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*Are Agricultural Policies Making Us Fat? Likely Links between Agricultural Policies and Human Nutrition and Obesity, and Their Policy Implications**

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Obesity has increased rapidly in the United States (see figure 1) and the related health concerns are priority issues for the U.S. government. Obesity is expensive. Health-care costs associated with obesity have soared (e.g., Flegal et al.) and obseity may also have large negative implications for worker productivity. The high and rising rate of obesity among children is of particular concern (Ogden et al.).

The U.S. government has a stated objective of reducing obesity. One option is to implement public education programs, and there is some evidence that these may have some effect (e.g., Nayga). Other options include regulatory or fiscal instruments that work to discourage "unhealthy" consumption choices and encourage "healthy" ones (Drewnowski, Darmon, and Briend; Fields). For instance, there is speculation about banning certain types of advertising and taxing foods with high fat or high sugar content (Jacobson and Brownell).

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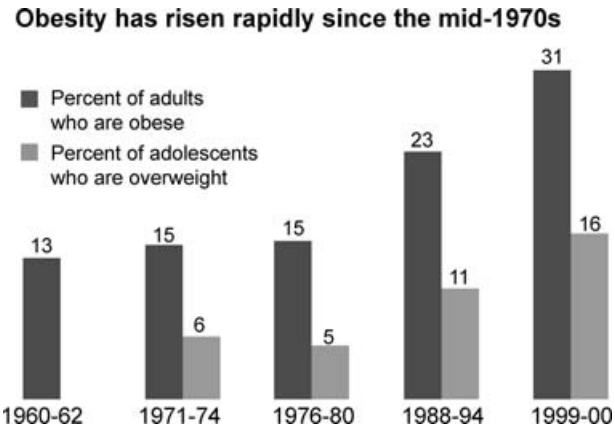
Figure 1. Obesity among adults and adolescents



Note: Data not available for adolescents in 1960–62.

Source: 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 Over weight Among US Children and Adolescents, 1999–2000," both in the *Journal of the American Medical Association*, Vol. 288, No. 14, October 9, 2002.

One common idea is that subsidized domestic agriculture is an important contributor to obesity in the United States, and that reducing support to agriculture will (symmetrically) go a long way toward solving the problem (e.g., see Pollan). This paper addresses the likely effects of agricultural subsidies on obesity both in the United States and abroad. In particular, we investigate the effects of commodity subsidy programs and government support for research and development of productivity-enhancing technologies.

Food Consumption and Obesity

The primary proximal cause of obesity is simple and not disputed: people consume more food energy than they use. Of course, both the nutritional story and the behavioral story involve complex dynamics, and many aspects of the relationships are not clearly understood. But the bottom line is that obesity relates to food consumption, particularly of certain types of foods. The quantities demanded of these foods depend on food preferences, relative prices, and incomes. In high-income countries like the United States, any important effects of changes in the agricultural sector on food consumption patterns will be through the effects on commodity characteristics and prices rather than through any direct effects on incomes. In particular, agricultural commodity policies may have contributed to lower relative prices of fattening foods and, by making agricultural commodities much cheaper as raw materials used as food ingredients, agricultural research and development (R&D) has made it less expensive to increase portion sizes.

Agricultural policy acts directly on the markets for farm commodities, but only indirectly on the market for food and thus on food consumption choices. Individual consumers typically are not buyers of agricultural commodities. The

demand for agricultural commodities is expressed by market intermediaries who take into account both consumer demands for foods and the cost of farm commodities as raw materials, among other things. Agricultural policy interposes and to some extent modifies the transmission of these market signals and their consequences, but other factors play pivotal roles in determining food intake and nutrition outcomes (Philipson et al.).

U.S. Agricultural Policy and Agricultural Productivity

In 2004, U.S. Department of Agriculture (USDA) outlays totaled about $113 billion (about 5% of total federal government spending). The biggest share is for food programs including food stamps, the Women, Infants and Children (WIC) Program and school lunch subsidies (U.S. Department of Agriculture). There has been a secular trend to increase the share going to food and nutrition programs (about $45 billion or 40% of the total in 2004) and some elements of environmental programs. Our focus is on commodity programs (including crop insurance and other risk management programs), which accounted for about $32 billion or 28% of the total USDA expenditures in 2004, and agricultural R&D, which accounted for about $2.5 billion or 2.2% of the total in 2004. We also note that important elements of agricultural policies that have significant implications for food commodity prices and consumption do *not* have major budget implications. These include trade policies or regulatory programs, such as the dairy and sugar programs.

