

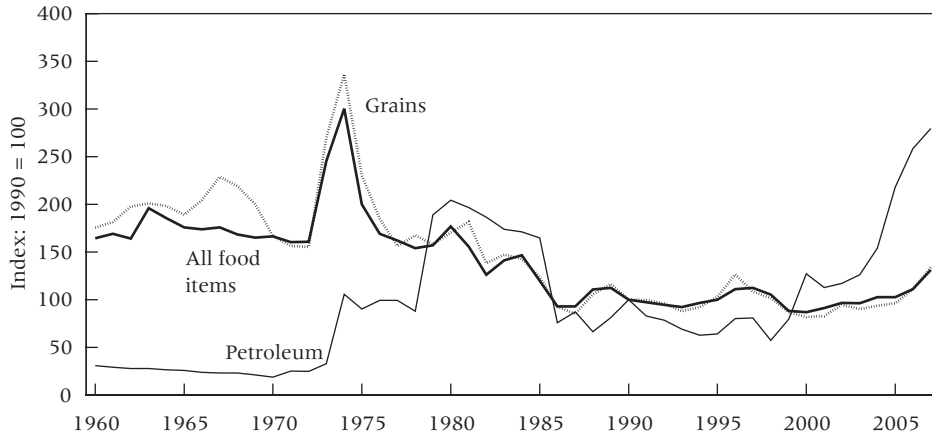
# Food Price Surges: Possible Causes, Past Experience, and Longer Term Relevance

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ONCE MORE THE WORLD is experiencing anxiety that agriculture may not be able to cope with the food demands placed upon it by a growing population and by rising incomes, notably in China and India and other emerging economies. What is thought to be in prospect can be described as a Malthusian predicament, with agricultural production now further constrained by problems of environmental sustainability and possible effects of climate change. The trigger of the current anxiety has been the sharp rise in the prices of basic food commodities in international markets, signaling growing shortfalls of global supply in relation to demand.

Concern about a Malthusian predicament has been a recurrent phenomenon whenever rising prices signaled the emergence of significant supply–demand imbalances. It happened in the mid-1970s (at the time of the first petroleum shock, although the food price surges of that period were only weakly linked to the rise in petroleum prices) and again in the mid-1990s. In both instances concern was followed by complacency as the causes of rising prices (temporary shortages from crop failures, demand shocks) ran their course and were followed by years of falling prices. Overall, the longer-term trend has been one of declining real agricultural prices (see Figure 1), indicating that supply tended to grow faster than effective demand. However, the trend toward declining prices should not be exaggerated, as it often has been. Figure 1 shows that the decline has largely halted since about the mid-1980s. There followed a period (from 1986 onward) of no consistent trend, though with significant fluctuations, around an average value of the world cereals price index of 98 (1990 = 100) up to 2002, when the index started creeping up to reach 111 in 2006 and 134 in 2007, followed by further sharp increases in the first months of 2008.<sup>1</sup>

**FIGURE 1 Price indexes (in 1990 constant US dollars): Petroleum, grains, and all food items (1990 = 100)**

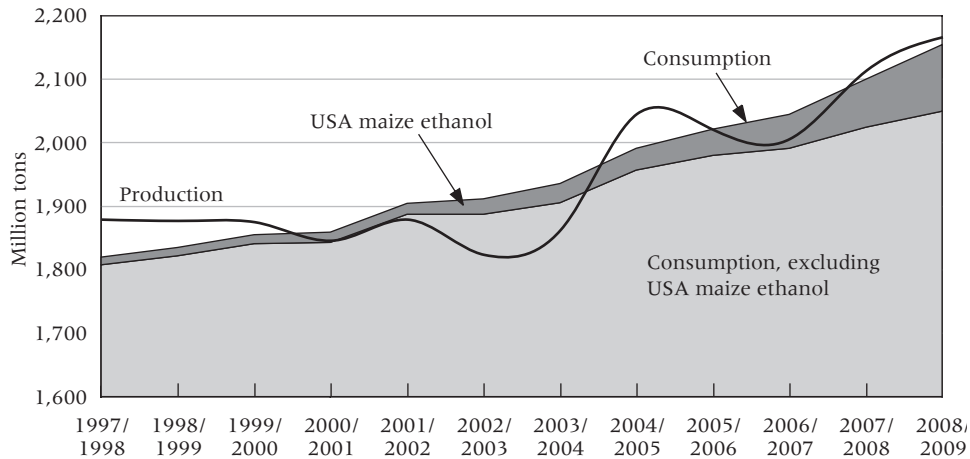


SOURCE: World Bank, Commodity Price Data.

The term *effective demand* is crucial for appreciating the significance of these trends in the context of food security and nutritional adequacy. Excess supply of food at the global level (which is what falling real prices imply) has coexisted with inadequate food consumption and undernutrition for a substantial part of the world's population, with an estimated 848 million persons undernourished in 2003–05 and 967 million in 2007 (FAO 2008a). Weak effective demand reflects the poverty and lack of purchasing power among the undernourished. In practice, food insecurity has been more a question of poverty than of inadequate global potential to produce sufficient food. At the local level, however, the two aspects are intimately linked: inadequate food production potential, or more general failures in agricultural development, can themselves be prime causes of the persistence of poverty in the many poor countries in which significant parts of the population depend on agriculture for a living. The Malthusian predicament is very much present in such local situations. This applies a fortiori to countries with high demographic growth, poor agricultural resources, and limited access to the actual or potential global plenty (Alexandratos 2005).

The fact that past upswings in food prices have been transitory should in no way prevent us from posing the question whether this time the phenomenon might prove durable. A number of major factors are implicated in the current price rises.

1) Cereal crop shortfalls occurred in a succession of years, starting in the early 1990s. World cereals production did not grow during 1997–2003 (see Figure 2). Shortfalls in China, largely compensated by drawing down its huge cereal stocks, were instrumental in this outcome. This set the stage for the price rises in subsequent years.

**FIGURE 2 World cereals production and consumption (million tons), 1997/98–2008/09**

SOURCE: USDA PSD database, accessed 12 July 2008; USA maize ethanol: «<http://www.ers.usda.gov/Data/feedgrains/FeedGrainsqueriable.aspx>», accessed 14 October 2008; data for 2008–09 are forecasts.

2) A drawdown of stocks ensued, as demand for food and animal feed kept growing, although not at an accelerating rate. On the contrary, such demand continued on its normal path of gradual deceleration. Stock reductions were often the result of policy decisions, as low prices, abundant supplies in world markets, and improved trade logistics were perceived as reducing the need for large public buffer stocks to back up those in the private sector. In brief, before the current price surges, the world had been in transition for some time from a situation of low prices and food surpluses to one of tightening supply–demand balance, presaging the imminent onset of another commodity cycle at the occurrence of a shock generated by excess supply or demand. Both types of shocks have occurred.

3) First, early in the current decade, came the demand shock, from the advent of high petroleum prices and the related growing demand for crops to be transformed into sources of bioenergy. Maize use for fuel alcohol in the United States jumped by 41 percent in 2001, compared with an average annual growth of 10 percent in the preceding five years. With the level of stocks already low, countries were ill prepared to face the intrusion of the energy market into the market for food commodities. Cereals and vegetable oils were diverted to biofuels precisely when other factors (weather shocks and stock depletion) were contributing to a tighter supply–demand balance.

4) The supply shock came from weather-induced crop failures in Australia in 2006 and 2007 and, less dramatically, in other major producing countries (for a list of countries affected see Trostle 2008). In addition, the surge in petroleum prices increased the production costs of agricultural products.

5) In parallel, upheavals in the foreign exchange and credit markets played a growing role: depreciation of the dollar (the currency in which most commodities are quoted) and low interest rates favoring demand for commodities as investments. In addition, export restrictions imposed by many exporting countries magnified the price movements in international markets, particularly for rice.

The quantities involved in cereals converted into biofuels are still fairly small and by themselves would not have had a major impact on the aggregate supply–demand balance. In tight conditions of that balance, however, even small changes can cause large price swings given the low short-run price elasticities of both demand and supply typical of most agricultural products. In the case of maize, used in fuel alcohol production mostly in the United States,<sup>2</sup> and vegetable oils the increased demand resulting from their growing use for biofuels was not insignificant. In both cases, expansion of these products for biofuels had knock-on effects on the prices of other crops, mainly through the mechanism of acreage substitution. Further, the targets of individual countries to increase the share of biofuels in the transport sector are indeed substantial. This factor presages continued growth in demand from this sector and contributes to the formation of expectations about the course of prices. The European Union aims at a target of 5.75 percent biofuels as a proportion of transportation fuel by 2010 and 10 percent by 2020 (from some 2 percent at present). Under these targets, the EU may be using for ethanol some 19 million tons (mt, the term ton refers to metric ton) of cereals by 2014 and some 59 mt (19 percent of total domestic cereals use) by 2020 (European Commission 2007a, 2007b). The United States has a 2008 biofuels target of 9.0 billion gallons (FAO 2008b: Table 4; one US gallon = 3.785 liters). A target of 36 billion gallons has been set for 2022 (of which 15 billion gallons is from maize and 1 billion from biodiesel). Current ethanol production runs at 8.7 billion gallons (data for January–July 2008, at annual rate), up from 6.5 billion gallons in 2007, while maize utilization in alcohol for fuel was 4.1 billion bushels in 2008, up from 3 billion bushels in 2007 (marketing years, September–August; there are 39.368 bushels of maize in one ton).<sup>3</sup> All of these mandates and explicit or implicit commitments to continue government support for biofuels (in the form of tax credits and tariff protections) have underpinned producers' decisions to invest heavily in biofuel facilities.

Besides cereals, other major crops used for biofuels include sugarcane for ethanol (predominantly in the world's largest sugar producer and exporter, Brazil, where some 50 percent of the national production is so used) and vegetable oils (rapeseed oil, soybean oil, palm oil) for biodiesel, predominantly in the European Union from both locally produced and imported oils. Given the fungibility of land and water resources (the possibility, within certain agroecological limits, to change their use from one crop to another), any

additional demand for biofuel feedstock crops can affect the resources allocated to the production of other crops unrelated to biofuels. Consumption substitution effects (when demand shifts from a commodity with rising prices to a substitute less affected by such rises) can also cause price rises to spread to crops unrelated to biofuels. This was probably one of the causes that sent the price of rice (a commodity not used in biofuels) soaring in early 2008. Likewise the price of soybeans rose because of substitution of soybean meal for high-priced maize in animal feed.

One conclusion seems clear: as long as energy prices remain high and concerns about climate change persist, the search for alternative energy sources will continue. Energy from biomass will likely remain an important component of such a search. If so, it will compete for land and water resources that have alternative uses, including for food production and environmental conservation. It is therefore reasonable to assume that the tighter global food supply–demand balance and accompanying high prices of recent years may prove more durable than in the past. In the worst-case scenario, energy prices would rise to such levels that biofuels from cereals and oils would become economically viable without subsidies and mandates, and no action would be taken to prevent the siphoning off of food to energy.

