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The Effects of Agricultural Research and Farm Subsidy Policies on Human Nutrition and Obesity

Julian M. Alston

Department of Agricultural and Resource Economics
University of California, Davis
julian@primal.ucdavis.edu

Daniel A. Sumner

Department of Agricultural and Resource Economics
University of California, Davis
University of California Agricultural Issues Center
dan@primal.ucdavis.edu

Stephen A. Vosti

Center for Natural Resources Policy Analysis
John Muir Institute of the Environment
Department of Agricultural and Resource Economics
University of California, Davis
vosti@primal.ucdavis.edu

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Short Abstract

Agricultural policies – including farm programs and R&D – are said to have contributed to obesity by making food commodities cheaper and thereby encouraging consumption. This paper explores the links from agricultural policy to food prices and consumption and suggests that contribution of agricultural policy to obesity is not so clear.

Extended Abstract

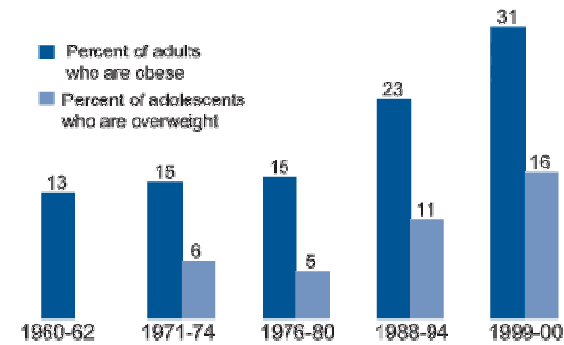
Rates of obesity among adults and children in the U.S. are soaring, with potentially huge private and social costs. Increasing attention is being paid to agricultural policies as both the culprits through their perceived roles in reducing the relative prices of energy-dense foods, and as the potential saviors through their perceived ability to do the opposite. However, the effects of agricultural policies on human nutrition and obesity are not well understood. This paper addresses the nature and extent of effects of the main elements of U.S. agricultural policies (commodity price and income supports, import barriers, and public agricultural R&D) on human nutrition and obesity. We establish a conceptual framework that identifies the pathways through which agricultural policies can affect human nutrition outcomes. Using this framework we consider (1) trends in agricultural *commodity prices*, and the contributions of different agricultural policies to those trends, (2) the links between changes in farm *commodity* prices and changes in *food* prices, and the implications for the characteristics of foods consumed by different groups in society; and (3) the implications of price-induced changes in food characteristics for human nutrition outcomes. Preliminary results suggest that commodity-specific trade policy has clearly increased the domestic prices of several major food commodities (such as beef, dairy products, sugar, and orange juice) beyond what they would have been in the absence of trade policy, but the consumer prices for most of these foods have fallen nonetheless. Agricultural policies have surely affected relative prices of different foods, but the effects of the price changes on food consumption and nutrition are not clear. Agricultural research and development has led to dramatic decreases in costs of production and to consequent long-term declines in commodity prices, but the links between commodity price declines and food prices are less clear and are conditioned by the structure of food markets. Changes in relative prices of ‘healthy’ versus ‘unhealthy’ foods are difficult to establish empirically, but even if ‘healthy’ foods are becoming more expensive, food prices in general play only a small role in determining food consumption; policies aiming to reduce obesity through changes in relative food prices may prove ineffective or inefficient.

1 – Introduction

Obesity is rapidly increasing in the United States (see Figure 1) and the related health concerns are priority issues for the U.S. government (Kant 2000); health care costs associated with obesity are soaring (Frazao 1994, Mokdad et al. 2001, Flegal et al. 2002), and the negative implications for worker productivity may be large (Cawley 2004). Clearly, food consumption choices are primary determinants of obesity, in interaction with other lifestyle choices such as exercise, and genetic factors (Philipson et al. 2004).

Figure 1 – Obesity among Adults and Adolescents

Obesity has risen rapidly since the mid-1970s



Note: Data not available for adolescents in 1960-62.
Sources: K.M. Flegal, M.D. Carroll, C.L. Ogden, and C.L. Johnson "Prevalence and Trends in Obesity Among US Adults, 1999-2000," and C.L. Ogden, K.M. Flegal, M.D. Carroll, and C.L. Johnson, "Prevalence and Trends in Overweight Among US Children and Adolescents, 1999-2000," both in the *Journal of the American Medical Association*, Vol. 288, No. 14, October 9, 2002.

Policy Perspectives

The U.S. government has a stated objective of reducing rates of increase in obesity (USDHHS 2001). There are distributional issues as well. The incidence of obesity is higher among the poor, and higher among certain ethnic groups; higher among young women than young men (Drewnowski and Specter 2002, Zhang and Wang 2004). Of particular concern is the rising rate of obesity among children (Cavadini et al. 2000; Ogden et al. 2002). Entry points for policy

action to address obesity are few and the best choices are not clear. One option is public education programs (Welsh et al. 1992), and there is some evidence that these may have some effect (e.g., Alston, Chalfant, and James 1999; Nayga 2001) although possibly not enough.

Other options include regulatory or fiscal instruments that work to discourage “unhealthy” consumption choices and encourage “healthy” choices (Variyam 2005; Drewnowski et al. 2004; Fields 2004). For instance, there is speculation about banning certain types of advertising and taxing foods with high fat or high sugar content (Jacobson and Brownell 2000; Cash, Sunding and Zilberman 2004). Implicit in the discussions of tax policies, in particular, is a conception that changing the prices faced by consumers will appreciably affect their consumption choices in ways that will lead to healthier diets and lower rates of obesity. Moreover, it is increasingly common in the popular press to find authors declaring that highly productive and heavily subsidized domestic agriculture is an important underlying cause of obesity in the United States, and suggesting that reducing support to agriculture will (symmetrically) go a long way towards solving the problem (e.g., see Pollan 2003; Davis 2003; or Boehm 2003). The connections between such instruments and the desired outcomes are complex and hard to predict, and the costs to consumers, especially poor consumers, farmers and government associated with particular policy instruments are rarely explored. This paper addresses these issues with a view to better-informed policy both in the United States and abroad (Pinstrup-Andersen et al. 1976; Pinstrup-Andersen 1990; Martorell 2003).

Food Consumption and Obesity

The primary proximal cause of obesity is simple and not disputed: people consume more food energy than they use (Goldberg et al. 2004; Jen 2004). Getting fatter can be avoided by

eating less, expending more calories, or both. Both the nutritional story and the behavioral story involve complex dynamics, and many aspects of the relationships are not clearly understood. We can all speculate about contributing factors, and some are obvious, but the importance of the roles of different factors is less obvious; even less clear is the potential for policy action to affect these factors enough to achieve desired outcomes, and do so in cost-effective ways.

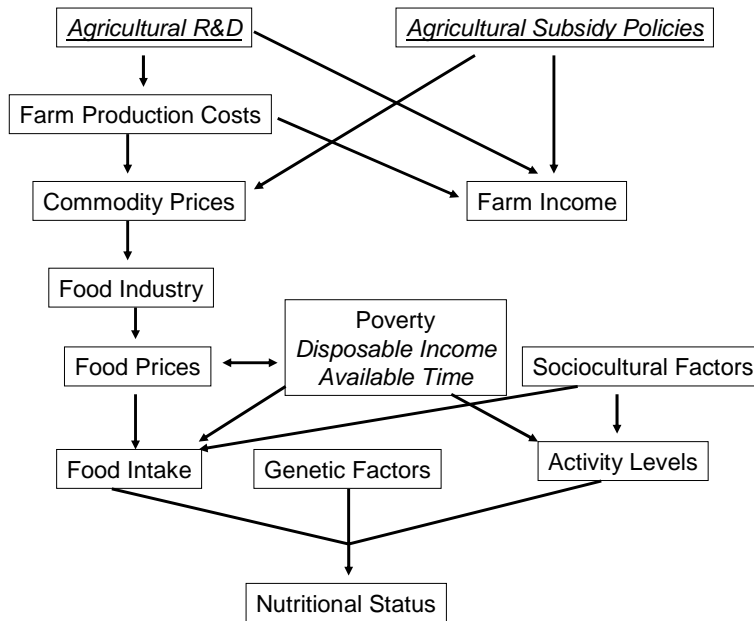
One hypothesis is that food consumption has been stimulated by growth in real incomes (partly because of lower food prices) and by falling prices of food (Smith 1999, Lakdawalla and Philipson 2002). A variant of this hypothesis is that certain types of more-fattening foods (fats, sugars, and carbohydrates) have become relatively cheaper, especially compared with the healthier foods such as fruits and vegetables, and this accounts in part for why consumers continue not to consume a more healthy diet (Drewnowski et al. 2004). It is easy to challenge this simple theory (e.g., Kuchler et al. 2004), but work remains to be done to quantify this aspect.

A key factor appears to have been the rising consumption of restaurant meals, and the high caloric content of those meals. The National Alliance for Nutrition and Activity (NANA 2002) argues that increasing portion size increases costs (and price) only modestly, but substantially increases calorie and fat content. Food companies are said to pursue a strategy of “value marketing” in which they compete for customers by offering them value for money, and to do this they increase portion sizes and bundle items together, which encourages overeating (NANA 2002). Agricultural policies may have contributed to the problem indirectly: by making agricultural commodities much cheaper as raw materials used as food ingredients, agricultural R&D has made it cheaper to increase portion sizes.

The Links between Agricultural Policy, Poverty, Food Consumption, and Obesity

Government policy affects food consumption and other consumer choices that affect dietary outcomes in myriad ways. For this analysis, we will focus on U.S. government agricultural policies that have their most immediate effects in the markets for farm commodities.

