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Farm subsidies and obesity in the United States: National evidence and international comparisons

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ABSTRACT

Many commentators have claimed that farm subsidies have contributed significantly to the "obesity epidemic" by making fattening foods relatively cheap and abundant. But U.S. farm policies have generally small and mixed effects on farm commodity prices, which in turn have even smaller and still mixed effects on the relative prices of more- and less-fattening foods. Other factors have had much more influence on reducing the farm prices of food commodities and the consumer prices of food such that any effects of U.S. farm policies on U.S. obesity patterns must have been negligible. Moreover, while many arguments can be made for changing U.S. farm subsidies, even entirely eliminating the current programs could not be expected to have a significant influence on obesity rates. International evidence reinforces this finding. The countries that support their farmers most strongly tend to have relatively low obesity rates. In these countries the main support for farmers comes through trade barriers and higher consumer prices, which—like U.S. policies for sugar, dairy, orange juice, and beef—discourage consumption and reduce obesity. In contrast with agricultural subsidies, agricultural R&D has had a significant effect in the past on the relative price of food commodities and food, and has the potential to influence obesity patterns in the future, but R&D policy is a very blunt instrument for pursuing public health policy objectives.

Introduction

In this article we examine the links between farm programs and farm commodity prices in the United States, and the implications of farm policy-induced commodity-price changes for food prices, food consumption, and obesity, drawing on both U.S. data and some international comparisons of farm supports, food prices, and obesity rates. We conclude that U.S. farm programs have had negligible effects on the prices paid by consumers for food and thus negligible influence on dietary patterns and obesity, consistent with some previous work by economists on the issue (e.g., Alston et al., 2006; Cutler et al., 2003; Miller and Coble, 2007), but contradicting the mainstream view presented in the media (e.g., Pollan, 2003).

Motivation

Obesity is a big business. The prevalence of overweight and obesity has increased rapidly in the United States—the average American adult added 9–12 pounds during the 1990s (Ruhm, 2007)—and the related health concerns are priority issues for the U.S. government and the medical community (see Fig. 1). This phenomenon is not unique to the United States. The prevalence of overweight and obesity is particularly high in the United States but is growing rapidly throughout much of the world (World Health Organization, 1997; International Obesity Task Force, 2005). Obese and overweight Americans generate large additional direct and indirect health care expenses. In his "Call to Action to Decrease Overweight and Obesity" the U.S. Surgeon General (2001) reported that, in 2000, the total cost of obesity was estimated to be $117 billion ($61 billion direct and $56 billion indirect). Without endorsing these particular estimates, we note that these costs will increase with increases in the U.S. prevalence of obesity, especially severe obesity, which is projected to continue to rise (e.g., see Ruhm, 2007).

The U.S. government has a stated objective of reducing obesity but the appropriate policy is not clear. One option is to implement ever-more-vigorous public education programs. Another option is to revise the food and nutrition programs administered by the USDA to encourage healthier diets of participants.[1]

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[1] These programs include the Food Stamp Program, the Special Supplemental Program for Women, Infants, and Children (the WIC Program), and the School Lunch Program, among others.