How durable and how intense the price rises may prove to be in the long term is impossible to tell without further research. Attempts at medium-term projections suggest that high food and petroleum prices are here to stay, although not at levels as high as the peaks reached in some months in 2008 (e.g., OECD–FAO 2008; Rabobank 2008). The World Bank's latest (mid-May 2008) projections indicate that the real grains price index in 2020 may be only 10 percent below that of 2007.<sup>4</sup> When considering longer term futures, much depends on the evolution of energy prices, trade policies, and technology development in the biomass conversion processes themselves as well as in other energy sectors.

The supply elasticity of agriculture will also be a crucial factor. If production potential (more land and irrigation, higher yields) fails to develop *pari passu* with the growing needs, then biofuel feedstock prices (in relation to the price of petroleum) may rise to such levels that their use in energy production becomes uneconomic, government support notwithstanding (Schmidhuber 2006; Tyner and Taheripour 2007; FAO 2008b). The extent to which supply-side constraints become binding has much to do with policies that can have widely differing impacts on the demand for the different feedstock crops. For instance, policies favoring the sourcing of biofuels from countries with ample production expansion potential of crops with high rates of conversion efficiency to biofuels (e.g., sugarcane in Brazil, and eventually biofuel production in African countries with significant potential for feedstock crops) will have a less severe impact on prices. The opposite is true of policies favoring local sourcing from crops like cereals.

The evolution of knowledge and perceptions about the comparative environmental consequences of biofuels will also play a role. Enthusiasm for biofuels has been waning: expansion of cultivation into virgin and forested areas, pressure on water resources, and the use of conventional energy inputs (fuel, fertilizer, and other chemicals) in their production can greatly reduce, even reverse, the environmental gains from reduced CO<sub>2</sub> emissions associated with the substitution of biofuels for fossil fuels. (For discussion of this issue see FAO 2008b: Chapter 5.) The growing awareness of the environmental limitations and food security implications of biofuels is placing the issue higher on the political agenda. For example, in the European Parliament the 10 percent EU target for biofuels in transport by 2020 has come under scrutiny.

These doubts about biofuels notwithstanding, we must prepare for the possibility that the risk of fuel–food competition may intensify, with adverse effects on the food security of some countries and populations. If this happens, the purchasing power of those demanding more energy could easily overwhelm that of the poor demanding more food. Food demand on the part of the non-poor will also be affected, but this population group can withstand (with an “acceptable” loss of welfare) the pressures emanating from the energy sector; they also benefit from whatever advantages the biofuels bring to the energy market.<sup>5</sup> In parallel, the potential for increased production and incomes in agriculture resulting from higher prices must also be factored in, although food security gains from this source will depend on the extent to which low-income farmers benefit from gains from higher producer prices. Such eventual benefits must be set against the potential losses of the net food buyers, both rural and urban.

### **Growth of world food and feed cereals consumption continues to slow**

Any attempt to address these supply–demand issues must (1) estimate the magnitude of long-term food demand in various countries, (2) evaluate their resource and economic potentials to increase production, and (3) identify the implications for food imports and exports. FAO’s latest attempt in this area dates from work done during 2003–05 (FAO 2006), with projections based on historical data up to 2001.<sup>6</sup> The broad message of the projections to 2030/2050 was that the slowdown in aggregate demand for the major food commodities, already evident in the recent past, would continue as the rate of population growth decelerated and per capita consumption of growing portions of the world population attained higher levels. The projections depicted the future food situation as it is likely to be, not as it should be from some normative standpoint—for example, one with all countries and population groups attaining some “acceptable” level of food security and nutrition. This approach reflects the prospect that low incomes and poverty, hence inadequate food

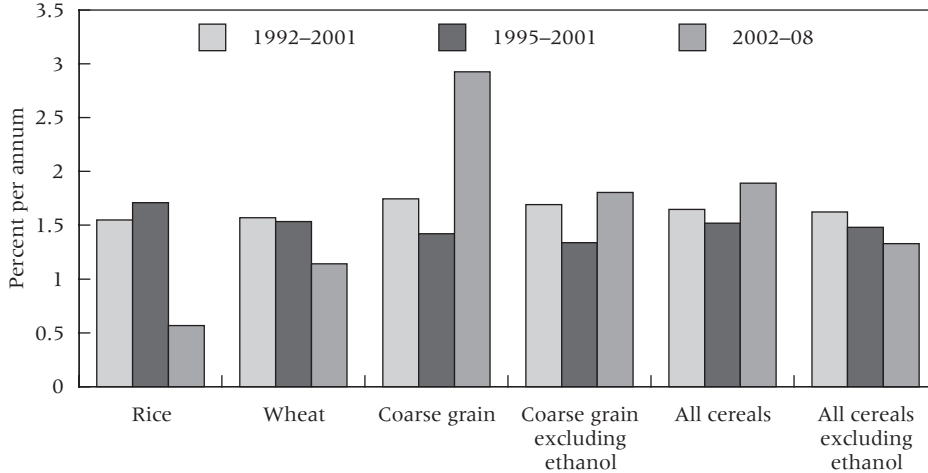
consumption and undernutrition, will persist in several countries, although at lower levels than at present. The study concludes: "The slowdown in the growth of world consumption is a very mixed blessing. On the positive side we must count the influence of the lower population growth and the gradual approaching of saturation levels in per capita food consumption in a growing number of countries. On the negative side is the prospect that there will still be countries with persistent low overall food consumption levels whose population would consume more if they had access to more food" (FAO 2006: 37).

The slowdown is expected to be most pronounced for rice, less so for wheat, and virtually absent for coarse grains, at least in the medium term, as growing quantities of coarse grains would be used as animal feed, mainly in developing countries. The rise in meat consumption would also slow over the medium term as the main driver of the recent past (China) was bound to provide less of a stimulus, given that it had already attained per capita meat consumption approaching 50 kg per year. In contrast, the consumption of milk and dairy products would continue on a path of rising growth rates. The growth rates of food consumption of vegetable oils would also remain high. (For details on these issues, including the extent to which the growth of the demand for meat may be a key driver of future developments, see FAO 2006.)

These findings were based on the assumption that no major structural factors would intervene to alter this pattern of gradual slowdown in aggregate consumption. No allowance in the projections was made for biofuel use of cereals, except to the (unknown) extent that the coefficients used for projecting non-food industrial uses implicitly reflected such use. Given recent developments, we must ask whether a rise in the petroleum price and the boost it gives to production costs and to the diversion of maize and other crops to biofuels can disrupt the normal evolution toward a slowdown in aggregate demand.

We do this by comparing the growth rates of world consumption<sup>7</sup> of cereals (with and without the maize used for ethanol in the United States) in the seven-year period 2002–08<sup>8</sup>—the years after the onset of the recent price rises—with those of the preceding seven and ten years, separately for wheat, rice, and coarse grains. The growth rates refer to world totals excluding data for the former Soviet Union (FSU). We exclude the FSU to avoid distortions in the historical growth rates, given that apparent consumption in the FSU collapsed by 50 percent in the 1990s following the shock of systemic change in the economy.<sup>9</sup> Figure 3 indicates that world consumption of both wheat and rice has grown at lower rates than in the past. The opposite is true for coarse grains, whose growth rate doubled in 2002–08 from that of the preceding seven years, but rose by much less if the maize used for ethanol in the United States is excluded. The same pattern emerges for total cereals: faster growth in 2002–08 than in the past because of the maize used for ethanol

**FIGURE 3** Average annual growth rates of world (excluding former Soviet Union) cereals consumption, with and without US maize for fuel ethanol



SOURCE: USDA PSD database, accessed 13 July 2008; Maize ethanol data from «<http://www.ers.usda.gov/Data/feedgrains/FeedGrainsqueriable.aspx>», accessed 14 October 2008; data for 2008 are forecasts.

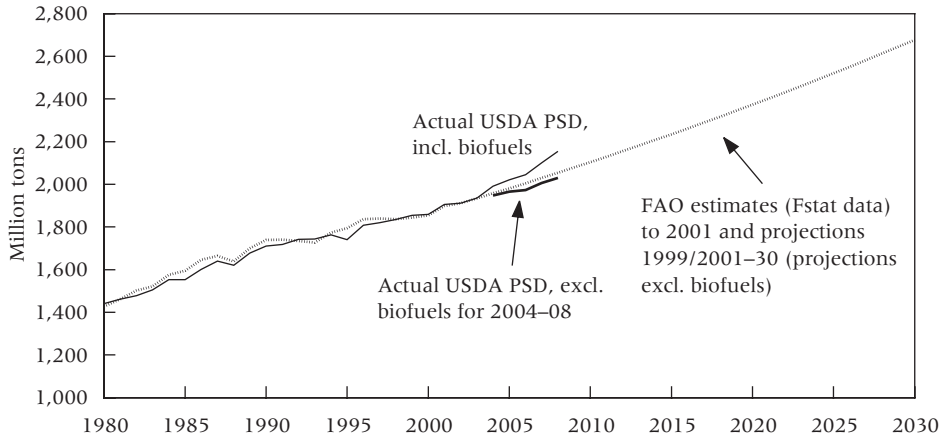
in the United States, but slower without such use.<sup>10</sup> This conclusion would probably be reinforced if we had time series data for recent decades on biofuel use of cereals in other countries.

What would world consumption of cereals have been in the absence of their use for biofuels? In Figure 4 we show the trajectory of the projections of world (including the FSU) cereals consumption to 2030 (all uses, without biofuels, and implying no major deviation from the near-constant price trends) from FAO (2006). Interpolating for 2008, we derive world consumption of approximately 2,054 mt in 2008.<sup>11</sup> This can be compared with the latest USDA (PSD) forecast for 2008 world consumption of 2,154 mt, of which 124 mt is for biofuels.<sup>12</sup> By implication, world cereals use excluding biofuels is forecast to be 2,030 mt (= 2,154 minus 124) in 2008, or 24 mt less than the level implied for 2008 in the long-term projections in FAO (2006). A tentative conclusion is that, of the total cereals used for biofuels in 2008 (124 mt), some 24 mt may have come from diversion of cereals from other uses (food, feed, etc.). The balance (100 mt) was additional demand that would probably not have been present in the absence of demand for use as biofuels and would not have contributed to reducing stocks and exerting additional upward pressure on prices.

The preceding calculations attempt to address the contention that if use of cereals for biofuels had not occurred, prices would have been lower and as a result the demand for food and feed would have been higher than the actual



**FIGURE 4 World cereals consumption (all uses), actual (with and without biofuels) and projections (without biofuels), 1980–2030**



SOURCE: FAO 2006: Table 3.2; USDA PSD database, accessed 13 July 2008; biofuels 2004–08 from von Braun 2008.