Figure 2 – The Links between Agricultural R&D, Subsidy Policies and Human Nutrition



Agricultural policy acts directly on the markets for agricultural commodities, but only indirectly on the market for food and thus on food consumption choices, and these choices do not completely explain nutritional outcomes (see Figure 2). Individual consumers are not typically the buyers of agricultural commodities. The demand for agricultural commodities is expressed by intermediaries, such as food processors, manufacturers, and retailers (increasingly including the food service sector) who take into account both consumer demands for foods and the cost of the raw materials, among other things. There is a complex linkage from consumers’ demand for retail food products—in terms of nutritional characteristics, taste, freshness, convenience, and cost—to

the demand for agricultural commodities and their characteristics in space, time, and form.

Agricultural policy interposes and to some extent modifies the transmission of these market signals and their consequences, but disposable income, available time and socio-cultural factors play pivotal roles in determining food intake and nutrition outcomes. This paper examines some of these interrelationships.

Section 2 begins with a description of the broad set of agricultural policies incorporated in the U.S. Farm Bill, and then narrows the focus to examine trends in the levels and types of support to agriculture provided by commodity support programs and agricultural R&D. Section 3 looks at trends in yields for commodities and groups of commodities, and in farm gate prices for these commodities and commodity groups. Section 4 examines trends in the prices paid by consumers for foods made from these commodities and investigates some divergences between commodity prices paid to farmers and consumer prices for foods containing these commodities. Section 5 reports key research findings, and suggests implications for research and policy.

2 – U.S. Agricultural Policy

Governments around the world intervene in almost every aspect of agricultural production and marketing, and many discussions of the effects of US agricultural policy on nutrition outcomes fail to understand or appreciate policy complexity or the difficulty of predicting the direction, timing or size of the effects of such multifaceted policy action (Extension Daily 2005). Moreover, government policy more generally (e.g., policies developed and implemented by the Environmental Protection Agency) can also greatly influence agriculture. We focus narrowly on agricultural policy.

The U.S. Farm Bill is the main federal mechanism for influencing agriculture. In 2004 USDA outlays in the federal budget totaled about \$113 billion (about 5 percent of total federal government

spending); about 25 percent of these outlays are discretionary and support the WIC program, rural development programs, research and education, soil and water conservation programs, forest management, and domestic and international marketing assistance. The bulk of these outlays (roughly 75 percent) support federally mandated programs to support nutrition assistance programs, commodity programs, export promotion programs and some conservation programs (USDA 2005). Table 1 sets out the estimated 2004 outlays by general budget categories, and their respective percentage contribution to total USDA outlays in that year.

Table 1 – USDA Outlays in 2004, by Major Spending Categories

USDA Program	Expenditure in 2004	Percent of Total
	<i>billions of dollars</i>	<i>percent</i>
Food, Nutrition, and Consumer Services	45.4	40.2
Farm Service Agency (mainly farm commodity programs)	27.4	24.3
Rural Development	15.5	13.7
Natural Resources and Environment	8.4	7.4
Foreign Agricultural Service	6.4	5.7
Risk Management (mainly crop insurance)	4.1	3.6
Research, Education and Economics (mainly ag. R&D)	2.5	2.2
Marketing and Regulatory Programs	1.8	1.6
Other	1.4	1.2
TOTAL	112.9	100.0

Source: <http://www.usda.gov/agency/obpa/Budget-Summary/2005/FYbudsum.pdf>

Of particular interest is spending on commodity programs and agricultural R&D, the two sets of agricultural policies selected for examination in this paper. Over time, total spending under

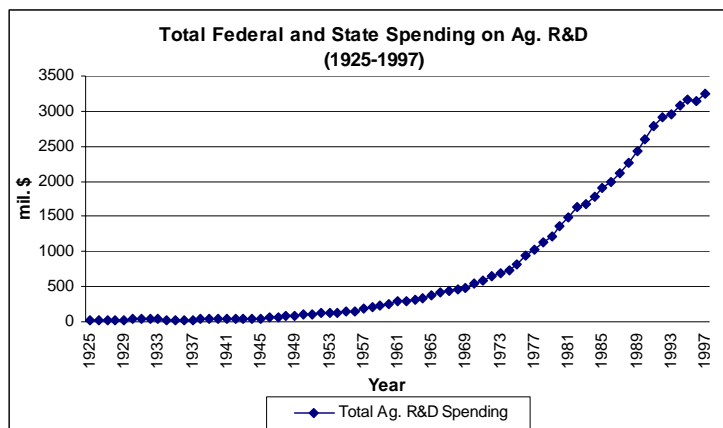
the various Farm Bills has generally trended up, with a shifting balance of spending among categories reflecting evolving public policy priorities. In particular there has been a secular trend to increase the share going to food and nutrition programs, and some elements of environmental programs. This shifting balance may have implications for the nutritional consequences of agricultural policies. It should also be remembered that many elements of agricultural policies that may have important implications for prices and consumption of food commodities—such as trade policies or regulatory programs—do not have major budget implications. Examples include the dairy and sugar program policies.

Farm subsidy policies implemented by the U.S. government include literally hundreds of specific provisions for particular commodities (Westcott et al. 2002; Sumner and Brunke 2003, Sumner 2003). These programs support farm incomes either through transfers from taxpayers, or at the expense of consumers, or both. Depending on the details, farm commodity programs might make agricultural commodities cheaper or more expensive, scarcer or more abundant. For example, every food product that contains white sugar and dairy products is more expensive as a result of farm programs (Babcock et al. 2002; Sumner and Balagtas 2002). Alternatively, farm programs may result in lower U.S. prices of some commodities, such as food grains or feed grains, and hence lower costs of producing breakfast cereal, bread or livestock products. And the effect of lower-priced feed grains may be different between poultry, hogs, and cattle, with implications for the relative prices of poultry meat, pork, and beef. Finally, the effects on consumption bundles may be different for different groups of consumers, especially the poor.

The effects of R&D expenditures are somewhat easier to predict, though the absolute size and timing of effects are challenging to estimate. Agricultural R&D contributes to reductions in costs of production and processing, and these cost reductions (*ceteris paribus*) reduce per unit

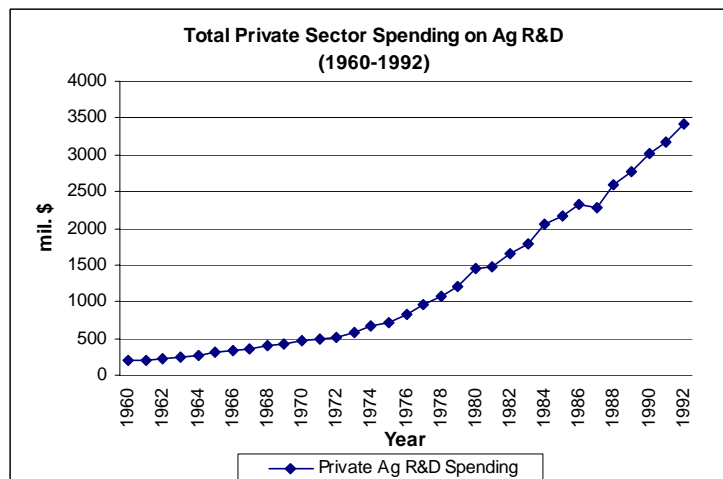
prices for agricultural products. The public sector in the United States has invested very substantially in agricultural R&D, especially in the second half of the 20th Century (Figure 3). If the returns to investments in agricultural R&D are sufficiently large, and if these returns can be captured by entrepreneurs, the private sector has incentives to invest in agricultural R&D. Since early 1990, in U.S. private sector spending has exceeded public sector spending on R&D.

Figure 3 – Federal and State Spending on Agricultural R&D



Source: Alston and Pardey (2005).

Figure 4 – Private Sector Spending on Agricultural R&D



Source: Alston and Pardey (2005).

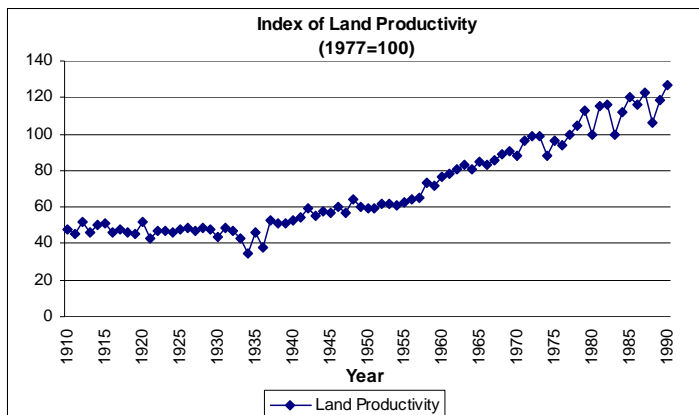
3 – Trends in Commodity Yields and Commodity Prices

Agricultural research policy implemented by the U.S. government has dramatically increased farm productivity and hence made agricultural commodities much cheaper and more abundant than they would have been otherwise (Alston et al. 1995; Alston and Pardey 1996; Alston et al. 2000; Johnson 2000; Pardey and Beintema 2001; Alston 2002).

Trends in Productivity

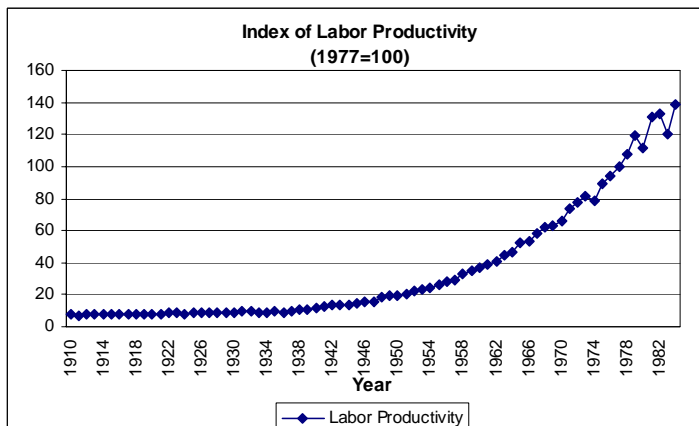
Figures 5 – 7 report the productivity of land and farm labor, and “total” factor productivity.