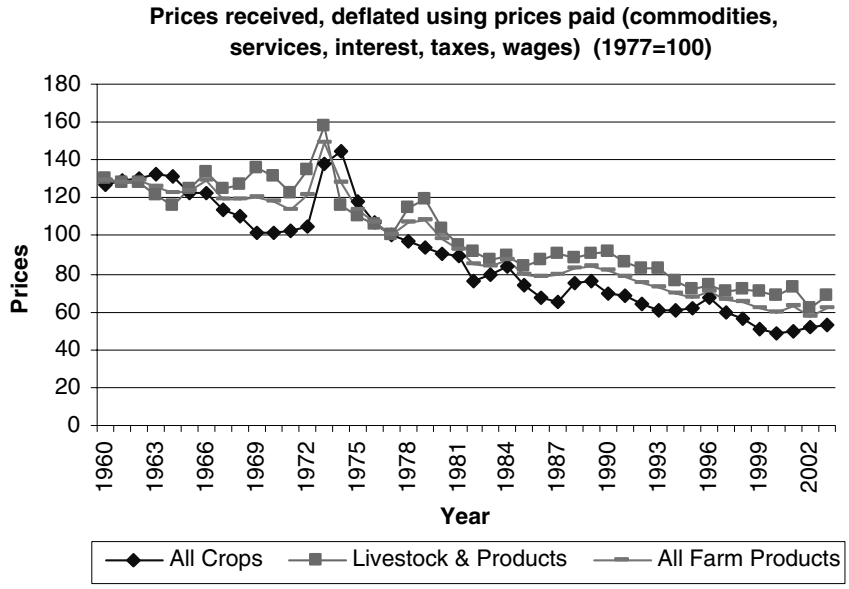
U.S. farm subsidy policies include hundreds of specific provisions for particular commodities. These programs support farm incomes either through transfers from taxpayers, or at the expense of consumers, or both. Farm commodity programs might make agricultural commodities cheaper or more expensive. For example, every food product that contains sugar or dairy products is more expensive as a result of programs for these commodities. Alternatively, farm programs may result in lower U.S. prices of some commodities, such as food grains or feed grains, and consequently lower costs of producing breakfast cereal, bread, or livestock products. The effect of lower-priced feed grains may differ between poultry, hogs, and cattle, with implications for the relative prices of poultry meat, pork, and beef.

The general effects of R&D expenditures are easier to predict, though the absolute size and timing of effects are challenging to estimate. Agricultural R&D contributes to lower production and processing costs, reducing per unit prices for agricultural products (*ceteris paribus*). Both the public sector and the private sector in the United States have invested very substantially in agricultural R&D (Alston and Pardey; Pardey and Beintema). These outlays have dramatically increased farm productivity and consequently made agricultural commodities much cheaper and more abundant than they would have been otherwise (Johnson). They have also changed the relative prices among commodities.

Trends in Commodity Prices

What do commodity-specific trends in productivity growth along with other drivers mean for commodity prices? Figure 2 depicts real prices received by farmers (nominal farm gate prices deflated by an index of prices paid by farmers

Figure 2. Real prices received by farmers



Source: Prices received are USDA indexes taken from: http://usda.mannlib.cornell.edu/reports/nassr/price/zap-bb; prices paid are BLS indexes from http://data.bls.gov/cgi-bin/surveymost?wp

for inputs and services) for (a) all farm products, (b) crops, and (c) livestock & products. Beginning in the early 1970s, the downward trend is clear. Real farm gate prices for grains, poultry, and eggs show similar general downward trends. 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. Improvements in dairy productivity and expansion in farm size reduced unit costs of production for milk, and reductions in dairy support prices allowed fairly consistent declines in farm gate prices, especially since the early 1980s. Real farm gate prices for sugar beets and sugarcane have also registered steady declines partly because nominal price supports have been constant.