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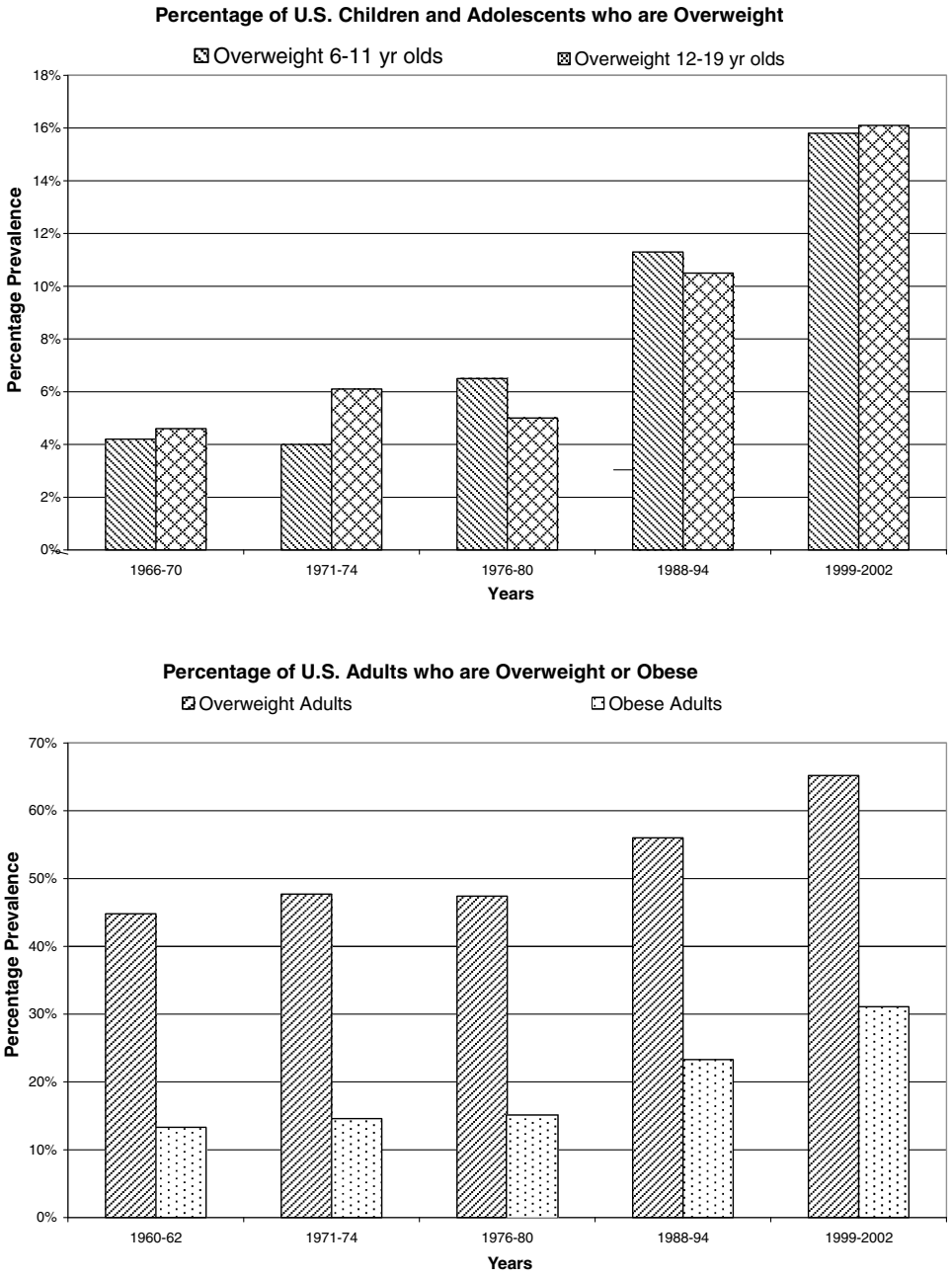


Fig. 1. Percentages of U.S. adults and children who are overweight or obese. Source: http://www.cdc.gov/nchs/about/major/nhanes/datatblelink.htm.

Various proposals have been raised and some have been subjected to analysis by economists.[2] Further options include regulatory or fiscal instruments that attempt to discourage less-healthy and encourage more-healthy consumption choices. For instance, some writers have speculated about banning certain types of advertising, taxing foods with high fat or high sugar content, or subsidizing healthier foods such as fresh fruit and vegetables, and economists have analyzed some of these possibilities.[3]

To make a socially beneficial choice among these instruments requires understanding the likely effects of each instrument on food consumption (and other) choices by different types of consumers, the implications of those choices for patterns of obesity, and the consequences for social and private costs. In every instance it is difficult to make clear inferences because the empirical relationships are complicated and hard to quantify with confidence based on available information. Even so, some commentators have been able to take strong positions on the issue.