Figure 5 – Land Productivity in U.S. Agriculture



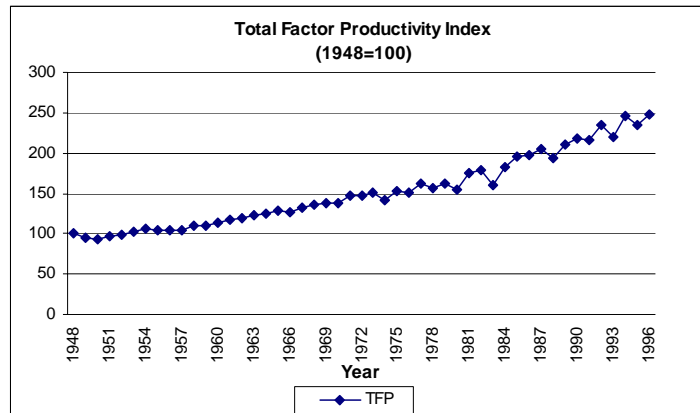
Source: Alston and Pardey (2005).

Figure 6 – Labor Productivity in U.S. Agriculture



Source: Alston and Pardey (2005).

Figure 7 – “Total” Factor Productivity in U.S. Agriculture



Source: Alston and Pardey (2005).

Clearly, overall productivity growth in agriculture since WWII has been dramatic and sustained, especially as regards farm labor, reflecting the dramatic increases in both public sector support for agricultural R&D, and private agricultural R&D investments during that time period. However, agricultural research has not affected all commodities equally. In particular, crop improvement and pest management research have allowed productivity for the main field crops to grow faster than productivity for most livestock and perennial crops.

Partial productivity measures tell much of this story. For example, Figure 8 depicts average national wheat yields for nearly 100 years. Post-WWII productivity growth has been substantial; variations around trends in yield growth are primarily attributable to weather. The same general trend is seen for corn (Figure 9). The case of soybean productivity growth is somewhat different from those of corn and wheat. As Figure 10 demonstrates, soybean yield growth has been essentially linear since the mid-1920s.

Figure 8 – U.S. Wheat Yields

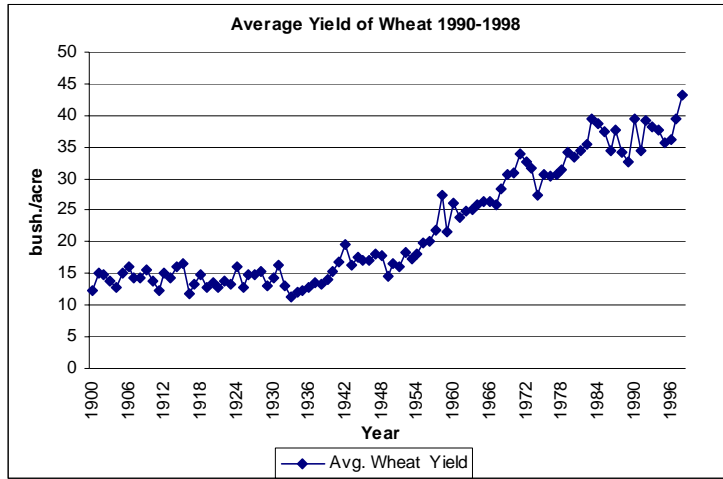


Figure 9 – U.S. Corn Yields

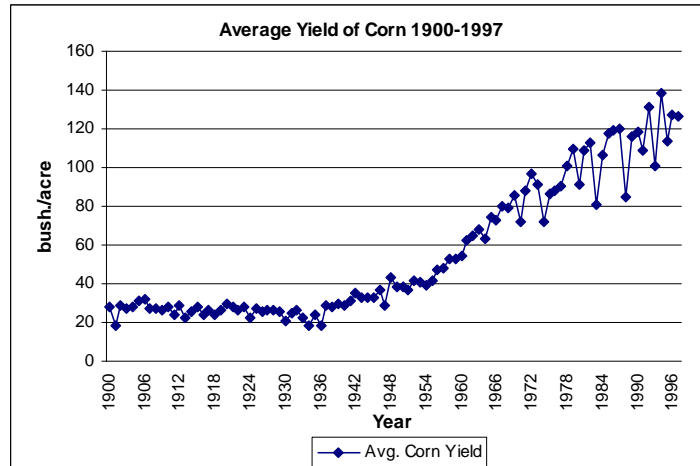
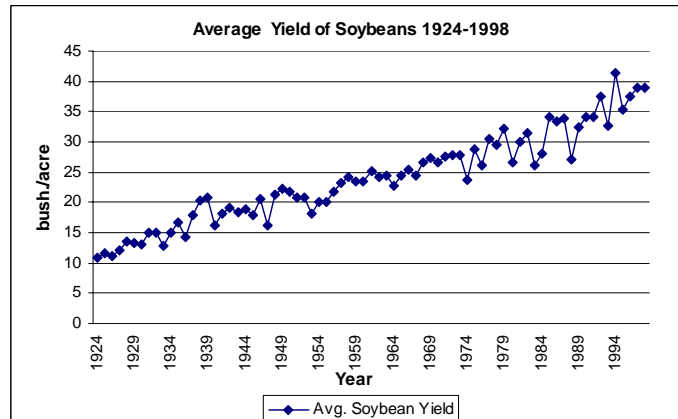


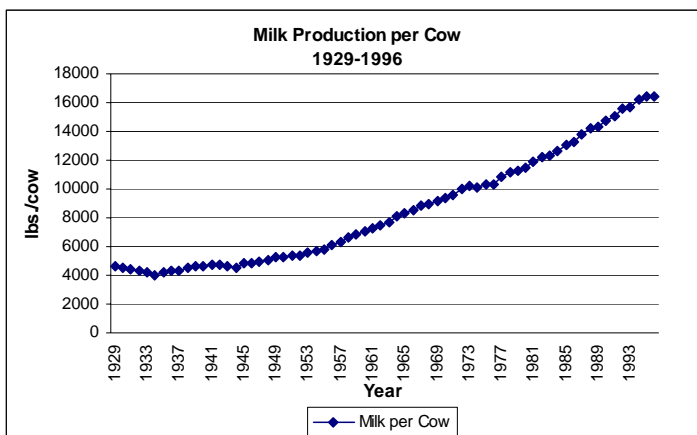
Figure 10 – U.S. Soybean Yields



Source: Alston and Pardey (2005).

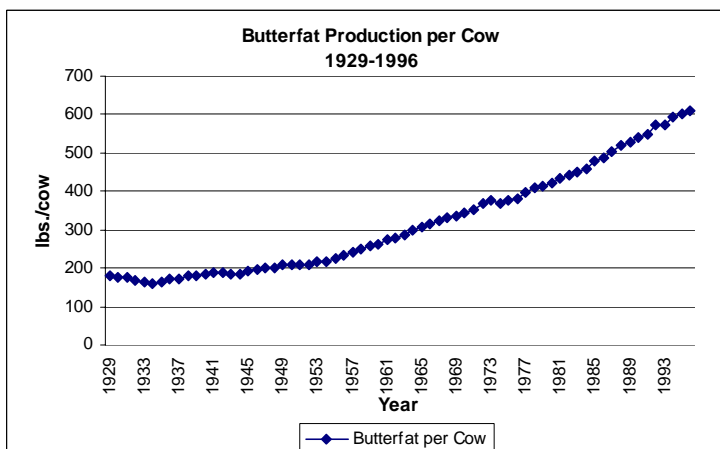
We do not have comparable partial productivity measures for most livestock products, and it is particularly difficult to define appropriate measures for meat animals. Productivity in the dairy sector can be measured in terms of annual output per cow of milk, as in Figure 11, or butterfat, as in Figure 12. Between 1950 and 1996, there was a nearly four-fold increase in milk output per lactating cow and a three-fold increase in butterfat per cow.

Figure 11 – U.S. Dairy Yields, Production per Lactating Cow



Source: Alston and Pardey (1995)

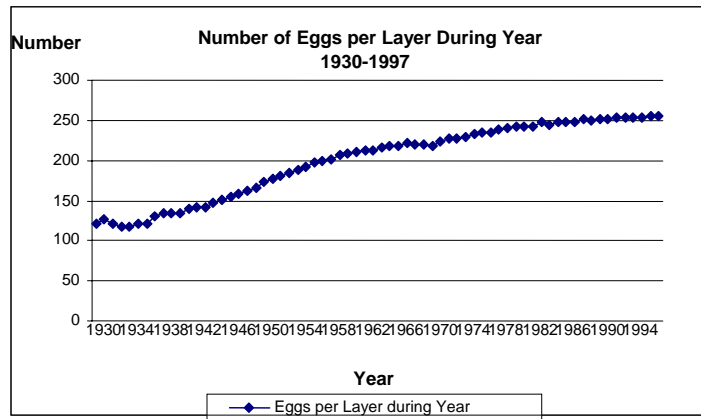
Figure 12 – U.S. Dairy Yields, Butterfat per Lactating Cow



Source: Alston and Pardey (1995)

Similarly, the egg industry enjoyed high rates of productivity growth, measured as eggs per layer per year from about the 1930s until the early 1980s, but very slow growth since then.