2,030 mt forecast for 2008. On this issue, opinions differ widely and give rise to fierce debates. At one extreme, according to press reports the US Secretary of Agriculture considers biofuels to have been responsible for only 2–3 percent of the global food price increase.<sup>13</sup> At the other extreme, Nobel laureate Gary Becker holds that high petroleum prices and demand for biofuels are the most important forces behind the recent food price surges.<sup>14</sup>

The International Food Policy Research Institute (Rosegrant 2008) attempted to quantify the proportion of the cereals price increase over the period 2000–07<sup>15</sup> attributable to biofuels demand. IFPRI concludes that the increased biofuels demand accounted for 30 percent of the average price rise of cereals and for 39 percent of the price rise of maize. Here the term “increased biofuels demand” means the difference between actual demand in 2007 and demand that would have prevailed in that year had such demand not accelerated after 2000 but had followed the trend of 1990–2000. I interpret this to mean that IFPRI estimated not the price impact of all biofuels demand but only of that part caused by the acceleration in the growth in such demand after 2000. We have no time series data on world cereals used for biofuels over the period 1990–2007, so we cannot gauge the actual tonnages involved in the IFPRI estimation. We can rely on the US time series data for maize used for fuel ethanol to approximate the magnitudes involved. If trends in 1990–2000 had continued, 2007 use would have been 23 mt.<sup>16</sup> Actual use was 76 mt, a difference of 53 mt. This latter figure is 6.8 percent of world maize consumption of 777 mt in 2007, or somewhat higher if maize used for ethanol in other countries is taken into account. According to IFPRI,

this additional use of maize for ethanol was associated with a 24 percent rise in the real price of maize (39 percent of the 61 percent rise in maize price in constant 1990 dollars).

In early July 2008 the British newspaper *Guardian* cited a “secret” World Bank report placing major responsibility for the food price surge on biofuels: the latter apparently accounted for 75 percent of the 140 percent increase in food prices from 2002 through February 2008.<sup>17</sup> The report, released in late July 2008 (Mitchell 2008), referred to the 130 percent rise in IMF’s price index of internationally traded food commodities from January 2002 to June 2008. In like manner, Keith Collins (2008), former chief economist at USDA, referring to the price of maize in the United States (but only in the past two years), considers that its use for ethanol has likely been the main cause of the rise in its price.

Do these findings provide a *prima facie* case for asserting that the diversion of cereal supplies to bioenergy is the major determinant of the recent surges in their prices? An article in *The Economist* states emphatically that they do.<sup>18</sup> Naturally, the entire price hike cannot be attributed to the demand for biofuels: as noted, other factors played a role, for example weather-induced crop failures in several major producing countries, particularly in 2007; stock depletion in earlier years; and the depreciation of the dollar. However, some analysts do not view biofuels use of cereals as being the dominant factor; instead they emphasize the surge in food and feed consumption. It is therefore worth examining critically these alternative perceptions.

### Blaming China and India

Strong economic growth in the emerging economies, particularly in China and India, is commonly cited as a major cause of the rise in food prices (e.g., IMF 2008a: 60). The head of the International Food Policy Research Institute stated in 2008 that 50 percent of the price increase was due to strong income growth, while biofuels accounted for another 30 percent.<sup>19</sup> A recent briefing paper from Chatham House (Evans 2008) offers a similar interpretation. Amartya Sen<sup>20</sup> recently added his voice to those who emphasize spurts in the demand for food by the newly better-off in emerging economies as a factor adversely affecting access to food by the poor. No doubt, such spurts occur frequently and can raise food prices in specific local situations, but here we are asking whether such behavior of the newly well-to-do has accelerated global demand for food and feed in recent years. The short answer is that it has not.<sup>21</sup>

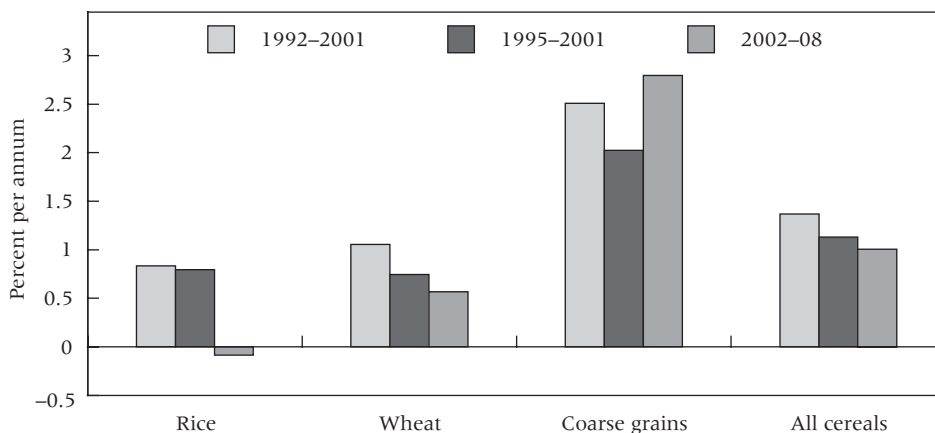
That the great bulk (almost the totality in the pre-biofuels era) of the annual increment in demand for most crops comes from food and feed is a commonplace. The key issue is why it is now considered to be causing price surges, while it did not do so in the past. Is it because the increments are

now larger? We have seen that this is not the case for cereals at the world level, whether we consider growth rates or absolute increments. As we shall see, the same applies to China and India: their combined average annual increment in consumption (both growth rates and absolute increments) was lower in the years of the price surges, 2002–08, than in the preceding period 1995–2001.

Naturally, if the behavior of the new middle classes and the newly rich in the emerging economies is causing the present havoc, there is reason to worry about the Malthusian prospect—not in its original formulation, but rather in a version emphasizing constraints to securing Western-type diets for every person in the world within some not-too-distant time horizon.<sup>22</sup> If so, we may need to revise the position that world demand growth is, and would continue to be, on a course of gradual deceleration absent demand for biofuels. Before contemplating such a revision, let us pose the question again: is the rate of growth of demand for food and feed really accelerating rather than following the predicted path of gradual deceleration?

We showed earlier (Figure 3) that the rate of growth of global cereals use, excluding biofuels, is slowing down, not accelerating. This use seems to follow the path of the long-term projections in FAO (2006). What do country-level data show, particularly for China and India? USDA data permit us to track developments in their apparent aggregate consumption or “domestic disappearance” for all uses. We can then ask whether trends in consumption exhibit significant breaks in recent years of rising prices compared with earlier years when prices were not rising. In other words, has the process of gradual deceleration been halted or reversed, and is demand growing faster than in the past? Figure 5 shows that this is not the case: the combined domestic

**FIGURE 5 Average annual growth rates of cereal consumption, China plus India, 1992–2001, 1995–2001, and 2002–08**



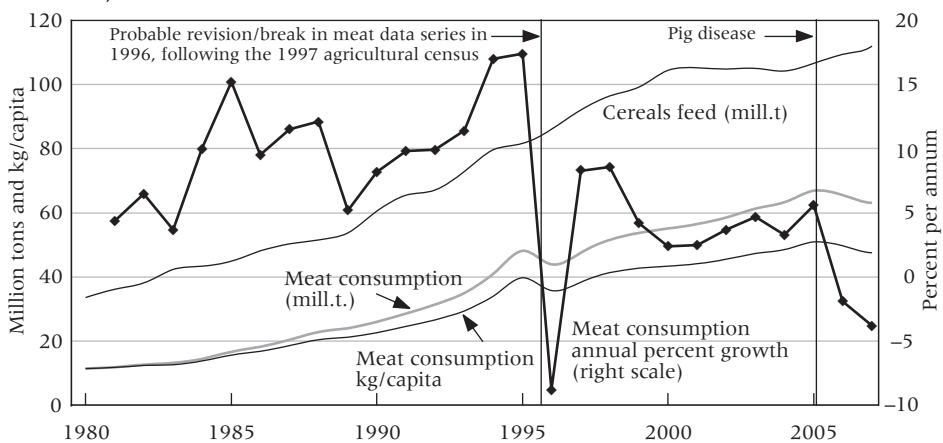
SOURCE: USDA PSD database, accessed 13 July 2008; data for 2008 are forecasts.

consumption (or domestic disappearance) of both wheat and rice in India and China has continued to decelerate during the recent years of price rises, just as it had been doing for some time earlier. In contrast, consumption of coarse grains shows signs of a modest acceleration; this is as expected, taking into account that China is using some 11 mt for ethanol (von Braun 2008). In effect, deceleration is still evident for the aggregate of all cereals. This conclusion applies also if we count absolute increments: the annual average increment for cereals is 7 mt for 1995–2001 and 6 mt for 2002–08.

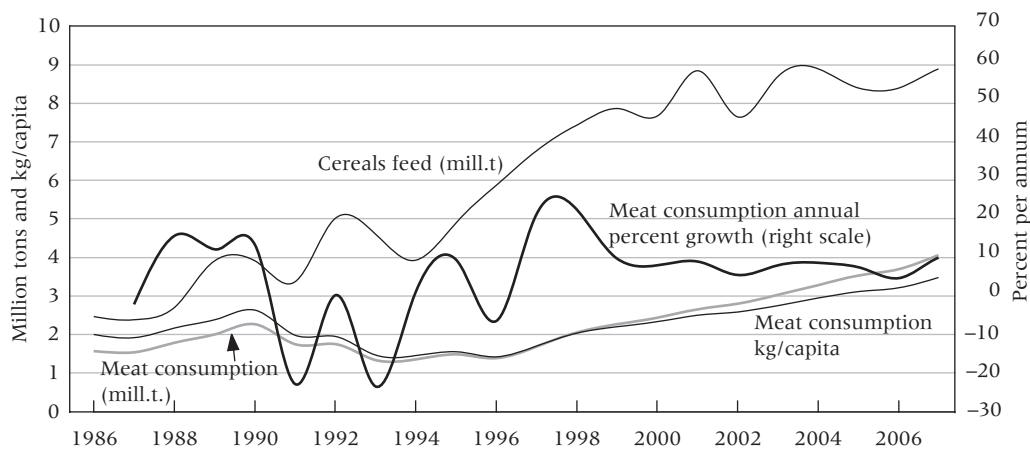
Meat consumption has been rising fast in China, but this has been occurring for several years and the trend shows no acceleration in recent years. On the contrary, a slowdown in the growth of aggregate and per capita consumption<sup>23</sup> is evident in the USDA data. The same holds for total cereals used for feed (see Figure 6). In other words, trends follow the normal evolutionary path of gradual slowdown as higher levels of consumption are attained and population growth decelerates. In India meat is still a minor consumption item.<sup>24</sup> Consumption has been growing, but it shows no acceleration in the recent years of rising prices; and feed use of cereals seems to have flattened out at about 9 mt (see Figure 7). At this level, feed use of cereals does not seem to be a critical component of India's total demand for cereals of some 200 mt.

It would appear that the much-touted “income effect” on consumption has had at best a limited role in explaining the food price surges. In particular, it is difficult to see how the recent (from late 2007) sharp rises in the price of rice in the face of record world production in 2007 can be ascribed to sudden increases in demand attributable to the income effect. Rice consumption per

**FIGURE 6 China meat consumption (excluding ovine meat) and cereals feed use, 1980–2007**



SOURCE: USDA PSD database, accessed 13 July 2008.

**FIGURE 7 India meat consumption (excluding ovine meat) and cereals feed use, 1986–2007**

SOURCE: USDA PSD database, accessed 13 July 2008. Data start from 1986 because there is an apparent break in the series (beef doubling from 1985 to 1986).

capita tends to stabilize or even decline with rising incomes and urbanization in the major rice-consuming countries. It is, of course, possible that demand for rice was stimulated if consumers substituted rice for other foods following the sharp rises in the prices of wheat and maize that had started earlier (World Bank 2008c: 23). However, in 2005–07 the annual growth rate of world rice consumption remained in the range of 1.2–1.4 percent. One is tempted to relate price rises to the decline in world rice stocks, which indeed fell by almost half from 2000 to 2007. However, the fall had bottomed out by 2004 while rice prices rose sharply in spring 2008. Moreover, the fall in global stocks cannot have been a major factor, since 80 percent of the decline was due to the drawdown of stocks in China, apparently a deliberate policy implemented by reducing production incentives. China's rice production declined for six consecutive years from a peak of 140 mt in 1997 to 112 mt in 2003, and it has not yet fully recovered (130 mt is forecast for 2008/09). As noted, export bans (themselves a form of hoarding) in the face of rising prices of wheat and coarse grains, panic buying (including by highly import-dependent countries), and hoarding (including by consumers<sup>25</sup>) seem to have been key factors in the surge of rice prices.