[2] For instance, proposals for a more-healthy Food Stamp Program have been analyzed by Mullally et al. (2008) and Guthrie et al. (2007). The Food Stamp Program may have contributed to an increase in obesity among participants, though the evidence is mixed with differential results between men and women, and the effects found are generally small (e.g., see Baum 2007; Chen et al., 2005; Gibson, 2003, 2006; Kaushal, 2007; Ver Ploeg et al., 2006, 2007). Even if the current program has not caused obesity, a revised program may contribute to reducing obesity, but the analysis to date has generally not been favorable to the idea.

[3] For instance, Jacobson and Brownell (2000), Fields (2004), Kuchler et al. (2004a,b), Cash et al. (2005), Chouinard et al. (2007), Miljkovic et al. (2008), and Schroeter et al. (2008).

One popular idea is that American farm subsidies contribute significantly to obesity and that reducing these subsidies will go a long way towards solving the problem. For instance, the well-known author and professor of journalism, Michael Pollan suggests:

> "[Our] cheap-food farm policy comes at a high price: ...[with costs including] the obesity epidemic at home – which most researchers date to the mid-70s, just when we switched to a farm policy consecrated to the overproduction of grain. Since that time, farmers in the United States have managed to produce 500 additional calories per person every day; each of us is, heroically, managing to pack away 200 of those extra calories per day. Presumably the other 300 – most of them in the form of surplus corn – get dumped on overseas markets or turned into ethanol." (Pollan, 2003)

Pollan and others making such claims generally treat the issue as essentially self-evident, and do not present details on the mechanism by which farm subsidies are supposed to affect obesity, nor evidence about the size of the impact. Nevertheless, the idea that farm subsidies have contributed significantly to the problem of obesity in the United States has been reported frequently in the press, and has assumed the character of a stylized fact.[4]

It is conceptually possible that farm subsidy policies contribute to lower relative prices and increased consumption of fattening foods by making certain farm commodities more abundant and therefore cheaper. However, each of several component elements must be true for the effects on obesity to be significant. First, farm subsidies must have made farm commodities that are important ingredients of relatively fattening foods significantly more abundant and cheaper. Second, the lower commodity prices caused by farm subsidies must have resulted in significantly lower costs to the food industry, cost savings that were passed on to consumers in the form of lower prices of relatively fattening food. Third, food consumption must have changed significantly in response to these policy-induced changes in the relative prices of more- versus less-fattening foods.

In what follows we examine each link in this chain, and we find that the magnitude of the impact in each case is zero or small. First, the evidence indicates that farm subsidies have had very modest (and mixed) effects on the total availability and prices of farm commodities that are the most important ingredients in more-fattening foods. Second, such small commodity price impacts would imply very small effects on costs of food at retail, which, even if fully passed on to consumers would mean very small changes in prices faced by consumers. Third, given that food consumption is relatively unresponsive to changes in market prices, the very small food price changes induced by farm subsidies could not have had large effects on food consumption patterns. These findings are reinforced by the consideration of some international data on obesity rates and farm commodity policies.

Farm subsidies and commodity prices

A basic knowledge of how farm subsidy programs work, and how agricultural markets work, raises immediate questions about the likely importance of farm subsidies as an influence on obesity. U.S. farm subsidy policies include hundreds of specific provisions for particular commodities including both farm bill programs and trade barriers that raise U.S. farm prices and incomes for favored commodities. These programs support farm incomes either through transfers from taxpayers, or at the expense of consumers, or both. In reality, then, farm commodity programs might make agricultural commodities cheaper or more expensive and might therefore increase or reduce the cost of certain types of food.

A simplistic model of farm subsidies and obesity, which is implicit in some writings on the subject, presumes a text-book subsidy policy that results in an increase in both production and consumption of the subsidized good by increasing the net return to producers (the market price plus the subsidy) and lowering the market price paid by consumers. If such subsidies had been applied more generously to more-fattening foods or their main ingredients (say sugars, starches, and fats) compared with less-fattening foods (say fresh fruits and vegetables) then it follows straightforwardly that the subsidy policy was fattening; the only remaining issue would be the magnitude of the effect.