Figure 13 – U.S. Egg Industry Yields



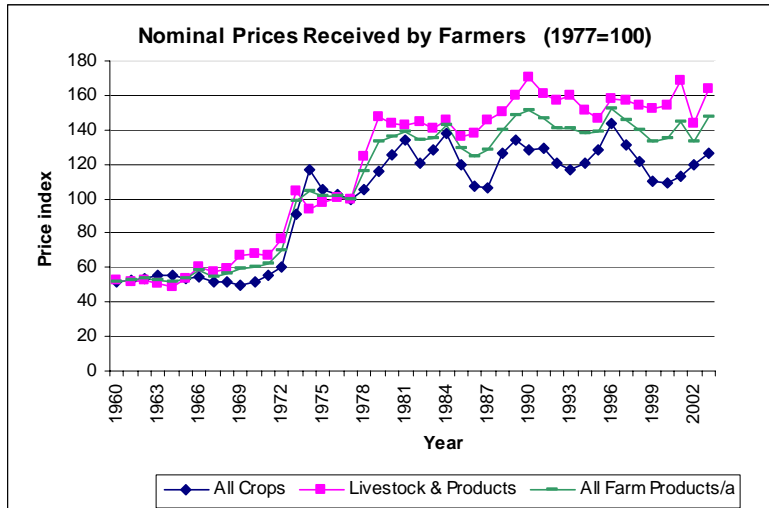
Source: Alston and Pardey (1995)

Commodity Price Trends

But what do these commodity-specific trends in productivity growth mean for commodity prices? Perhaps more important for examining the effects of agricultural policy on obesity, have the prices of commodities that have been the focus of federal programs behaved differently from those that have not? If so, what does a visual examination of price trends suggest the effects of these programs might have been on commodity prices for targeted commodities and perhaps for their food/feed substitutes?

We address this issue by first examining overall trends in prices received by farmers, and then proceed to examine groups of commodities and then specific commodities, some of which have been the focus of federal program support, while others have not. Figure 14 depicts nominal prices received by farmers for all farm products and for crops and livestock & products taken as separate categories. Following a period of relative stagnation in the 1960s, nominal prices rose from the early 1970s until about the early 1980s, after which prices have been stable on average, but have displayed increased inter-annual variations, especially for crops. So, except for the inflationary period of the 1970s, nominal prices received by farmers have been essentially “flat.”

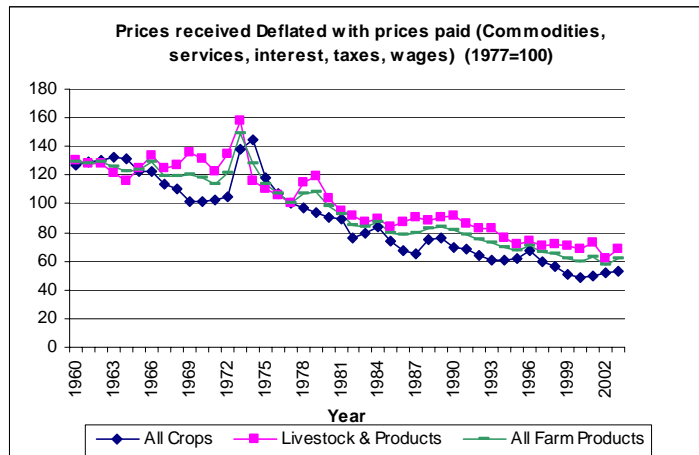
Figure 14 – Nominal Prices Received by Farmers



Source: Producer prices are USDA data taken from: <http://usda.mannlib.cornell.edu/reports/nassr/price/zap-bb>;
 Consumer Price Indexes are BLS estimates from <http://data.bls.gov/cgi-bin/surveymost?cu>
 Producer Price Indexes are BLS estimates from <http://data.bls.gov/cgi-bin/surveymost?wp>
 Consumer prices are BLS estimates from <http://data.bls.gov/PDO/outside.jsp?survey=ap>

Figure 15 – “Real” Prices Received by Farmers

(nominal prices deflated by an index of prices paid by farmers for inputs and services)



Source: USDA and BLS (see notes to Figure 14).

When one accounts for changes in the prices paid by farmers for inputs (e.g., wages, fuel costs, fertilizers, interest payments on farm debt, etc.) a different story emerges. Figure 15 depicts the trends in indexes of prices received for all crops, livestock and products, and all farm products,

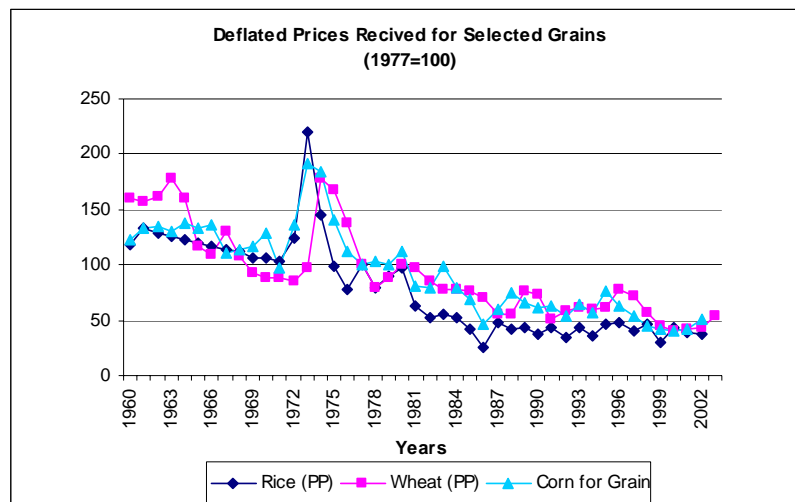
deflated by an index of prices paid by farmers for inputs and services. Beginning in the early 1970s the downward trend in real, or deflated, prices received is clear.

Examinations of more disaggregate data series helps identify additional trends. Grains can often substitute for one another in household consumption and especially in commercial food production, so productivity growth and supply shocks affecting one grain or production area will affect price trends of substitute grains.

Figure 16 depicts the general downward trend in farm gate prices for rice, wheat and grain corn. With the exception of the major, global shock to grain prices in the early-1970s, this trend is a continuation of the very long-term decline in prices. These reductions in prices are attributable to productivity increases, at least partly resulting from public sector expenditures on R&D (Alston and Pardey 1996).

Figure 16 – “Real” Prices Received by Farmers for Selected Grains

(nominal prices deflated by an index of prices paid by farmers for inputs and services)

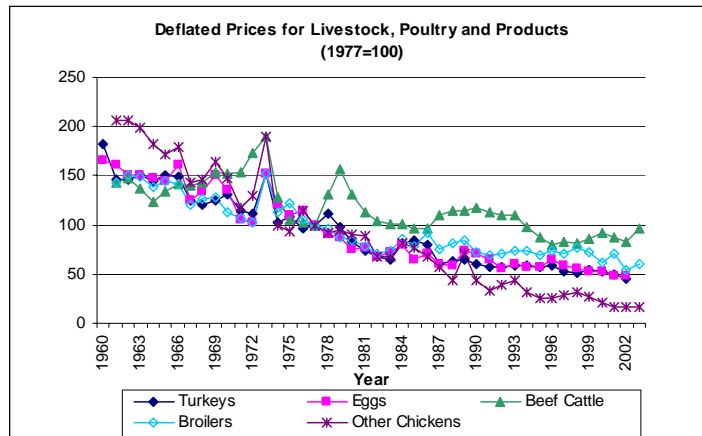


Source: USDA and BLS (see notes to Figure 14).

Examination of trends in farm gate prices for the livestock and poultry subsectors (Figure 19) tell a somewhat different story. While the trends for all subsectors have been negative since

the early-1980s, some commodities (e.g., broilers, other chickens and eggs) have experienced long-term declines dating back to the 1960s, and even earlier. Farm gate prices for beef cattle, on the other hand, have not declined as swiftly, and experienced several increases over the past 30 years or so.

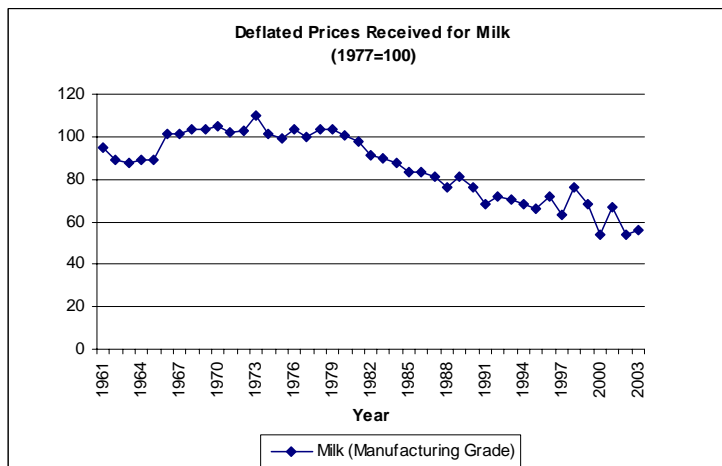
Figure 17 – “Real” Prices Received by Farmers for Livestock, Poultry and Related Products
(nominal prices deflated by an index of prices paid by farmers for inputs and services)



Source: USDA and BLS (see notes to Figure 14).