The deceleration of world consumption growth also reflects the rising prices of recent years, in addition to the standard forces behind deceleration (declining population growth and gradual attainment of higher consumption per capita). However, the conclusion that the income effect had at best a modest role in the price surges still stands. Had it played a larger role, this would have shown up as an acceleration in demand in recent years even after ac-

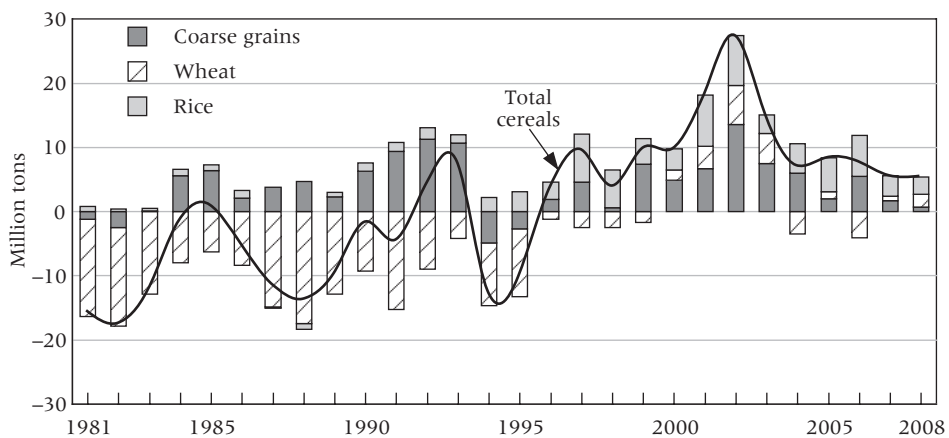
counting for the depressing effect of rising prices, a point made by Becker. We provided above (Figure 4) a rough-and-ready estimate from the projections in FAO (2006) indicating that world consumption of cereals in 2008 would have been 2,054 mt (or 2,063 mt according to OECD 2003 under near-constant prices), that is, about 1.2 percent above the actual level for food, feed, and other non-biofuel uses.

A tentative conclusion may be drawn: if acceleration in the demand for cereals has been one of the underlying causes of the price surges, it did not come from the combined demand of China and India. The latest World Bank report for the G-8 underlines the scant growth in consumption of cereals in East Asia, by implication “absolving” the region from “responsibility” for the price surges of cereals (World Bank 2008a; see also World Bank 2008c: 25).

But were China and India implicated in the world price surge of cereals in ways other than by accelerating their consumption growth? Changes in their foreign trade balances suggest such a role, albeit a minor one. For the last ten years China and India have been net exporters of cereals, reaching peak net exports of 27 mt in 2002. Thereafter the net export balance kept falling—to some 5 mt by 2007 (see Figure 8). Coming at a time when world trade in cereals had to absorb shocks in the main exporting countries (crop failures in Australia and elsewhere, the EU turning from a significant net exporter to net importer in 2007, maize diversion to biofuels in the US), a *prima facie* case can be made that the fall in net exports from China and India has played a role in the price rises.

But why did their net exports fall? We saw that consumption growth did not accelerate. A plausible explanation is that the process of stock depletion that has been occurring for some time and that supported the increases in

**FIGURE 8** China and India, net trade in cereals, 1981–2008 (million tons)

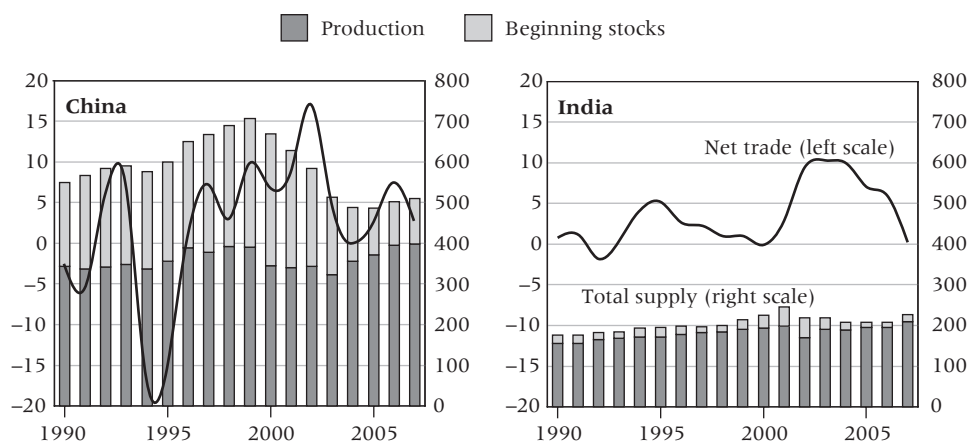


SOURCE: USDA PSD database, accessed 13 July 2008; data for 2008 are forecasts.

exports came to an end. Although both India and China reduced their net exports, the dominant role of China in these developments must be underlined. The country is reported to have accumulated huge cereals stocks: according to the data,<sup>26</sup> its end-season stocks during the period 1990–2007 reached a peak of 324 mt in 1999, 87 percent of its annual consumption.<sup>27</sup> In contrast, the corresponding numbers for the rest of the world were stocks of 260 mt, representing 17.5 percent of annual consumption. There followed a series of years of falling production in China (to 322 mt by 2003) and some recovery thereafter, but production in 2007 at 398 mt was only slightly above the 1998 level of 392 mt. Stocks were drawn down and fell to 119 mt by the end of 2007, or 30 percent of consumption. These changes are clearly seen in Figure 9, indicating the sharp decline in total domestic supply (production plus beginning stocks) after 1999. One is tempted to say that these developments in China after 2000 were a harbinger of things to come: the country accounted for 55–60 percent of world cereals stocks in 1996–2000 and still accounts for 35 percent currently, while 80 percent of the fall in world stocks from 2000 to 2007 was attributable to the decline in China’s stocks. China, however, has a relatively minor role in world cereals trade. Thus, changes in world stocks attributable predominantly to changes in China’s stocks (the case in the years after 2000) should significantly reduce the value of changes in world stocks as a correlate of world price movements. More important are changes in the stocks of the major trading countries (Abbott, Hurt, and Tyner 2008).

We now turn to prices of commodities other than cereals. Prices of vegetable oils rose even faster than those of cereals. Vegetable oils are food

**FIGURE 9 Cereals: total supply (= production + beginning stocks) and net trade, China and India, 1990–2007 (million tons)**

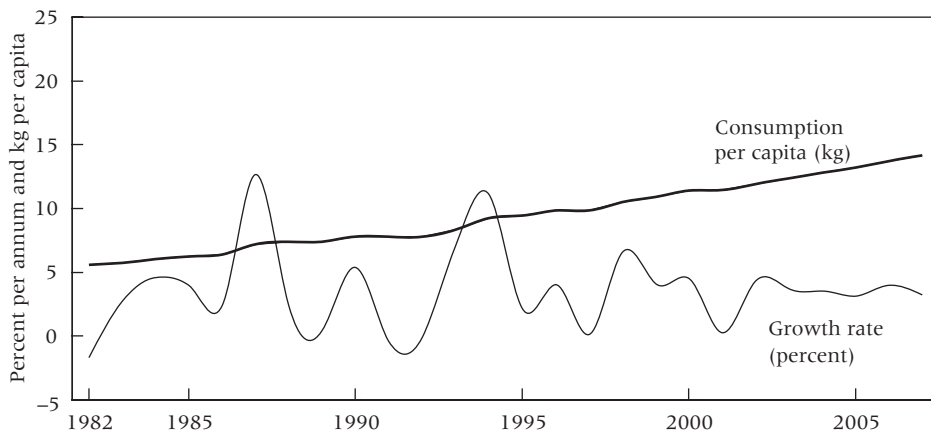


NOTE: Total supply (columns) on right scale; net trade (solid line) on left scale. Both scales in million tons.  
 SOURCE: USDA PSD database, accessed 13 July 2008.

products with high income elasticity in developing countries, where food consumption of oils has been growing at fairly high rates. There has been no acceleration in recent years, however (see Figure 10). In principle the continued high growth of food consumption in the developing countries has not introduced a new element in the trends in supply and demand. What is new is the influence of biofuels: it is now widely accepted (e.g., World Bank 2008a) that biofuel use explains much of the price rises in oils and oilseeds, directly through their use for biodiesel, mainly in Europe, and indirectly via displacement of soybeans by maize in the United States. The European Union is a major importer and consumer of such products. In 2007 the European Union used some 10 mt of oilseeds for bioenergy out of a total consumption of 49 mt. In terms of oil, achievement of the EU's 10 percent target could imply that 60 percent of domestic use of vegetable oil will be absorbed by biodiesel in 2020 (European Commission 2007a, b). The oilseed price rises spilled over to wheat prices as several wheat-exporting countries (the European Union, Russia, and Ukraine) expanded oilseed production at the expense of wheat,<sup>28</sup> thereby accentuating wheat shortfalls in international markets.

China has also played a discernible role in the price surges of oilseeds. The country's imports of soybeans skyrocketed in recent years. China now accounts for 45 percent of world imports, up from less than 10 percent a decade earlier. The USDA data show that about 17 percent of total supplies go to direct food consumption, some is used for seed, and losses occur through waste. The rest is crushed into oil (for fast-growing food use but also for non-food industrial uses) and oilmeal for animal feed; use of the latter grew threefold in the last ten years. Yet there has been no acceleration in meat production to

**FIGURE 10** Developing countries: Food consumption of vegetable oils per capita, amount and growth rate, 1982–2007



SOURCE: USDA PSD database, accessed 8 May 2008.



justify this surge in soybean imports and oilmeal supplies and use. If anything, pork production (which accounts for some three-quarters of all meat) declined sharply in 2007 because of disease (see Figure 6).<sup>29</sup> Even the rapidly increasing production of milk seems to have slowed to an annual increase of 9 percent in 2007, compared with annual increases of 15–32 percent in the preceding four years. One possible explanation is that the implied rapid growth of apparent consumption of soybean meal is increasingly substituting for cereals in livestock feeding and in fish farming—something that may explain the slow growth in China's use of cereals feed in recent years (Figure 6).