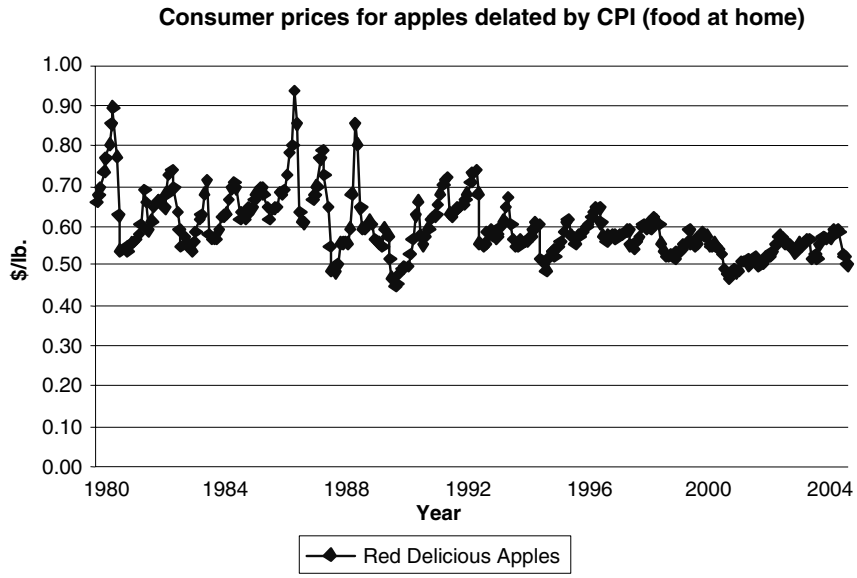
The picture is also mixed for commodities that largely had neither federal commodity support nor large public sector R&D programs. The commodities that occupy the "wedges" of the new USDA food pyramid normally associated with so called "healthy foods," such as fruits and vegetables, are of particular interest. Deflated farm gate prices for selected vegetables have declined, with the exception of lettuce and asparagus. For example, tomato prices fell approximately 40% from 1970 to 2000. The same is roughly true for broccoli and potatoes. Trends in farm gate prices for fruits tell a mixed story. For instance, there was a clear decline in prices received for apples during 1960–80, but an increase in prices received for table grapes. Prices of oranges (supported by the U.S. government using trade policy) show no trend after about 1970. Those claiming that healthier foods are increasingly expensive (e.g., Drewnowski, Darmon, and Briend) cannot look to the farm gate as the source.

Linking Commodity Prices to Food Prices

Examining average national prices paid by consumers (deflated by the CPI for foods consumed at home) reveals some telling patterns. These prices are affected by commodity prices, behavior of market intermediaries, changes in services associated with food, and other quality characteristics. While farm product prices have generally trended down, mainly reflecting the influence of technological change, the corresponding food prices fell faster or slower than farm prices, or not at all. In most cases, consumer food prices have not fallen in step with the corresponding commodity prices. Real prices for wheat flour, for example, have declined in line with farm gate prices for wheat. However, the real per-unit price of white bread has not changed over the past 25 years, with other factors offsetting the impact of lower prices of the primary ingredient. Consumer prices for raw potatoes have also remained relatively constant over the past several decades while the price of potato chips has declined.

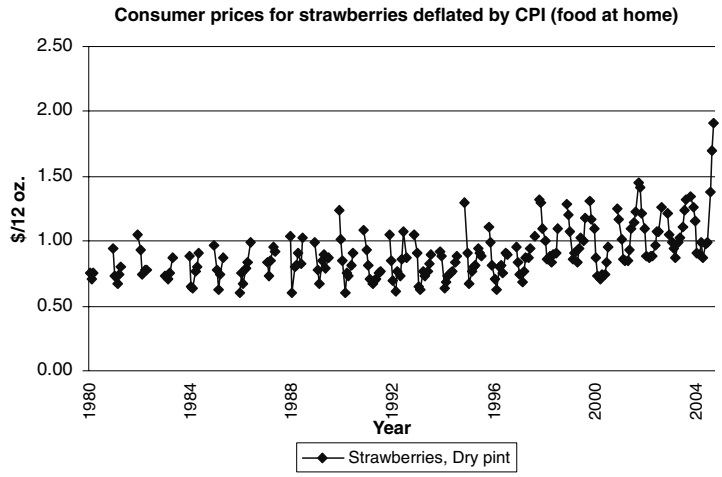
Specific price patterns have varied, reflecting various factors at work, but farm commodity prices have generally declined in real terms and faster than the corresponding consumer food prices. Average prices for red delicious apples exemplify patterns that are evident for many other fruits and vegetables; they have fallen steadily over the past 25 years, with a substantial reduction in seasonal swings in prices (figure 3). Average prices of meats and some fish have also followed the trend of decreasing prices and lower price variability. Even white sugar, one of the most protected commodities in the United States, has become cheaper in real terms because the support price has been fixed in nominal terms for many years.