Figure 18 – “Real” Prices Received by Farmers for Fluid Milk

(nominal prices deflated by an index of prices paid by farmers for inputs and services)

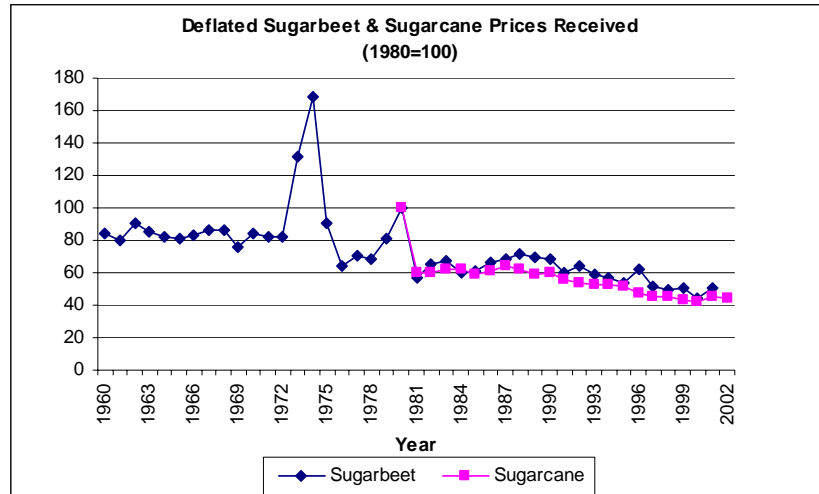


Source: USDA and BLS (see notes to Figure 14).

The dairy subsector has also experienced fairly consistent declines in farm gate prices, especially since the early-1980s. Figure 19 depicts trends in farm gate prices for sugar beets and

sugarcane. Dramatic upswings in the early-1970s and early-1980s (that were generated by severe supply shocks) aside, there has been a slow, steady decline in farm gate prices for two of the more-protected farm commodities in the United States.

Figure 19 – “Real” Prices Received by Farmers for Sugar Beets and Sugarcane
(nominal prices deflated by an index of prices paid by farmers for inputs and services)

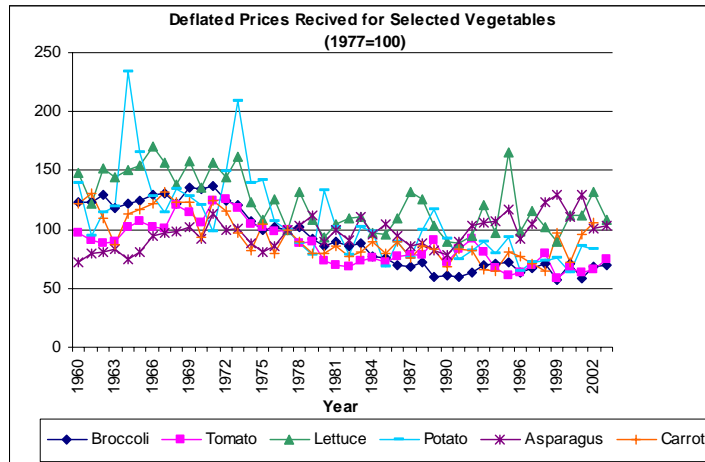


Source: USDA and BLS (see notes to Figure 14).

Let us now examine trends in farm gate prices for commodities that by and large enjoyed neither federal commodity support nor large public sector R&D programs. Of particular interest will be the commodities that occupy the lower tiers of the USDA food pyramid, the so called “healthy foods” such as fruits and vegetables. With the exception of lettuce and asparagus, deflated farm gate prices for selected vegetables have declined (see Figure 20). For example, tomato prices fell approximately 40 percent over the period to 2000. The same is roughly true for broccoli and potatoes. Those claiming that healthier food are increasingly expensive (e.g., Drewnowski et al.) cannot look to the farm gate as a source for such trends.

Figure 20 – “Real” Prices Received by Farmers for Selected Vegetables

(nominal prices deflated by an index of prices paid by farmers for inputs and services)

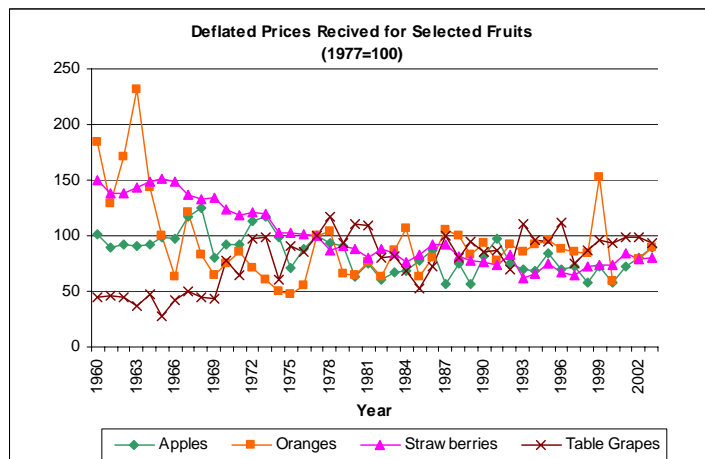


Source: USDA and BLS (see notes to Figure 14).

Trends in farm gate prices for fruits tell a different story. Figure 22 depicts prices received by farmers for selected fruits. There is a clear decline in prices received for strawberries, but a clear increase in prices received for table grapes. Prices for apples and oranges (the focus of federal support via trade policy) show no trend after about 1970.

Figure 21 – “Real” Prices Received by Farmers for Selected Fruits

(nominal prices deflated by an index of prices paid by farmers for inputs and services)



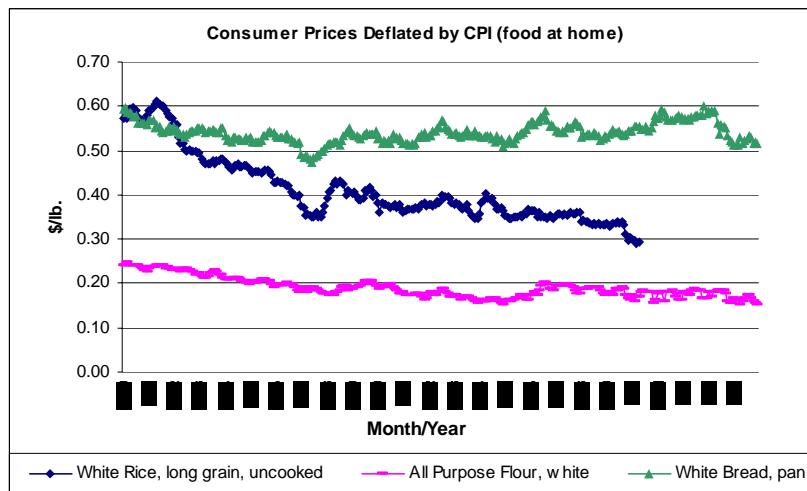
Source: USDA and BLS (see notes to Figure 14).

4 – Linking Commodity Prices to Food Prices

We now move from the farm gate to the supermarket check-out stand and examine trends in prices paid by consumers. The data series available for examining trends in prices paid by consumers for foods is shorter (running from about 1980 to the present) and foods do not always map easily into commodities for which farmers are paid, but nevertheless some interesting patterns emerge.

Figure 22 depicts average national prices paid by consumers (deflated by the CPI for foods consumed at home) for rice, wheat flour and white bread. Prices have declined for rice and for wheat flour; indeed, declines in wheat flour prices have kept pace with declines in farm gate wheat prices. However, despite the large declines in prices received by farmers for wheat (recall Figure 18), the real per-unit price of white bread has essentially not changed over the past 25 years.

Figure 22 – “Real” Prices Paid by Consumers White Rice, Wheat Flour and White Bread
(nominal prices deflated by the CPI for food-at-home)

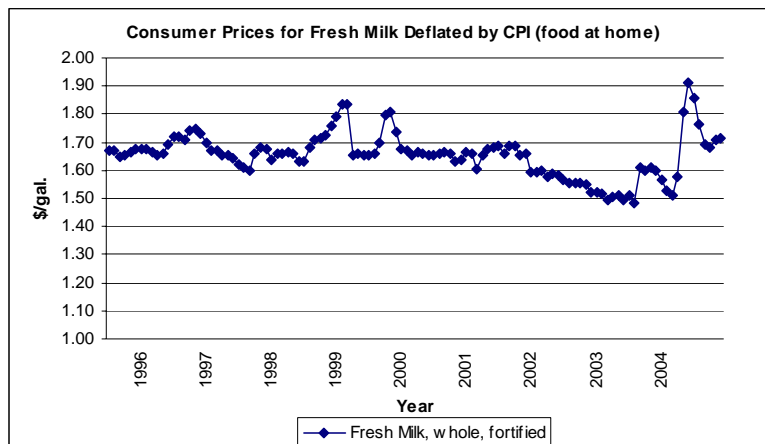


Source: USDA and BLS (see notes to Figure 14).

The picture for milk and dairy products is quite different. Despite dramatic increases in milk cow productivity (recall Figure 13), the average price of milk paid by consumers (Figure 23)

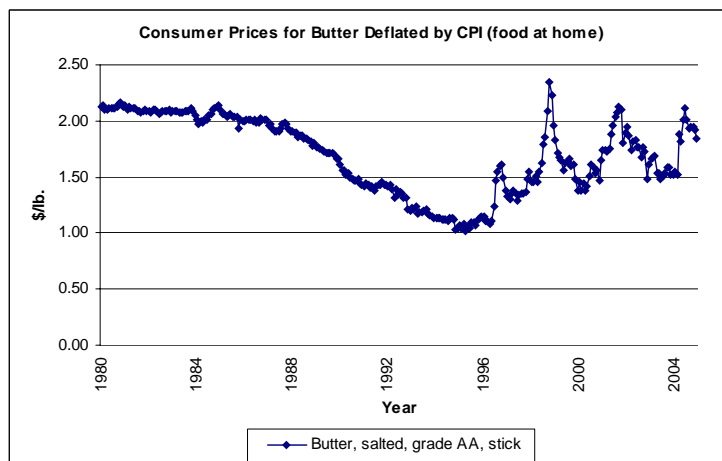
has relatively stable over the past decade or so. This ‘flat’ price trend is attributable to dairy price policy. The price paid by consumers for butter (the chief ingredient of which is butterfat, which enjoyed healthy productivity gains over the past several decades) declined over the 1980-95 period, but since then has risen on average, sometimes quite sharply (Figure 24).