In conclusion, the frequently reported acceleration of demand for food in China and other emerging economies does not seem to have been a major contributor to the present food price surges. This is not to deny that in the countries with moderate to low food consumption levels the growth of food demand tends to accelerate when incomes rise rapidly. This is a gradual process, however, and normally does not last very long. The growth of meat consumption has been occurring for some time, and much of it took place before the current price surge: per capita apparent consumption of meat in China grew from 36 kg in 1996 to 51 kg in 2005 and then fell in the two subsequent years to 47.5 kg in 2007 (Figure 6). This is not the first time that China's alleged huge appetite, particularly for meat, has been seen as a threat to world food security. In 1995 Lester Brown's book *Who Will Feed China?* provoked concern (Brown 1995; for a critique see Alexandratos 1996). China went on to become a net exporter of cereals while also raising its meat consumption. The OECD–FAO (2008) projections estimate zero cereals net trade for 2017 (and small net exports for India). China could become a modest net importer in the future. The conventional wisdom may have been prompted by the role of the emerging economies, in particular China, in creating a significant demand shock, and consequent rising prices, in other commodity sectors, such as energy and metals. This possibility requires that we consider the role of the general commodity boom in the rise in food prices.

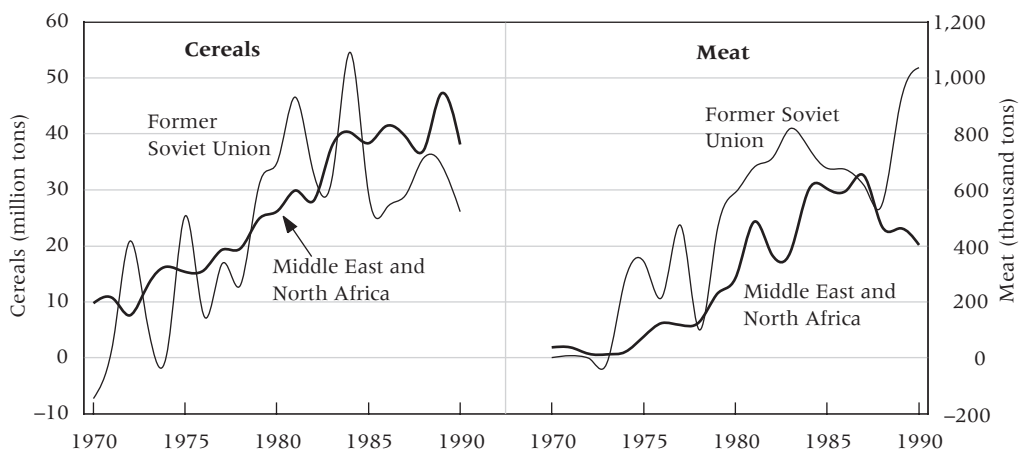
### **Is the petroleum price surge the culprit?**

The preceding discussion indicates that if a demand shock is a factor in the rise of cereal prices, it is more likely to have originated in the emergence of the biofuels sector as a novel user of cereals than in growth in the demand for food and feed. In the cereals consumption trends shown earlier (Figure 4), the only demand shock discernible is that of biofuels, which contributed to raising the growth rate of global consumption of coarse grains and caused world consumption of cereals to be higher than it would have been otherwise. The rise in the price of petroleum and the accompanying policy responses in support of biofuels have been instrumental in these developments because they made such use of agricultural commodities profitable.

That the price of petroleum affects the prices of agricultural products is, of course, nothing new. The traditional view has been that the link operated via (1) the effects on production costs given agriculture's heavy use of energy-intensive inputs (fertilizer, fuel, and, in irrigated agriculture, electricity<sup>30</sup>), and (2) the macroeconomic effects, for example the influence of petroleum prices on inflation, incomes, interest rates, exchange rates, and foreign trade. Both effects suggest a negative impact of petroleum prices on the growth of demand for agricultural products.

Yet a positive impact on demand for agricultural products has occurred in parallel with the rise in petroleum prices. Positive impacts could result for some agricultural products (e.g., cotton, rubber) because petroleum price rises would raise the prices of petroleum-based synthetic substitutes and would shift demand to natural products. Additional positive impacts occur when the increased earnings of petroleum exporters result in increased demand for food imports, as happened in the mid-1970s. The increased demand comes mostly from countries that began with low food consumption levels. This was the case in Middle Eastern and North African countries during the first and second petroleum shocks in the mid-1970s and early 1980s: their net cereal imports increased sixfold between 1972 and 1984, those of meat 15-fold.<sup>31</sup> Similar changes occurred in the former Soviet Union, which also benefited from the petroleum boom (see Figure 11). Increased demand for food imports also appears to be happening currently (World Bank 2008b: 39), although we do not have sufficient data to validate this development. Impacts are likely to be less spectacular this time because, unlike the earlier petroleum shock

**FIGURE 11 Net imports of cereals and meat: Former Soviet Union and Middle East/North Africa, 1970–90**



NOTE: Meat excluding ovine.

SOURCE: USDA PSD database, accessed 22 June 2008.

periods, a good part of the gains from increased petroleum prices now accrues to countries whose food consumption levels are already fairly high.

Such positive impacts of petroleum prices are now greatly reinforced by the stimulation of the biofuels sector. This is the novel element with which the world is now confronted. If the link between rising petroleum prices and increased demand for, and prices of, biofuel feedstock crops proves robust, projections of future petroleum prices could allow us to glimpse future agricultural prices. The above-mentioned article in *The Economist* with the suggestive title "Grain prices go the way of the oil price" expresses this view. Several researchers have concluded that we have entered an era when agricultural prices have become a function of petroleum prices (e.g., Good and Irwin 2008: 3). A study by Baffes (2007) finds that the pass-through of petroleum prices to the prices of internationally traded non-energy primary commodities is significant, with the highest impact exerted on prices of fertilizer and food commodities. The high prices of food commodities would persist (although not necessarily at the high levels reached in early 2008) if petroleum prices remained high.

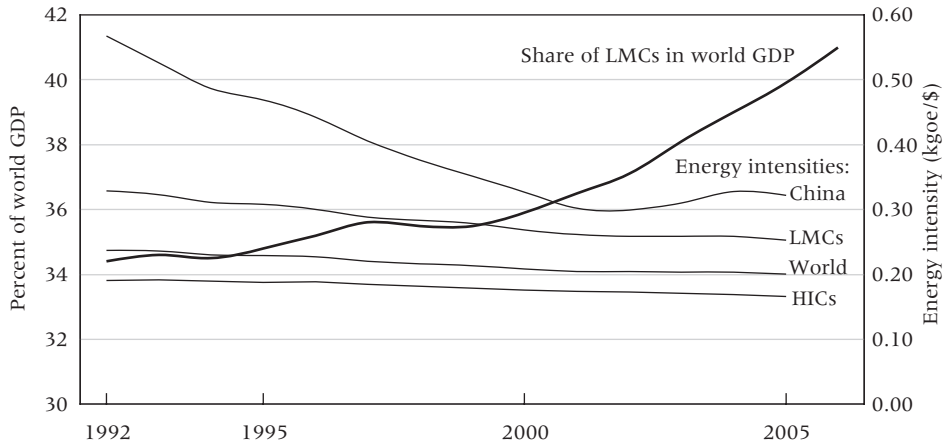
### **China again: The link via energy- and resource-intensive growth**

The links between petroleum prices and agricultural prices can also help us gain a better understanding of the role of particular countries in explaining the present price surges in agriculture. For instance, if China has been a major contributor to the surge of petroleum prices, then one can deduce that China also contributed to the increases in agricultural prices, although not because it experienced a spurt in food demand. Some analysts argue that China has been a prime mover in triggering the current commodities boom.<sup>32</sup>

Another interesting aspect of this issue is the growing share of the emerging economies in aggregate world output. On the margin, this means that an increasing share of additions to world gross domestic product comes from these countries, particularly if measured using purchasing power parity (PPP) exchange rates. The low- and middle-income countries<sup>33</sup> now account for 41 percent of world GDP, measured in PPP international dollars, up from 34 percent in 1992 (see Figure 12). In the past the declines in the prices of primary commodities, *inter alia*, were attributed to the growing "dematerialization" of world GDP growth. That is, an additional unit of world GDP was obtained with lower than average input of material goods, including energy, as the services sector grew and industry became a more efficient user of raw materials and energy.

The growing weight of the emerging economies, which use more material inputs per unit of GDP (represented in Figure 12 by total energy use in petroleum-equivalent per PPP dollar of GDP, showing China separately),

**FIGURE 12** Share of world GDP of low- and middle-income countries (LMCs) and GDP energy intensity in LMCs, in China, in high-income countries (HICs), and in the world, 1992–2005



NOTE: World GDP share is measured in PPP terms. Energy intensities are shown as kg oil equivalent per constant 2005 PPP dollar.

SOURCE: World Bank, World Development Indicators, 15 August 2008.

implies that this “dematerialization” has now slowed. In China the process has apparently gone into reverse as the industrial structure has been shifting from light manufacturing to heavy industry.<sup>34</sup> Some observers point to the shift from a “commodity-lite” to a “commodity-intensive” period of economic growth<sup>35</sup> as a major factor in the surge in commodity demand and prices. If the emerging economies continue on their high-growth path, we can expect that the slowdown in “dematerialization,” and hence vibrant commodity demand, will continue for some time.

### A role for exchange rates and monetary policy in the price surges

The recent commodity price surges occurred at a time when the dollar depreciated against most other currencies—for example, by 30 percent in Brazil, 25 percent in the Philippines, 20 percent in the Eurozone, and 18 percent in the CFA African countries, although by less than 5 percent in Indonesia and Mexico (nominal exchange rate changes between the annual average of 2005 and March 2008). Over the same period dollar prices rose 189 percent for wheat, 107 percent for rice, and 138 percent for maize.<sup>36</sup> Therefore, the revaluations offset only a small part of the price rises for these countries. Moreover, for importing countries the increases in prices were further magnified by the rise in transport costs. For example, the wheat price (US Gulf) in mid-June 2008 was \$369/ton, up \$134 or 57 percent over a year ago, but with freight (to Europe) added the price came to \$451, up \$179 or 66 percent.<sup>37</sup>

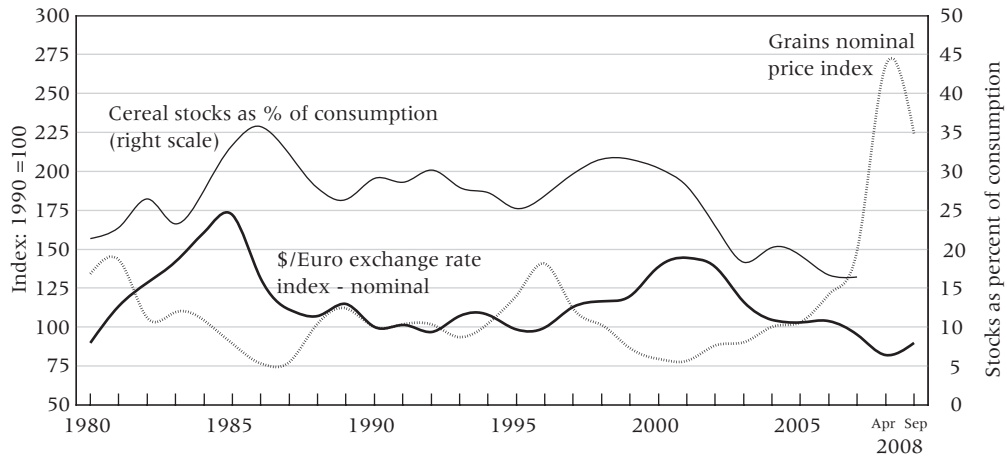
The more interesting question is whether the declining value of the dollar is itself a factor in the surge of dollar-denominated commodity prices. Some analysts think so.<sup>38</sup> The World Bank (2008a) in its report for the G-8 lists dollar depreciation among the “underlying structural factors contributing to rising food grain prices.” Mitchell (2008) estimated that dollar devaluation increased the food price index by 20 percent between January 2002 and June 2008. It is doubtful whether any one seller acting alone could raise prices to compensate for the declining dollar, although dominant suppliers in an industry (e.g., Saudi Arabia in the case of petroleum) could. So, too, could several sellers who acted together or were otherwise in a position to control supplies. This might well be the case for commodities like petroleum, where major sellers are organized in the OPEC cartel. It might also be relevant for the cereals sector, in which there are few major net exporters and many importers. Several countries (see World Bank 2008a: Annex 6) have imposed restrictions or outright bans on exports while striking government-to-government deals (often undisclosed) with importing countries.<sup>39</sup> The dollar exchange rate would very likely be a major bargaining point in the determination of prices in these deals.

