By definition, however, whether they *will* do so remains to be seen.

Finally, the experience of the 2007-2008 food crisis provides us with a series of interesting lessons about the consequences of living in a resource-constrained world economy, despite the possibility that some of these lessons will be obscured – at least in the near-term – by the fallout from the financial crisis. These lessons include the renewed importance of commodities as a result of the Great Convergence, the likelihood of higher and more volatile commodity prices, and a warning about the world's increased vulnerability to supply shocks. Other messages include the significance of geography and (hence) international trade, the pressing need for international cooperation despite the growing difficulty in achieving it, and some clear evidence of the return of government.

[137] For two examples, see Oxfam, *What agenda now for agriculture? A response to the World Development Report 2008.* Oxfam, October, 2007 and Patel, *A critical review of the World Bank's World Development Report 2008.*

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