Figure 23 – “Real” Prices Paid by Consumers for Milk
(nominal prices deflated by the CPI for food-at-home)



Source: USDA and BLS (see notes to Figure 14).

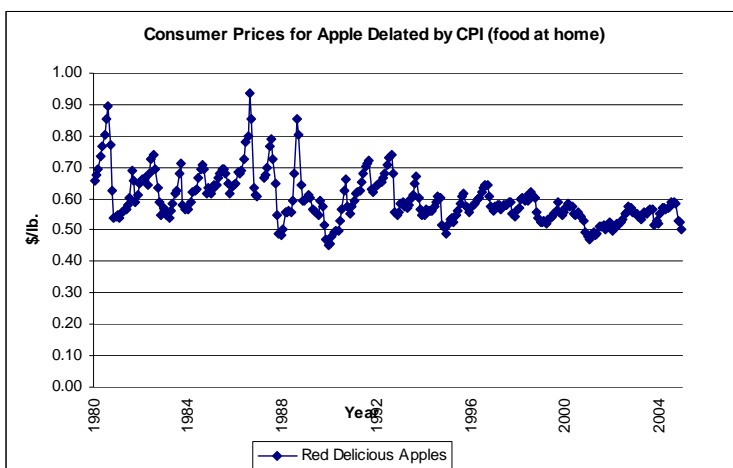
Figure 23 – “Real” Prices Paid by Consumers for Butter
(nominal prices deflated by the CPI for food-at-home)



Source: USDA and BLS (see notes to Figure 14).

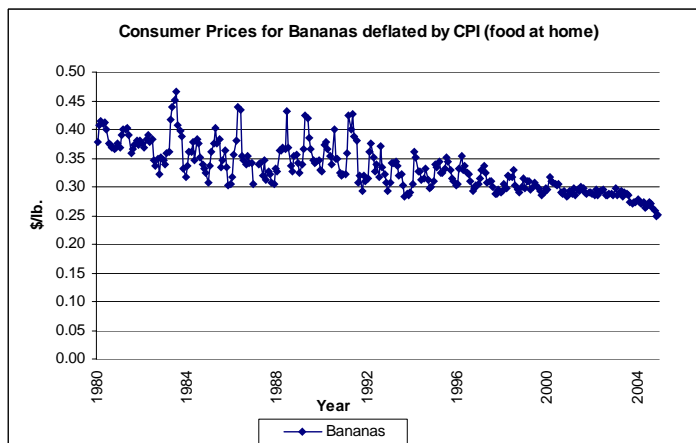
Figure 25 depicts the slow, steady decline in the average price of apples, and the substantial reduction in seasonal swings in apple prices over the past 25 years. This commodity, too, is becoming less expensive over time; apples in 1980 cost about \$.75 per pound, but only about \$.50 per pound in 2005. Similar patterns are evident for many other fruits and vegetables (e.g., bananas, Figure 26)

Figure 25 – “Real” Prices Paid by Consumers for Apples
(nominal prices deflated by the CPI for food-at-home)



Source: USDA and BLS (see notes to Figure 14).

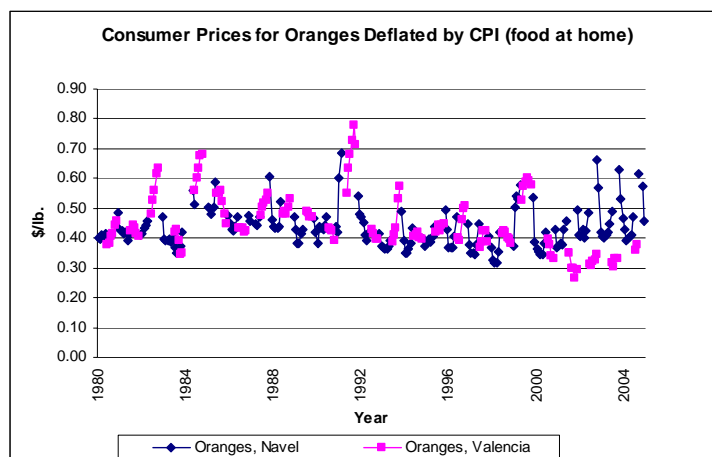
Figure 26 – “Real” Prices Paid by Consumers for Bananas
(nominal prices deflated by the CPI for food-at-home)



Source: USDA and BLS (see notes to Figure 14).

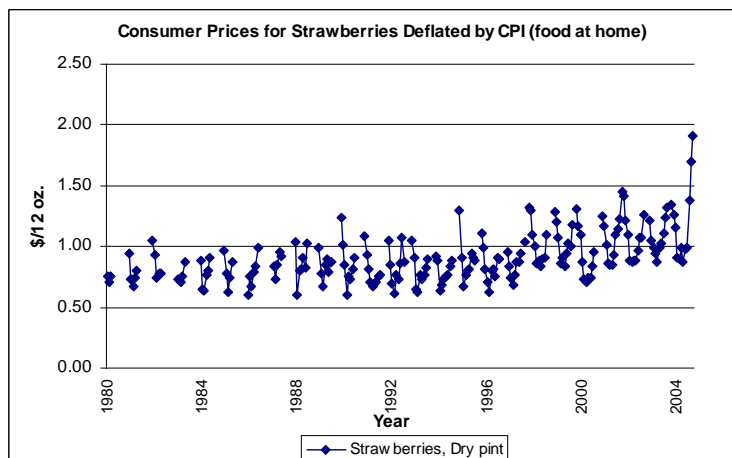
Prices paid by consumers on average for oranges (Figure 27) have been essentially unchanged since about 1980. Moreover, unlike many other fruits and vegetables examined here, seasonal and inter-annual fluctuations in prices have not seemed to decline over time. Trade policy restricts the importation of oranges and of orange juice, thereby reducing competition in the market for oranges generally.

Figure 27 – “Real” Prices Paid by Consumers for Valencia Oranges
(nominal prices deflated by the CPI for food-at-home)



Source: USDA and BLS (see notes to Figure 14).

Figure 28 – “Real” Prices Paid by Consumers for Strawberries
(nominal prices deflated by the CPI for food-at-home)



Source: USDA and BLS (see notes to Figure 14).

Several fruits and vegetables have, according to available data, increased in price on average over the past 25 years; for example, strawberries. Figure 30 depicts this trend, and the apparent increase in seasonal price volatility. But trends derived from market prices may not tell the whole story, especially for perishable fruits and vegetables that have short seasonal production cycles. Table 2 demonstrates this clearly for the case of strawberries. Until relatively recently strawberries were simply unavailable during most of the year; empty data cells are treated as ‘missing values’ in such cases, hence the increasing number of observations in Figure 30 as time goes on. Moreover, reported prices will occur only during seasons when strawberries are plentiful and prices are low. Estimated consumer prices for strawberries for years prior to about 2001 (the first year for which strawberries were available year-round) are therefore biased downward. Changes in production technology and varietal improvements have extended the national production season and international trade has now made strawberries available throughout the calendar year. Similar, though less dramatic, situations occur for table grapes and other fruits, hence, there will be a tendency for historical prices for these commodities to be understated.

Consumer prices for potatoes (Figure 29) have also remained relatively constant over the past several decades. Potatoes are generally not traded internationally; hence inter-year and seasonal fluctuations in prices persist. No federal commodity programs directly target potato production or potato producers. Despite the absence of a trend in average prices for potatoes, the price of potato chips (Figure 30) has tended to decline somewhat over time.

Table 2 – Nominal Strawberry Prices Paid by Consumers, by Month

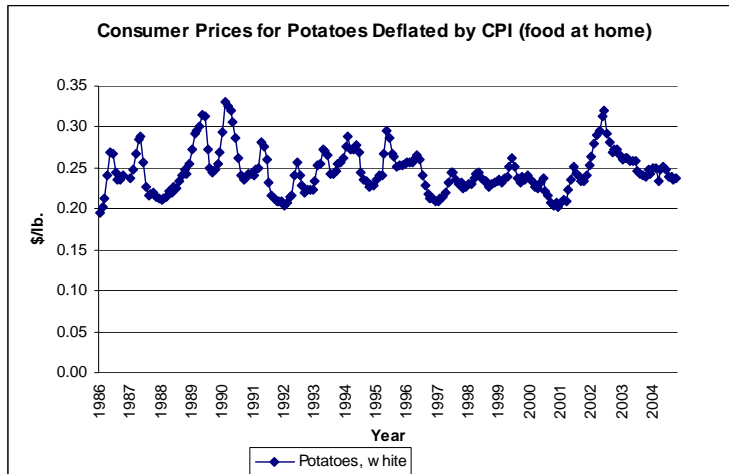
Item: Strawberries, dry pint, per 12 oz. (340.2 gm)