The other channel through which the dollar’s depreciation may push prices upward is by reducing prices of dollar-denominated commodities in terms of other currencies. This tends to stimulate demand and raise dollar prices. It also enhances the competitiveness of US exports, including maize, wheat, and soybeans—commodities in which the United States is the (or a) major supplier to world markets. Given the “price-setter” role of US markets and commodity exchanges in these exports, the depreciation of the US currency is likely to have this additional effect on world prices.

Figure 13 plots the price indexes of cereals (current \$), the nominal dollar/Euro exchange rate, and cereals stocks as a percent of world consumption for the period 1980–2007. The figure suggests that an inverse relationship (dollar rising/grain prices falling and vice versa) has held true through most of the period, with the exception of the years 1985–90 when grain prices and the dollar exchange rate moved in unison rather than in opposite directions. These were years of major changes in the supply–demand balance of cereals as measured by changes in stocks (percent of consumption) and years of even more substantial changes in the dollar exchange rate. The period 1984–86 saw high cereals production (an increase of 10.9 percent in 1984) and stock accumulation (to an unprecedented 36 percent of world consumption by 1986). There followed two years of production shortfalls (1987–88) and falling cereal stocks. In parallel, abrupt policy changes (the September 1985 Plaza Accord<sup>40</sup>) led to a precipitous depreciation of the dollar, which fell by 50 percent against both the yen and the D-mark from March 1985 to December 1987.

The IMF (2008a: Box 1.4) has examined how movements in commodity prices may be related to those of the dollar exchange rate and to other variables. They conclude that movements in the dollar exchange rate have

**FIGURE 13** Indexes of grain prices and \$/Euro exchange rate (1990 = 100) and world cereal stocks as percent of annual consumption, 1980–2008



SOURCES: Grain Price Index (nominal), World Bank, Commodity Price Data; Exch. rates USDA (<http://www.ers.usda.gov/Data/ExchangeRates/>) 26 October 2008; Stocks/consumption: USDA PSD database, accessed 15 July 2008.

a significant impact on the prices of most commodities, particularly those of petroleum and metals, but are not an important determinant of the price of cereals. They suggest that this latter finding reflects the nature of cereals, which, in contrast to commodities like petroleum, gold, and metals, are less suitable for use as “store of value,” an important consideration in times of exchange rate fluctuations and lax monetary policies. Note, however, the contrast with the World Bank report for the G-8 meeting, which highlights the role of dollar depreciation in the food price surges.

The IMF explanation seems less than satisfactory: the exchange rate affects the price of petroleum, which in turn affects the price of cereals by raising production and transportation costs and by stimulating demand for biofuels. It is therefore unreasonable, I believe, to say that the exchange rate is not an important determinant of the price of cereals. One must also note, however, that the direction of causation is not always from dollar exchange rate to commodity prices; causation can also work the other way around in a kind of vicious cycle.

Resort to commodities as “store of value” and investment portfolio diversification in times of low interest rates and financial turbulence like the one the world is currently experiencing is a common theme in the literature on commodity prices (e.g., Frankel 2006, 2008). The IMF (2008a: 47) also emphasizes this issue. This issue is becoming increasingly contentious as politicians look for culprits to blame for the rising prices, precisely the speculators. Economists are not so certain. As the Nobel laureate Paul Krugman points out, speculation can raise the futures prices, but it will raise the spot

prices only if it leads to hoarding and rising stocks.<sup>41</sup> However, cereals stocks have been falling, not rising. Krugman argues along similar lines concerning the influence of speculators on the formation of the petroleum price.<sup>42</sup> Other influential commentators offer similar positions.<sup>43</sup>

In conclusion, one must recognize a role for speculative activity in the formation of spot prices, even though concrete quantification proves elusive. In any case such a role would not be on a par with that of the fundamentals affecting demand and supply and certainly is a far cry from the alarming positions often propounded in the press. The World Bank's (2008a) position on this matter in the G-8 paper is a balanced one: it emphasizes the importance of the fundamentals and policies in the food price rises, while also recognizing a minor role for speculative activity.

### **Petroleum and food prices: Is the experience of the 1970s relevant?**

Will food prices return to more "normal" levels? They will probably do so in the short term as the impact of weather-induced supply shocks diminishes and other aggravating factors, such as export bans, are relaxed. Additional factors will be the fall in petroleum prices following the onset of recession in the world economy and changes in exchange rates, for example dollar appreciation. For the longer term we must look for changes in the factors that determine the supply–demand balance. We have identified above several factors whose confluence contributed to generating the recent price surges. These include, in the first place, "traditional" disturbances (in the sense that we have seen them before): production shortfalls in relation to demand, leading to reduction of stocks; the price of energy and an associated rise in production costs; and the dollar exchange rate and monetary policy.

The preceding factors are in addition to the standard factors that maintain ever-rising demand for food, although at a declining pace: the growth of population and incomes. Population growth has been and will continue to be the main driver.<sup>44</sup> Deceleration in population growth will slow the growth of food demand, although the absolute quantities involved will remain considerable (Figure 4; see FAO 2006 for projected increases of the different commodities). Income growth, accompanied by urbanization, in the countries with still low and undiversified food consumption levels will continue to play a role, but this growth will be gradual and may not generate sudden spurts in global food demand. If many populous countries were to experience China-like economic growth rates simultaneously, the resulting spurts in global food demand could conceivably be classified as a "disturbance," but such an event is unlikely. Were this to happen, however, spurts would be short-lived as per capita consumption grows to levels beyond which the stimulus for further increases loses momentum.

Some of the aforementioned factors have been present in past instances of agricultural price surges. Previous surges were resolved through a combination of policy responses and spontaneous market adjustments. If these were the only factors at play currently, we could look forward with some confidence to the prospect that the present price surges will subside over the short to medium term. What is required is a combination of immediate food security relief measures and actions to boost production in the short term, as well as provisions to replenish stocks and for investments to raise longer term production potential. These and related responses are clearly reflected in the Declaration of the June 2008 High-Level Conference on World Food Security (FAO 2008c) and in the Comprehensive Framework for Action produced by the UN High-Level Task Force on the Global Food Crisis (United Nations 2008). We cannot have such confidence this time around. Food prices are affected in more permanent fashion by novel “nontraditional” factors that are related to the price of energy. Should the price keep rising, biofuels may in the end become profitable even without policy support, posing a risk that growing shares of agricultural resources will be diverted to supplying the energy market rather than meeting the demand for food.

To see what might be different this time, let us compare the present increase in prices with that of the 1970s. Some elements of the two situations are deceptively similar. Then, as now, prices of both food and petroleum rose sharply, while the dollar depreciated by 31 percent between April 1971 and July 1973 (this was the time of the collapse of the Bretton Woods system, ushering in the era of floating exchange rates). Were these happenings organically linked to one another or was their synchronous occurrence a mere coincidence?

The stage for the rise of cereal prices had been set in the preceding years when world stocks had fallen for four years in row, from 24 percent of annual consumption in 1968 to 15 percent in 1972. The 1972–73 crop year saw widespread crop failures in major producers.<sup>45</sup> The collapse of Peru’s anchovy fisheries (supplying fishmeal for the livestock sector) added to the problem. The rise in food prices would have occurred even without the petroleum shock. Grain prices skyrocketed from 1972 to 1974 (see Figure 1). These were the years of the first petroleum shock, followed shortly by the second one in 1979. Robust global economic growth was then, as it is today, a key factor behind the petroleum price rises. In the 1970s, the conflict in the Middle East and OPEC’s reduction in output reinforced the effects of such price rises (Radetzki 2006). Petroleum prices rose 20-fold in nominal terms from 1972 to 1980, eightfold in real terms. Real petroleum prices peaked in 1980, declined slowly up to 1985, and then remained low until the end of the 1990s (Figure 1). In contrast, real cereal prices had returned to their 1972 level by 1977. There followed a decade of falling real prices and then near constancy up to the beginning of the rise in prices starting in mid-2002,



apart from short-lived spikes in 1988 and 1996, both related to production shortfalls in the years preceding.

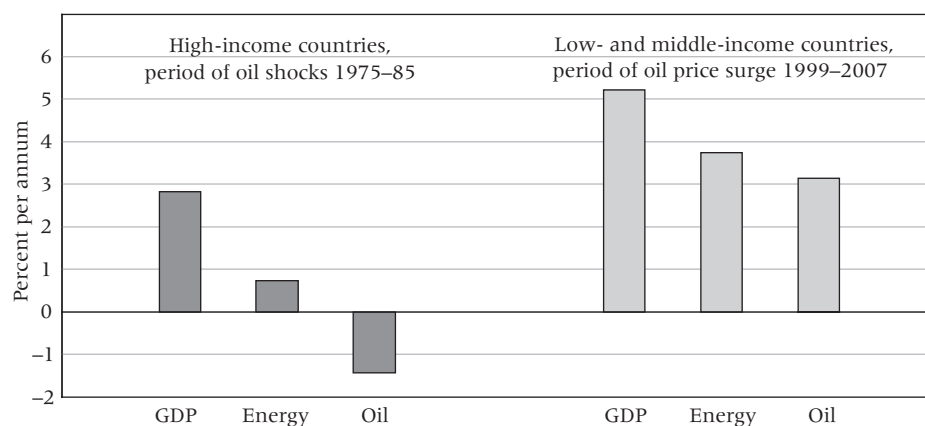
Two questions are critical to assessing the relevance of the experience of the 1970s for the current food price surges.

First, will food prices revert to their earlier level and perhaps resume their declining trend, as happened in the 1970s? At that time the link of food prices to the price of petroleum was not as strong as at present. Cereal prices followed a “normal” commodity cycle pattern, but petroleum prices did not do so for more than a decade. This is certainly a weak link. There is a real prospect that high cereal prices will not decline according to the “normal” pattern as long as the price of petroleum remains high and incentives for biofuels remain in place.