However, the main elements of U.S. farm subsidy programs are significantly different from simplistic text-book subsidy policies. Farm subsidies have resulted 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. But in these cases, the price depressing (and consumption enhancing) effect of subsidies has been contained (or even reversed) by the imposition of additional policies (such as acreage set-asides) that restricted acreage or production.[5] So the effects of the subsidy on quantities produced and consumed, and consumer prices, are smaller than the text-book model would suggest. In addition, for the past decade, about half of the total subsidy payments have provided limited incentives to increase production because the amounts paid to producers were based on past acreage and yields rather than current production. The effects of these payments are muted compared with a text-book production subsidy at the same rate applied to current production. Finally, for some commodities (notably sugar, dairy products, and orange juice), the U.S. policy increases U.S. farm prices by restricting imports. For these commodities the effect of the policy is to increase the consumer price and decrease domestic consumption.[6]

Economists have modeled and projected the likely economic consequences of U.S. farm subsidies for prices and production. For instance, in 2006 the Australian Bureau of Agricultural and Resource Economics (ABARE) quantified the likely effects if U.S. farm subsidies (including import tariffs) were phased out over 10 years, 2007–2016. The ABARE estimates are summarized in Table 1. They show that eliminating existing farm programs would have a very modest effect on farm prices and production of the main food commodities. Only sugar and rice would experience a reduction in production of more than 10%, and only sugar would see a price change of more than 10%. Importantly, the direction of the effect on price is mixed. Elimination of farm subsidies would result in increases in prices only for wheat and maize (corn). For every other commodity the net effect of eliminating the subsidies would be to reduce the

[4] Examples abound. For instance, in November 2007 alone, articles were published Nicole Gaouette, in the Los Angeles Times http://www.latimes.com/news/science/la-na-farmbill25nov25,1,6084664.story?coll=la-news-science&ctrack=1&cset=true, Amanda Paulson in the Christian Science Monitor http://www.csmonitor.com/2007/1116/p03s01-uspo.html, Michael Grunwald in Time magazine, http://www.time.com/time/magazine/article/0,9171,1680139,00.html, and Michael Pollan in the New York Times http://www.nytimes.com/2007/11/04/opinion/04pollan.html?incamp=article_popular.

[5] While acreage set-asides have been phased out of the current farm programs, they were relevant in the recent past and thus are relevant to the issue of obesity today. In addition, the Conservation Reserve Program (CRP), which has been operating since 1986, removes about 36 million acres (about 8 percent of cropland) from production for environmental purposes. If the CRP is seen as a concomitant of the subsidy programs, then its offsetting effects on reducing output should be taken into account in evaluating the effects on prices and consumption (Alston 2007a).

[6] There is not space in this paper for a fuller history of the rationales and rationalizations used for current of farm program features. We note, however, that the effects of U.S. farm program policies are well known among agricultural economists and documented in the literature on the economics of agricultural policy—for instance, Alston and James (2002), Sumner (2005), and Alston (2007a).

Table 1
Consequences in 2016 from a complete elimination of U.S. commodity protection and subsidy policies

	Output	Price
	(percent difference from baseline)	
Soybean's	−2.86	−1.14
Wheat	−7.58	1.52
Maize (Corn)	−3.79	0.26
Rice	−11.71	−3.87
Cane and beet	−33.31	−15.30
Fruit and vegetables	4.42	−5.16
Beef cattle	1.44	−3.31
Pigs and poultry	0.41	−0.01
Milk	−0.45	−0.01

Source: See Alston (2007a) Table 3, which was based on a table provided by Vernon Topp, ABARE, December 2006, personal communication. Effects refer to elimination of U.S. farm programs as represented in McDonald et al. (2006), ABARE Research Report 06-10, Scenario 1.