Year	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1980				0.653	0.608	0.66						
1981			0.886	0.69	0.637	0.696	0.77					
1982			1.016	0.914	0.73	0.778	0.775					
1983				0.728	0.708	0.752	0.863					
1984			0.912	0.663	0.648	0.78	0.827	0.943				
1985			1.016	0.809	0.646	0.774	0.913					
1986			0.637	0.797	0.718	0.84	0.899	1.081				
1987				0.937	0.824	0.955	1.071	1.029				
1988			1.181	0.693	0.919	0.937	1.059	0.971	1.216			
1989			1.218	0.966	0.831	1.055	1.117	0.986	1.087			
1990		1.638	1.338	1.109	0.781	0.987	0.965	1.081	1.21			
1991		1.467	1.268	1.112	0.976	0.924	0.948	0.961	1.014	1.035		
1992		1.43	1.173	0.96	0.831	1.048	0.988	1.185	1.473	1.19		
1993		1.467	1.26	0.908	0.874	1.066	1.013	1.069	1.151	1.261		
1994		1.318	1.262	0.91	0.983	1.047	1.085	1.108	1.209	1.286		
1995		1.926	1.34	1.001	1.14	1.18	1.209	1.398	1.355	1.316		
1996	1.692	1.505	1.236	1.082	0.957	1.226	1.247	1.164	1.42	1.409		
1997		1.514	1.317	1.179	1.073	1.213	1.383	1.375	1.488		1.654	
1998	2.135	2.08	1.751	1.613	1.386	1.413	1.346	1.454	1.469	1.779		
1999		2.102	1.96	1.751	1.419	1.49	1.375	1.557	1.679	1.664	1.948	
2000	2.167	1.935	1.825	1.45	1.218	1.187	1.246	1.263	1.416	1.619		
2001		2.14	2.01	1.737	1.482	1.465	1.486	1.628	1.916	1.996	2.137	2.526
2002	2.498	2.137	1.941	1.551	1.527	1.552	1.545	1.695	1.873	1.884	2.224	
2003		2.153	1.871	1.762	1.678	1.568	1.776	1.84	1.986	2.246	2.41	
2004	2.481	2.332	2.124	1.661	1.672	1.847	1.629	1.817	1.843	2.6	3.185	3.602

Source: USDA, BLS (see notes to Figure 14)

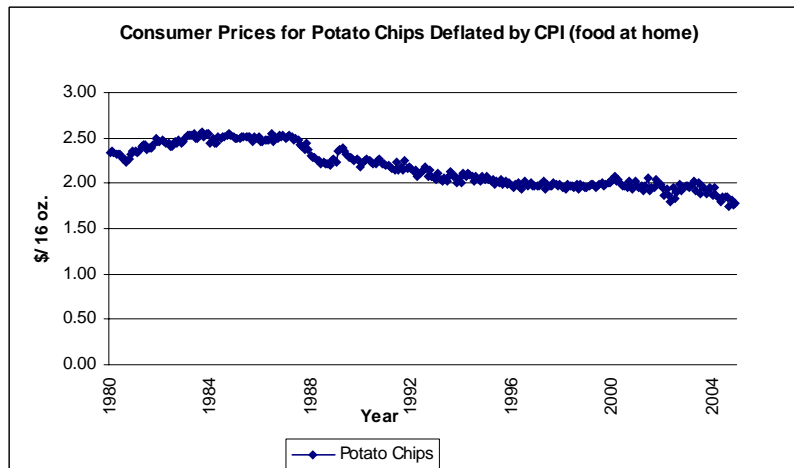
Note: Gaps in the table indicate prices were not available.

Figure 29 – “Real” Prices Paid by Consumers for Potatoes
 (nominal prices deflated by the CPI for food-at-home)



Source: USDA and BLS (see notes to Figure 14).

Figure 30 – “Real” Prices Paid by Consumers for Potato Chips
 (nominal prices deflated by the CPI for food-at-home)

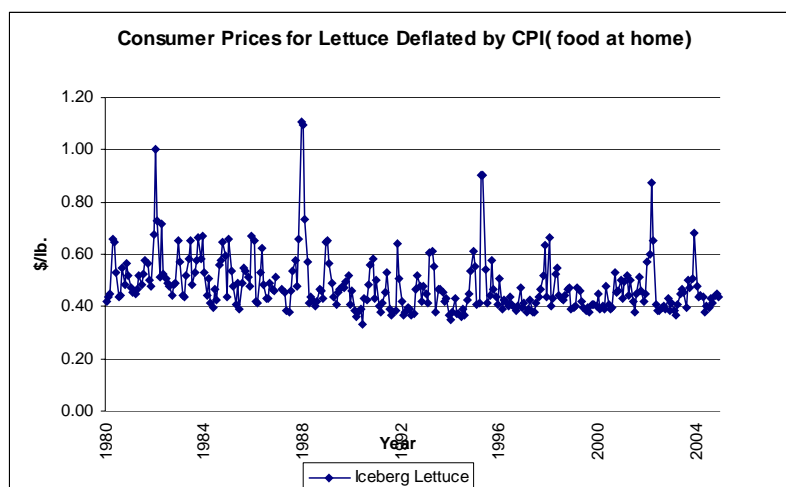


Source: USDA and BLS (see notes to Figure 14).

Price trends for iceberg lettuce (Figure 31) capture many of the salient characteristics of many fruits and vegetables that to date are not internationally traded, or if they are, trading is limited to a single international border, usually between the United States and Mexico. Over time consumers have experienced slow declines in the price of this perishable vegetable, and seasonal price spikes (associated with the month or two during the year in which lettuce supplies are very

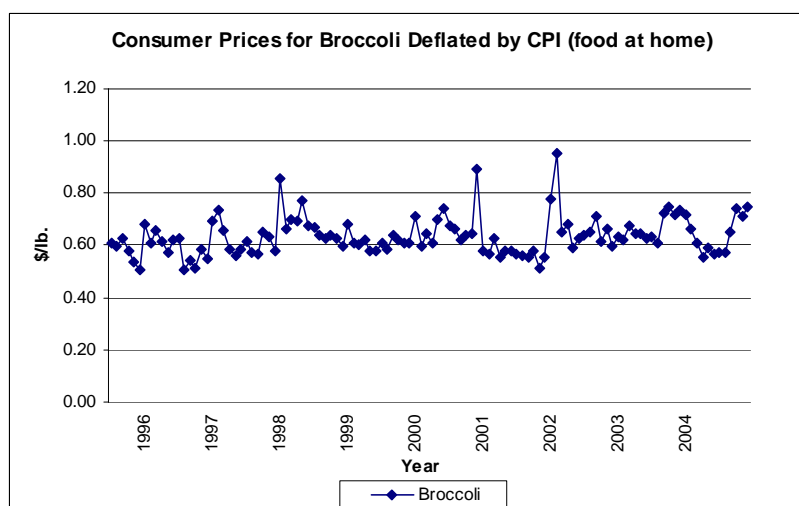
low) have been decreasing over time as seasonal niche production areas in the southwestern US and in Mexico have been identified. The price of broccoli (Figure 32) follows essentially the same pattern; essentially no trend in average prices paid, with some reductions in price variability, especially over the past several years as trade with Mexico has increased.

Figure 31 – “Real” Prices Paid by Consumers for Iceberg Lettuce
(nominal prices deflated by the CPI for food-at-home)



Source: USDA and BLS (see notes to Figure 14).

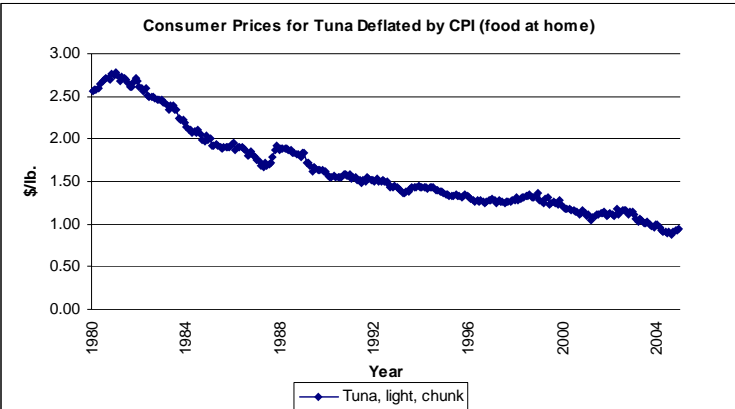
32 – “Real” Prices Paid by Consumers for Broccoli
(nominal prices deflated by the CPI for food-at-home)



Source: USDA and BLS (see notes to Figure 14).

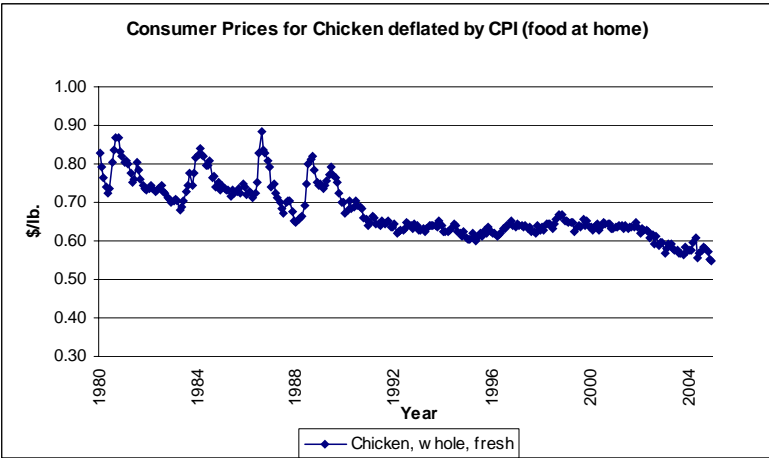
Average prices of meats and some fish have generally followed a common trend of decreasing prices and lower price variability over time. Figure 33 depicts the case of canned tuna. Figure 34 reports prices for whole, fresh chickens, and Figure 35 depicts the case of ground beef. The lone exception to this general decline in the price of meats is bacon (Figure 36) which displays no trend over the past 25 years, but which does display some reduction in price variability.