Second, what are the prospects that petroleum prices will replicate the experience that followed the petroleum shocks of the 1970s? As noted, real petroleum prices collapsed after the mid-1980s and did not recover until the late 1990s. Some significant differences from the situation in the 1970s suggest that this time things may turn out differently. In the first place, the scope for the petroleum industry to respond to high prices by increasing supplies is much smaller at present; second, there was significant slowdown in the earlier period in the growth of demand, the result of both recession and energy efficiency gains in the high-income countries. In the period of high petroleum prices (1975–85) the GDP growth rate of such countries was nearly halved from that of the preceding decade, the growth rate of total energy consumption fell sharply, and the growth rate of petroleum consumption turned negative (see Figure 14). These developments were a key factor in bringing about the long period of low prices in petroleum markets in the following decade and a half. In the process, and in tandem with the rise in prominence of several emerging economies, the dominant position of the high-income countries in world energy and petroleum consumption has gradually eroded, a process that has continued to the present (see Figure 15).

The response of the low- and middle-income countries to the recent rise in petroleum prices has been to maintain robust petroleum demand growth. Far from slowing down, their growth rates of all three variables (GDP, energy, petroleum) were higher in 1999–2006 than in the period of low petroleum prices in 1986–98. In short, the emergence of several low- and middle-income countries as major players on the world economic and energy scenes appears to have imparted a degree of resilience to the world economy vis-à-vis rising petroleum prices. The current economic slowdown in the high-income countries exerts a smaller depressing effect than in the past on the global economy and energy markets. This sounds counterintuitive in an era of advancing globalization and economic integration between different regions of the world. It is perhaps too early to tell whether the apparent signs of “decoupling” presage the advent of a durable change in world economic

**FIGURE 14 Average growth rates of GDP and energy and oil consumption for high-income countries, 1975–85, and low- and middle-income countries, 1999–2007**



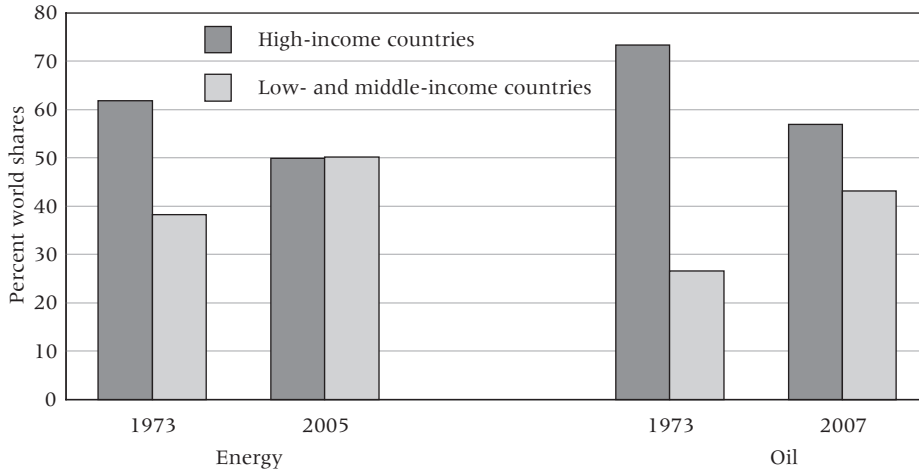
NOTE: High-income countries, oil consumption for OECD only; low- and middle-income countries, GDP 1999–2006, energy 1999–2005, oil non-OECD countries.  
 SOURCES: GDP and total energy: World Bank, World Development Indicators, 15 August 2008; oil consumption: BP WorkBook 2008 «<http://www.bp.com/subsection.do?categoryId=9023761&contentId=7044545>».

architecture (see discussion in Kohn 2008). The latest update of IMF's *World Economic Outlook*, dated 6 November 2008, projects significant slowdown of GDP growth of the advanced economies from 2.6 percent in 2007 to 1.4 in 2008 and outright absolute decline in 2009 (–0.3 percent). Slowdown is also projected for the emerging and developing economies, but their growth rates are still fairly high: from 8.0 percent in 2007 to 6.6 percent in 2008 and 5.1 percent in 2009, including for China (from 11.9 percent to 9.7 percent and 8.5 percent, in the three years, respectively) and India (9.3 percent, 7.8 percent, 6.3 percent) (IMF 2008b: Table 1.1).

At this stage of the development of the emerging economies, high economic growth means industrialization, heavy industry, infrastructure construction, and spread of motorization—all energy-intensive sectors helping to maintain robust growth in petroleum demand in the face of rising international prices. Such growth has also reflected policies of shielding consumers from the full cost of energy price rises. The high petroleum prices reached by mid-2008 have the potential of moderating demand growth via the usual channels—slowdown in economic growth and consumer response to the rising prices. So far, this seems to be happening only in OECD countries, where petroleum demand has started to fall, accompanied by a drop in petroleum prices.

The declines in petroleum demand in the OECD notwithstanding, the prospect of a recurrence of the lowering of petroleum prices similar to that

**FIGURE 15 Shares of high-income countries and low- and middle-income countries in world energy and oil consumption, 1973 and 2005–2007 (percent)**



SOURCES: See sources for Figure 14.

in the period after the petroleum shocks of the 1970s appears less probable now.<sup>46</sup> A supply crunch looms in the not-too-distant horizon, according to some (Stevens 2008; IEA 2008). The latest update of the *Asian Development Outlook 2008* suggests that the key structural factor responsible for rising petroleum prices, sustained demand on the part of developing Asia, will continue to play this role for years to come (Asian Development Bank 2008: 32–72). It concludes: “the biggest message is that high oil prices are here to stay.”

### Concluding remarks: Assessing long-term food prospects in light of rising energy costs

High economic growth in the emerging economies may contribute to keeping food prices high, not so much because of acceleration in the growth of their demand for food, but rather via the energy channel. Economic growth can continue to put upward pressure on energy prices and stimulate demand for crops as biofuel feedstocks. How should we assess world food futures in this new era in which the energy sector is directly encroaching on the markets for food?

The first point to recognize is that the propensity to invest in agriculture may receive a significant boost from both governments and the private sector. If petroleum prices remain high, the emergence of biofuels may provide the hoped-for support for agricultural prices and free farmers from the perennial treadmill whereby productivity increases in agriculture tend to lower prices.

It is possible to think that in the new era of energy–food competition the treadmill could go into reverse: any tendency for food prices to fall below the parity price (see below) as a result of productivity gains in agriculture will divert supplies to biofuels and prices will revert to parity; and the latter may be moving upward if petroleum prices continued to rise. On the positive side, countries with ample agricultural resources may see new opportunities to achieve improved living standards. We could, therefore, be more sanguine than in past assessments that the required investments to agriculture will be forthcoming.

This leads to the question whether and to what extent policies to increase production would lead to lower food prices. In principle the answer is yes, almost certainly so if we focus on the short term. However, if the preceding discussion is any guide, the answer concerning the longer term must be conditional on what happens to the price of energy and to policies for biofuels and, of course, on the agroecological and technological potential. But the general principle stands: if energy prices remain high, it is difficult to see how the biofuels industry can be prevented from snapping up supplies if it is profitable for it to do so. If low-income food consumers must compete with consumers demanding more energy, it is the former who will lose out. Therefore options for minimizing such effects must be examined. One avenue to explore is the potential to channel demand for biofuel feedstocks toward types of crops, countries, and agroecological environments where they compete the least with food. A straightforward case is trade policies that would channel biofuel-generated pressure on land resources to Brazilian sugarcane fields rather than to land used to grow American maize or European cereals and oilseeds.

What potential exists to increase production of traditional food crops as well as novel ones and eventually plants suitable for second-generation biofuels, with particular emphasis on those that minimize competition for land having food crop potential (Babcock 2008a)? FAO long-term estimates (Alexandratos 1995; Bruinsma 2003; FAO 2006) conclude that if demand were to grow as foreseen in the projections (Figure 4), it would be possible for production to grow *pari passu*, provided supporting policies for investment, agricultural research, and technology development were implemented. These provisional estimates were based on land-suitability data for different crops and countries in the FAO/IIASA Global Agroecological Zones (GAEZ) study (Fischer et al. 2001). The estimates are in need of updating and re-evaluation (for problems, see ADAS 2008), a project currently underway using a new global soil database and other updated information (e.g., climate, yield potentials of the different crops and varieties, etc.) as well as revised procedures for assessment of land suitability. Future work should evaluate potentials for increasing production by amounts significantly higher than those required to meet the “normal” demand growth coming from population, income, urban-

ization, and associated changes in diet patterns. The possible role of genetically modified crops should also be explored (see Collier 2008).

I conclude by drawing attention to an important caveat in this argumentation. It concerns the proposition that as energy prices remain high and tend to rise further, so will the price of food because high energy prices stimulate demand for biofuel feedstocks and raise agricultural costs. As food prices rise, so does the cost of producing biofuels. This introduces uncertainty about the future role of biofuels in propping up demand for crops. There are already signs that high crop prices squeeze profit margins and create overcapacity in the biodiesel industry in Europe. Future prices of energy are a critical factor. For any given petroleum price, biofuel production ceases to be profitable if prices of feedstock crops exceed certain levels. There is a useful notion of the “parity price”—or a breakeven relationship between the price of petroleum and the price of biofuel feedstock crops that is necessary in order for biofuels to be profitable (Schmidhuber 2006). The problem, of course, is that the parity price rises along with the price of petroleum. Quantifying the relationship would give us a clearer idea of how food prices may change when the petroleum price rises or falls.

Attempts at quantification have been undertaken for the US ethanol and maize markets (Tyner and Taheripour 2008; FAPRI–MU 2008; Babcock 2008b). As expected, the findings show that (1) maize prices are positively correlated with the petroleum price (via the ethanol link), and (2) maize prices are higher with support policies than without. Two important aspects of this price issue must be noted. First, when blending mandates are in place, the mandated quantity (10.5 billion gallons of ethanol in 2009 in the United States, rising to 12 billion gallons in 2010) will have to be available to the blenders from domestic production and/or imports. According to Babcock (2008b), most of the ethanol will be produced in the United States and this will put a floor under the price of maize (and of other crops). Thus, in the presence of mandates, biofuels will continue to prop up agricultural prices even when petroleum prices are so low that the production of ethanol would not be justified on purely economic grounds. Second, the short-run response of ethanol production to increased petroleum prices (hence its influence on the demand for crops and their prices) is limited by several constraints—for example, capacity of the ethanol industry and the distribution network, as well as the size of the market for blends of ethanol and gasoline. The notion of highly elastic demand for maize at the breakeven price applies only in the long run. In the short run the elasticity could very well be close to zero.

So far, attempts to estimate possible impacts of alternative petroleum prices on food prices over the medium term in the context of multi-commodity, multi-country agricultural analyses have explored impacts of lower rather than higher petroleum prices. For example, a recent OECD (2008) study estimates impacts on food prices in 2013–17 of a return of petroleum

prices to the \$72 per barrel average of 2007. This is some 28 percent lower than the price assumed for the baseline projection. Yet exploring futures with high energy prices is necessary in any assessment of long-term food prospects. The need is particularly urgent if the prospect of a petroleum supply crunch in the medium term were to ring truer as global economic growth resumes after the current downswing.