Figure 3. Real prices paid by consumers for red delicious apples



Source: Consumer price indexes are BLS estimates from http://data.bls.gov/cgi-bin/surveymost?cu; consumer prices are BLS estimates from http://data.bls.gov/PDQ/outside.jsp?survey=ap

Figure 4. Real prices paid by consumers for strawberries



Source: Consumer price indexes are BLS estimates from http://data.bls.gov/cgi-bin/surveymost?cu; consumer prices are BLS estimates from http://data.bls.gov/PDQ/outside.jsp?survey=ap

In some cases average consumer prices for several fruits and vegetables seem to have increased over the past 25 years, but average prices can be misleading if the availability or quality of the product has changed over time. Figure 4 depicts the prices for strawberries, showing higher average prices and an apparent increase in seasonal price volatility. But trends derived from reported market prices do not tell the whole story, especially for perishable fruits and vegetables that in the past have had short seasonal production cycles. For example, until relatively recently, strawberries were unavailable during most of the year. Changes in production technology and varietal improvements have extended the national production season. With these changes and international trade, strawberries are now available throughout the calendar year. Similar, though less dramatic, stories apply for table grapes and other fruits. In these cases, trends in average prices reflect both a generally declining price for products of a given quality and a change in the product mix (in terms of seasonal availability or varieties) that entails an increase in average "quality."

Other cases may also entail hidden quality improvements (or the converse) and the provision of different services associated with products (such as enhanced packaging or further processing). Price trends for iceberg lettuce capture many of the salient characteristics of many fruits and vegetables that have not been internationally traded much. Over time, consumers have experienced slow declines in iceberg lettuce prices, and seasonal price spikes (in the month or two when lettuce supplies are very low) have been decreasing over time as seasonal niche production areas have been identified.

Other Factors That Influence the Cost of Meals and Consumption Choices

We have mainly discussed foods consumed in the home. Changes in technology (microwaves, home freezers), household structure (more

single-parent households, fewer nonworking spouses), and tastes have promoted the consumption of food away from home and in-home, pre-prepared meals (Senauer, Kinsey, and Asp). The nutritional characteristics of meals (including nutrient content and portion size) in the fast food industry may be systematically different from those for meals prepared at home. Incomes have played a role, albeit a complicated one.

Rising real income, smaller households, and increasing opportunity costs of time imply a greater demand for more services, including convenience associated with food. Changes in the agricultural commodity prices are involved as well, through their influence on food manufacturers' choices of least-cost combinations of inputs and other economizing choices they make. Clearly, the role of commodities in determining costs of all food consumption has decreased since the 1950s, and the relative importance of real estate, wages, employee benefits, and insurance have increased.

Implications for U.S. Policy

The effects of agricultural policies on human nutrition and obesity are not well understood. Simple causation from farm subsidies to obesity is clearly inconsistent with international patterns across countries. For example, obesity trends for adult males and children in Australia are similar to those in the United States and the proximate causes (among them dramatic increases in fast food and soft drink consumption) are essentially the same (Australian Institute of Health and Welfare). However, Australia has much different agricultural policies, with a much greater relative emphasis on agricultural R&D and no important farm commodity programs.

U.S. agricultural policy comprises a complex set of programs that affect production costs, production, commodity prices, and farm incomes. Commodity-specific trade policy has clearly led to higher consumer prices of several major food commodities (such as dairy products, sugar, and orange juice). However, consumer prices for virtually all of these foods have trended down in real terms during the period when obesity has risen. Changes in farm subsidy programs have also shifted to provide income support with less incentive to expand production.

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 differed among commodities, reflecting the nonuniform focus of R&D expenditures and impacts over time. The consequences of commodity price changes (in either direction) for food prices are less easy to discern but are likely to be muted because the contribution of commodity costs as a share of total prepared food costs is small, having fallen dramatically over the past several decades.

Even so, through its effects on lowering commodity prices, agricultural research must contribute to lower food costs—indeed, this effect is one of the primary justifications for public involvement. Those who are concerned about obesity might conclude that agricultural research is counterproductive and that, to achieve its national health objectives, the federal government should spend less on agricultural research. This conclusion is almost surely false. The primary consumer benefit from lower food prices is to make funds that would have been

spent on food available for other purposes; only a small fraction of those funds is spent on additional food consumption per se. This argument applies for the general reduction in food costs resulting from research; more dramatic impacts may follow from changes in the relative prices of foods (such as poultry versus beef).