Figure 33 – “Real” Prices Paid by Consumers for Canned Tuna
 (nominal prices deflated by the CPI for food-at-home)



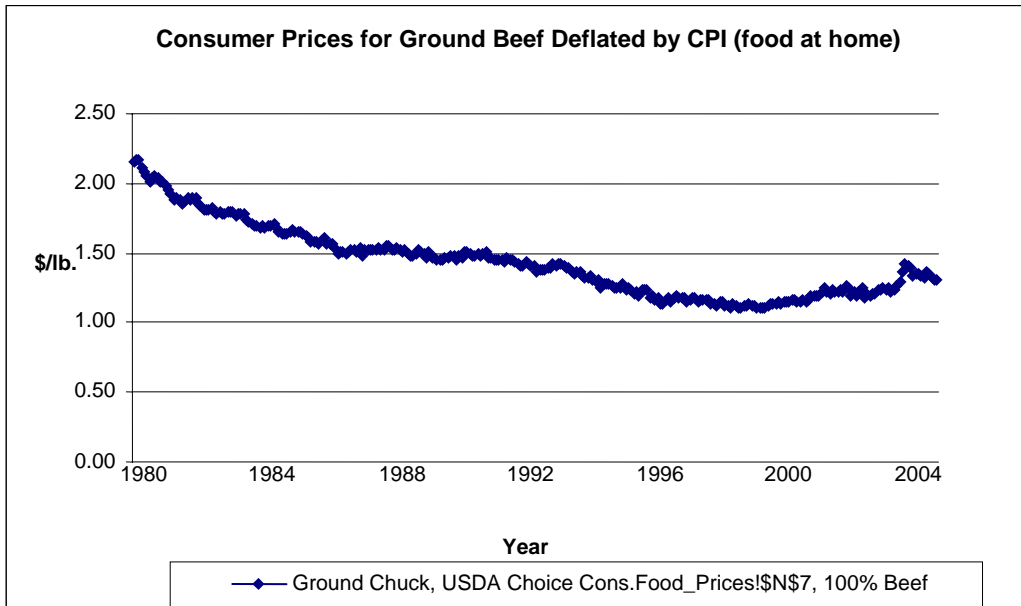
Source: USDA and BLS (see notes to Figure 14).

Figure 34 – “Real” Prices Paid by Consumers for Chicken
 (nominal prices deflated by the CPI for food-at-home)



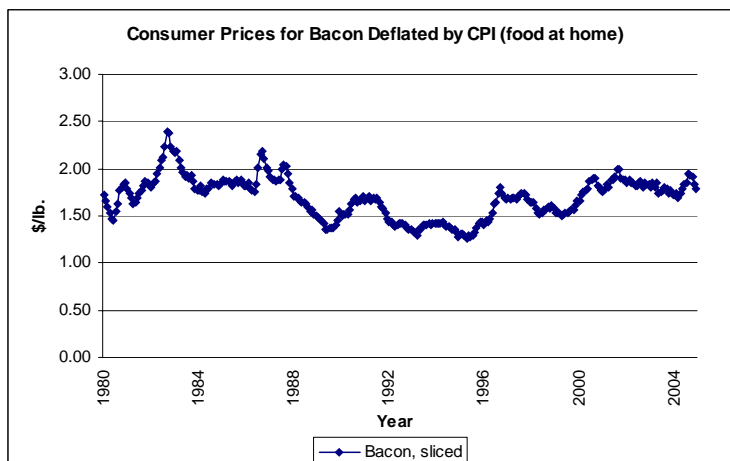
Source: USDA and BLS (see notes to Figure 14).

Figure 35 – “Real” Prices Paid by Consumers for Ground Beef
 (nominal prices deflated by the CPI for food-at-home)



Source: USDA and BLS (see notes to Figure 14).

Figure 36 – “Real” Prices Paid by Consumers for Bacon
 (nominal prices deflated by the CPI for food-at-home)

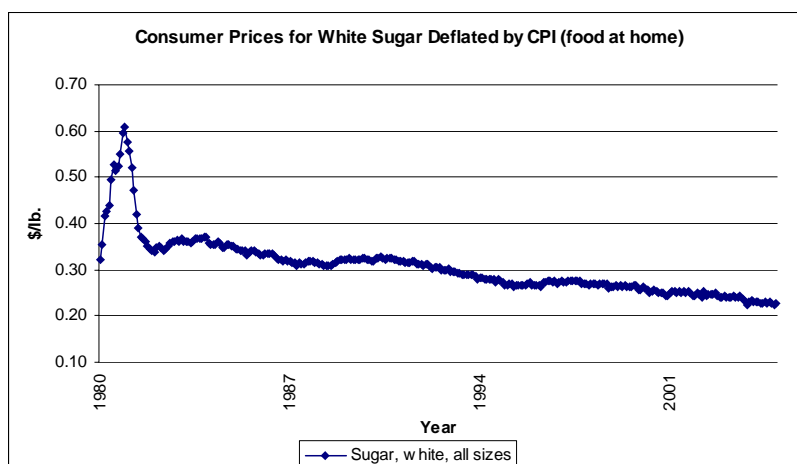


Source: USDA and BLS (see notes to Figure 14).

The final food to be examined in this section is white sugar (Figure 37). Despite enormous federal support for the commodities used to make this food (sugar beets and sugarcane) implemented in particular through and restrictions on sugar imports, consumers have paid less and

less per pound for sugar over the past 25 years. One could argue that the price of sugar would have fallen much more and more quickly in the absence of federal support programs. This is surely true. What is not true, however, is that sugar has become more expensive to consumers over time.

Figure 37 – “Real” Prices Paid by Consumers for White Sugar
(nominal prices deflated by the CPI for food-at-home)



Source: USDA and BLS (see notes to Figure 14).

Other Factors that Influence the Cost of Meals and Consumption Choices

Analysis to this point has focused on foods that can be consumed in the home, and generally are. But dietary outcomes have been driven in part by available time and broader changes in society. Food consumption patterns have changed in the context of a complex of changes in technology (microwaves, home freezers), household structure (single-parent households, few non-working spouses), and tastes, which together have promoted a shift in consumption to more food away from home and more consumption in the home of pre-prepared meals (see Chalfant and Alston 1988; Senauer et al. 1991; Allhouse et al. 2002; Lakdawalla and Philipson 2002; Mancino et al. 2004; Variyam 2004).

Rising real income, smaller households, and a rising opportunity cost of time together imply an increased demand for more services, including convenience associated with food. The nutritional characteristics of meals (including nutrient content and portion size) in the fast food industry may be systematically different than for meals prepared at home. Incomes have played a role here but it is a complicated one. Changes in agricultural commodity prices are involved as well, through their influence on food manufacturers' least-cost combinations of inputs and other economizing choices they make. To begin to understand the potential role of commodity prices in changes in prices of processed foods, we need to examine the relative contributions of commodities, semi-processed food and other factors to finished products, including energy costs, wages, employee benefits and overhead. Clearly, the role of commodities in determining costs has decreased since the 1950s, and the relative importance of wages, benefits and insurance have all increased.

5 – Conclusion and Implications

Rates of obesity among adults and children in the United States are soaring, with potentially huge implications for health care costs and worker productivity. Increasing attention is being paid to agricultural policies as both the culprits through their perceived roles in reducing the relative prices of energy-dense foods, and as the potential saviors through their perceived ability to do the opposite. However, the effects of agricultural policies on human nutrition and obesity are not well understood. This paper examined trends in agricultural policies, agricultural productivity, commodity prices and food prices in order to assess the nature and extent of effects of the main elements of U.S. agricultural policies (commodity price and income supports, import barriers, and public agricultural R&D) on human nutrition and obesity.

Federal agricultural policy, as articulated in the U.S. Farm Bill, is a complex set of policies that affect production costs, production, commodity prices and farm incomes in very different ways. Commodity-specific trade policy has clearly led to higher consumer prices of several major food commodities (such as beef, dairy products, sugar, and orange juice) than would have been the case without such policies, but consumer prices for virtually all of these foods have nonetheless fallen.

Agricultural R&D has led to dramatic decreases in production costs and to consequent long-term declines in commodity prices. The speed of decline has been different for different commodities, reflecting the non-uniform focus of R&D expenditures and impacts over time. Those who are concerned about obesity—an apparent excess of nutrition—might conclude that agricultural research is counterproductive and that the federal government should fund less of it as a way of achieving its national health objectives. This conclusion is probably false. The primary consumer benefit from a lower price of food is to free up funds that would have been spent on food and make them available for other purposes; only a small fraction of those funds is likely to be spent on additional food consumption per se. This argument applies for the general lowering of the cost of food as a result of research; more dramatic impacts may follow from changes in the relative prices of different foods (such as poultry versus beef).

The links between commodity price declines and food prices are not easy to discern. For example, a falling price for wheat was one likely cause of declines in the price of wheat flour, but real consumer prices for white bread made from wheat flour have not changed for over twenty years. Moreover, the contribution of commodity costs to total prepared food costs has fallen dramatically over the past several decades, thereby limiting the effects of commodity price changes (in either direction) on food prices.

Changes in relative prices of “healthy” versus “unhealthy” foods follow no easily identifiable patterns, and available data likely mask important contributions of agricultural R&D and trade to product availability (and hence price) and quality. But regardless, these differences in relative prices likely play only a small role in determining food consumption.

Low-cost agricultural commodities are not the primary cause of overeating. Moreover, a general policy called for by some authors of making agricultural commodities more expensive (through reducing agricultural research, say) might not be very effective at reversing the shift towards large portions of high calorie meals because of the low elasticity of the cost of meals with respect to agricultural commodity prices. Moreover, in view of the compelling evidence of a very high rate of return to agricultural research, reducing agricultural R&D would seem to be a very high-cost way of pursuing the objective of reducing obesity.

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