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## Notes

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1 Figure 1 does not capture the sharp price surge of 2008, for which only monthly indexes at current prices (re-based to year 2000) up to September 2008 are available in the World Bank data «[http://econ.worldbank.org/WBSITE/EXTERNAL/EXTDEC/EXTDECPROSPECTS/0,,contentMDK:2148472~menuPK:556802~pagePK:6416\\_5401~piPK:64165026~theSitePK:476883,00.html](http://econ.worldbank.org/WBSITE/EXTERNAL/EXTDEC/EXTDECPROSPECTS/0,,contentMDK:2148472~menuPK:556802~pagePK:6416_5401~piPK:64165026~theSitePK:476883,00.html)». The Bank's data indicate that the average indexes for January–September 2008 were above the 2007 annual averages by 60 percent for cereals, 45 percent for all food, and 56 percent for petroleum. Figure 13 plots the nominal grains price index up to September 2008.

2 Use of maize in the United States for the production of fuel alcohol increased eightfold in the last ten years to an estimated 104 mt (4.1 billion bushels) in 2008/09 (13 percent of world production, 34 percent of US production, 38 percent of US domestic use), double the country's exports (USDA, «<http://www.ers.usda.gov/Data/feedgrains/FeedGrainsQueryable.aspx>», accessed 14 October 2008). Not all maize used in the ethanol industry should be considered as subtracting an equal amount from supplies available for feed, given that the industry produces and returns to the feed sector byproducts equal to about one-third of the maize processed into ethanol. The EU27 uses for biofuels some 5 mt of cereals—2.4 percent of its production «[http://ec.europa.eu/agriculture/markets/crops/index\\_en.htm](http://ec.europa.eu/agriculture/markets/crops/index_en.htm)», China some 11 mt, and Canada some 2 mt (estimates for latter

two countries from von Braun 2008). China is now shifting ethanol production from cereals to cassava and sweet potatoes.

3 Ethanol production data and target for 2022 from «<http://www.ethanolrfa.org/resource/standard/>»; maize use data from «[www.ers.usda.gov/data/feedgrains/FeedGrainsQueryable.aspx](http://www.ers.usda.gov/data/feedgrains/FeedGrainsQueryable.aspx)» (accessed 14 October 2008); see also FAO (2008b) and Coyle (2007).

4 «<http://web.worldbank.org/WBSITE/EXTERNAL/EXTDEC/EXTDECPROSPECTS/EXTGBLPROSPECTSAPRIL/0,,contentMDK:20891436~isCURL:Y~menuPK:902607~pagePK:2470434~piPK:4977459~theSitePK:659149,00.html>»

5 The growing supply of biofuels has a significant impact, according to some, on both crude petroleum prices (lowering them by 15 percent; see “As biofuels catch on, next task is to deal with environmental, economic impact,” *Wall Street Journal*, 24 March 2008) and retail gasoline prices in the United States (Du and Hayes 2008).

6 Earlier FAO projections are in Alexandratos 1995 and Bruinsma 2003.

7 FAO has no published consumption data derived from full Supply-Utilization Accounts (SUAs) and Food Balance Sheets (FBS) for years after 2003. The US Department of Agriculture database for production, supply, and distribution (USDA PSD) has data for cereals as well as for several other commodities «<http://www.fas.usda.gov/psdonline/psdQuery.aspx>». Aggregate consumption (or “domestic disappearance”) is derived as: Production + Opening stocks + Imports – Exports – Closing stocks = Total domestic use, including food, feed, and non-food uses. I use here these latter data in

the public domain to track the evolution of consumption.

8 2008 data are USDA forecasts as of 14 October 2008.

9 The collapse of consumption in the former Soviet Union meant that the growth of world consumption fell in the 1990s to 1 percent per annum, down from 1.7 percent in the preceding decade. Excluding the former Soviet Union, world consumption had followed the “normal” path of gradual deceleration: 1.8 percent per annum in the 1980s and 1.6 percent per annum in the 1990s.

10 This finding applies even if we compare average annual increments rather than growth rates—for example, the average in 2002–2008 is 34.1 mt with biofuels (up from 24.8 mt in 1995–2001) and 22.2 mt without biofuels (down from 24.2 mt).

11 Interpolation between the base year 1999–2001 and the projection for 2030 (from data in FAO 2006: Table 3.2). The resulting interpolation of 2,054 mt for 2008 is very close to the one projected for that year by the OECD in 2003 (i.e., the pre-biofuels years) with its flex-price model (2,063 mt for 2008/09 and nearly unchanged average cereals prices between 2002/2003 and 2008/2009—OECD 2003: Annex Table 4).

12 Forecast of world cereals utilization for ethanol production, given in von Braun (2008), citing the International Grains Council as the source.

13 “U.S. rejects criticism over policy on biofuels,” *International Herald Tribune*, 31 May 2008.

14 “Rising food prices and public policy,” [http://www.becker-posner-blog.com/archives/2008/04/rising\\_food\\_pri\\_1.html](http://www.becker-posner-blog.com/archives/2008/04/rising_food_pri_1.html).

15 An increase of 87 percent in current dollars, or 64 percent in constant 1990 dollars, according to the World Bank cereals price index.

16 Best-fit polynomial second-degree trend on data for 1990–2000 from [www.ers.usda.gov/data/feedgrains/FeedGrains-Querable.aspx](http://www.ers.usda.gov/data/feedgrains/FeedGrains-Querable.aspx).

17 “Secret report: Biofuel caused food crisis,” *Guardian*, 4 July 2008.

18 “Grain prices go the way of the oil price,” *The Economist*, 21 June 2007.

19 “Feed the world? We are fighting a losing battle, UN admits,” *Guardian*, 26 February 2008.

20 “The rich get hungrier,” *New York Times*, 28 May 2008.

21 There are notable exceptions to the seeming consensus—for example, Gary Becker (see note 13) and Bill Emmott, former editor of *The Economist*; “GM crops can save us from food shortages,” *Daily Telegraph*, 17 April 2008. Exceptions have tended to multiply as time passed: they include the World Bank (2008a) in its report for the July 2008 G-8 meeting and in its *Global Development Finance 2008* (World Bank 2008c), Naylor and Falcon (2008), and, of course, Mitchell (2008), who had taken this position early in 2008.

22 That global food production potential may evolve to provide for satisfactory diets to a peak world population of about 9 billion by 2050 is not equivalent to saying that Malthusian fears are unfounded. It is possible that other resource constraints may prevent the achievement of that goal, for example energy shortages and the capacity of the ecosystem to absorb the waste generated by increased energy use. See Alexandratos (1995: 32–34) and Niall Ferguson, “Don’t count out Malthus,” *Los Angeles Times*, 30 July 2007.

23 China’s data on meat consumption are subject to considerable uncertainty, as there are great discrepancies between what can be derived as domestic disappearance from the production and trade data and from food consumption surveys (see Ma et al. 2004). For the purpose of this discussion, the concept of “domestic disappearance” as representing aggregate consumption is appropriate since we are mostly interested in the impact of the growth of livestock production (which underlies the estimate of domestic disappearance) on the demand for cereals.

24 The latest meat consumption data used in a 2004 report by the authoritative National Centre for Agricultural Economics and Policy Research refer to the year 1993 (1.7 kg/person—Dastagiri 2004). The USDA data show 1.5 kg for that year, but this excludes ovine meat, which is important in India, though

a minor meat in China. The question of the extent to which India might join, and eventually replace, China as a major driver in a world “meat revolution” is discussed in FAO (2006: 49). The conclusion is: not anytime soon.

25 “What spurred the run on rice; High food prices prompted producers to hoard, limiting supply. The rush to stockpile followed,” *Business Week*, 12 May 2008.

26 There are great uncertainties concerning the quality of China’s data on cereal stocks (see FAO 2006: Box 3.2 and FAO 2004).

27 Problems associated with the huge stocks accumulated by the late 1990s included overflowing granaries and losses due to quality deterioration, as well as large financial losses from sales (domestic and export) at below-cost prices. These problems prompted policy reforms to reduce stocks, including relaxation of policies that obliged farmers to produce cereals (OECD 2005: 37; see also USDA 2001).

28 Collectively, in these countries, wheat area declined by 7 percent and production by 8 percent, and those of rapeseed and sunflowerseed increased by 12 percent and 8 percent, respectively (changes between 2005/06 and 2006/07).

29 USDA (2007). As noted, China’s live-stock production data (and by implication data on apparent consumption) present a number of problems (see FAO 2006: Box 3.2).

30 Mitchell (2008) estimates that higher energy prices plus the dollar depreciation increased food prices by 35–40 percent and that the balance of the 130 percent increase in the IMF index of food prices from January 2002 to June 2008 was due to use as biofuels. He further estimates that the dollar depreciation over the same period (by 26 percent, a trade-weighted real exchange rate for US bulk agricultural exports) increased food prices by about 20 percent. By implication, according to this estimate, increased energy costs caused food prices to increase by 15–20 percent (35–40 percent minus 20 percent).

31 The growth of meat imports would have been even greater if we had import data for ovine meat (a major consumption item in the region), including in the form of live animals, which the USDA data set does not cover.

32 See, for example, “China’s quest for resources: A ravenous dragon,” *The Economist*, 13 March 2008; also World Bank (2007: 6; 2008b: 32, 38) and IMF (2008a: 197).

33 World Bank definition; see country list in «<http://siteresources.worldbank.org/DATASTATISTICS/Resources/Class.xls>».

34 See “China must learn to do more with less,” *The Economist*, 13 March 2008.

35 Stephen King (managing director of economics at HSBC), “Commodity-intensive growth requires institutional reform,” *The Independent*, 16 April 2008.

36 Prices from World Bank, *Commodity Price Data*; exchange rates from «[www.ers.usda.gov/Data/ExchangeRates/](http://www.ers.usda.gov/Data/ExchangeRates/)».

37 Given that freight had also risen from \$37 to \$82/ton. Data from International Grains Council «<http://www.igc.org.uk/en/grainsupdate/igcfreight.aspx>» (accessed 23 June 2008).

38 See, for example, “Commodities, a bit tarnished,” *The Economist*, 19 March 2008; also Becker, cited in note 14.

39 “Nations enter secretive deals on grain supply,” *Financial Times*, 11 April 2008.

40 The United States, Japan, Germany, France, and the United Kingdom agreed to cooperate more closely to encourage further orderly appreciation of the main non-dollar currencies against the dollar.

41 “Commodities and speculation: Metallic (and other) evidence,” «<http://krugman.blogs.nytimes.com/>» 20 April 2008. See also his “Running out of planet to exploit,” *New York Times*, 21 April 2008.

42 Paul Krugman, “The oil non-bubble,” *New York Times*, 12 May 2008. He develops the argument in a short theoretical paper, “Speculation and signatures,” «<http://www.princeton.edu/~pkrugman/Speculation%20and%20Signatures.pdf>».

43 “The oil price: Recoil,” *The Economist*, 29 May 2008; see also “Written Testimony of Jeffrey Harris, Chief Economist, before the Committee on Energy and Natural Resources, United States Senate, 3 April 2008, «<http://www.cftc.gov/>». The Commodity Futures Trading Commission (CFTC) has the mandate to regulate commodity futures and option markets in the United States.



44 On the significance of population growth as a driver of food demand, see Alexandratos 1997.

45 Former Soviet Union, India, Turkey, Philippines (all two years in a row), Nigeria (three years in a row), Australia, China, North

America, Thailand, Ethiopia, Mexico, Brazil, South Africa, Indonesia and Egypt (all in the 1972–73 crop year).

46 On the issue “current vs. seventies” see Paul Krugman, “Running out of planet to exploit,” *New York Times*, 21 April 2008.

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