Changes in relative prices of "healthy" versus "unhealthy" foods follow no easily identifiable patterns, and available data likely mask contributions of agricultural R&D and trade to product availability, price, and quality. In any event, compared with other factors, the differences in relative prices among farm commodities likely play only a small role in determining food consumption. It could be argued that, in view of public health implications, the balance of public agricultural research programs should shift to place greater emphasis on lowering the consumer costs and enhancing the quality of "healthy" foods, such as fresh fruits and vegetables. But this change in emphasis should only go so far as is appropriate to maximize the total research benefits, taking into account any implications for human health. Total benefits may be comparatively high for other research investments, even for research related to "unhealthy" foods, and we should not unduly emphasize benefits associated with healthier diets resulting from certain types of research.

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

Lessons for Developing Countries from the U.S. Experience

Our work has focused on the links between agricultural policies and food prices and hence on food choices in the United States. But it also offers broader insights that may quicken the search for effective policies for managing obesity in the context of developing countries.

Rates of obesity in the United States are among the highest worldwide, but high and rising obesity is a global phenomenon, of concern to many governments, and not only in rich countries. There are worldwide trends in the "Americanization" of diets and food industries, and there are lessons to be learned from international comparisons of human behavior, outcomes, policies, and their effectiveness. While the basic calorie equation roughly holds for all populations, the specific determinants of food consumption and energy expenditures, and hence the policy instruments for influencing diet and exercise choices, may vary among nations. Importantly, however, both within and among countries, food consumption patterns and dietary outcomes vary systematically and in predictable ways with income, educational status, ethnicity, and other factors. Responsiveness to policies also varies systematically with the same factors (e.g., through their influence on price elasticities).

Work remains to be done to explore the nature and extent to which the economics of obesity and the related policy choices differ among nations. Our reading of the literature on obesity in the United States, combined with the more-specific results from our own work on U.S. agricultural policy and obesity, leads to the following observations related to less-developed countries.

First, the social costs of obesity can be large. A critical first step in determining the size of social costs is more detailed and frequent evaluation of the health and nutritional status of children and groups at high risk of obesity. The U.S. case can provide some guidance in translating changes in nutritional status into social costs, but the final outcomes of these calculations will likely be different for developing countries.

Second, reductions in food costs are essential to combating hunger, and there are huge private and social benefits from policies, such as public agricultural R&D, that lower food costs. Cheaper food may also contribute to obesity by facilitating some consumers to ingest more calories than they expend and thereby may generate some social costs. It is highly unlikely, however, that the obesity effects could justify reducing support for public agricultural R&D, even in the richest countries. This point is more obvious for very poor countries that still face serious problems of under-nutrition and where the cost of basic staples takes a large share of the consumer budget, but is no less true in richer countries.

Third, long-term reductions in *commodity* prices have been driven by productivity growth within the United States and abroad. Public and private investments in agricultural research have been the primary sources of productivity growth. The high social payoff to public research investments comes primarily from the consumer benefits from cheaper food. Reductions in commodity prices benefit the poor, who consume commodities directly, and enable reductions in food prices. Commodity price policies have much more mixed and comparatively unimportant effects for long-term movements in food prices and consumption patterns. The same is generally true in the context of developing countries, but technology spillovers from rich countries have been the source of much of their productivity growth. U.S. agricultural research policy therefore has implications for nutrition in other rich and poor countries, as well as in the United States.

Fourth, as the development process unfolds, the direct consumption of commodities declines, and foods comprised of these commodities (prepared for consumers by the food industry) become more important. Analysis of the U.S. case suggests that the food prices decline more slowly than commodity prices partly because food production requires inputs such as labor and energy. Some of these input costs have not declined as quickly as commodity prices. The nature of competition in the food industry also influences food prices. Therefore, policies that focus on changing commodity prices may not have the intended effects on food prices and hence, on food choices.

Fifth, changes in food prices are not always easy to determine or measure, especially for foods other than basic grains. Changes in food quality and seasonal availability are not generally factored into calculations of changes in food prices. In the United States, conventional measures of average prices give a misleading impression of the patterns of changes in relative prices of fresh fruits and vegetables, such as strawberries, grapes, and lettuce, for which changes in

seasonal availability and varieties have been important. Similar issues may also be important in other countries and possibly for other types of commodities.

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