prices, encouraging the consumption of meat and dairy products (albeit only modestly) along with fruit and vegetables (a price decrease of 5.2% associated with an increase in production of 4.4%), and sugar (the biggest effect, with a price decrease of 15%, that would be reflected more generally in the market for caloric sweeteners resulting in lower prices for all foods containing caloric sweeteners). Among all these effects, a reduction in farm prices of fruit and vegetables might have some favorable effects on nutritional outcomes, but it needs to be remembered that potatoes would account for a significant share of the increased production and consumption of fruit and vegetables; and, since almost 60% of potatoes are consumed as french fries or chips, the nutritional consequences may not be desirable.[7]

The main message from Table 1 is that the effects of U.S. farm subsidies on commodity prices are mixed and mostly modest. Other studies have found somewhat larger effects. For instance, Alston (2007a) estimated that eliminating U.S. crop subsidies (but leaving other subsidies and tariffs in place) would result in a decrease in U.S. crop production by 7.3%. Sumner (2005) estimated that eliminating corn subsidies alone (leaving all other subsidies in place) would result in a decrease in U.S. corn production of 9–10%.[8]

As would be expected the estimated effects of eliminating subsidies for a subset of commodities are larger for those commodities (but smaller for the sector as a whole) than when eliminating subsidies for all commodities together, so the ranking of findings between ABARE, Alston (2007a), and Sumner (2005) is consistent with expectations (based on market conditions and policies existing in 2005).

One potentially confusing element in this story is the effect of farm subsidies on the sweetener market. Farm subsidies are responsible for the growth in the use of corn to produce high fructose corn syrup (HFCS) as a caloric sweetener, mainly through sugar policy that has restricted imports, driven up the U.S. price, and encouraged the replacement of sugar with alternative caloric sweeteners. Combining the sugar policy with the corn policy, which has encouraged the production of corn for all uses, the net effect of farm subsidies has been to increase the price of caloric sweeteners generally, and to discourage total consumption while causing a shift within the category between sugar and HFCS (e.g., Beghin and Jensen, this issue). In this context, eliminating the subsidy policies would result in cheaper caloric sweeteners, and if anything more rather than less total consumption of sweeteners, with a switch in the mix back towards sugar.

Farm commodity prices, food prices, consumption, and obesity

The cost of farm commodities as ingredients represents only a small share of the cost of retail food products, on average about 20%, and much less for products such as soda and for meals away from home, which are often implicated in the rise in obesity.[9]

This already small influence of farm commodity prices on retail food prices is shrinking, as the average farm share of the retail food dollar has fallen from around 30% in 1980. Hence, a very large percentage change in commodity prices would be required to have an appreciable percentage effect on food prices.[10] However, as documented in the previous section, the effects of U.S. subsidies on farm prices of food commodities have been generally quite small.

Even if the subsidies were responsible for reducing corn prices by as much as 10%, the resulting percentage effect on food prices and consumption would be very small. For instance, if the cost of corn at the farm embodied in a food product represented one-fifth of the cost of the product at retail, corn subsidies might be responsible for a 2% decrease in consumer price, which would imply an increase in consumption of less than half of one percent (given that final consumer demand is very unresponsive to price for most food categories). For meat products, such as beef, pork, and poultry, the cost of corn as feed as a share of the final retail value is well less than 10 percent, so the effect of corn subsidies on meat consumption must be very small, perhaps in the range of one tenth of one percent; similarly or more so for prepared foods or food away from home.[11] These are tiny impacts compared with the effects on consumer food prices and consumption from changes in other input prices, food technology, consumer income and other drivers of commodity prices, such as technology or climate.

A useful perspective on this issue is provided by Miller and Coble (2007, p. 108) who graphed total expenditure by the U.S. government on direct payments (a type of subsidy expenditure) on the same scale as consumer expenditure on food for the years 1960 through 2003. Over the period, this measure of subsidy expenditure averaged only 1.1% of consumer expenditure on food. Moreover, the final incidence of the subsidy between producers and consumers depends on the detail of the policy and the elasticities of supply and demand (e.g., see Alston, 2007a), but certainly some (and possibly most) of the incidence stays with farmers such that the consumer incidence would have been well less than the 1.1% average subsidy expenditure relative to consumer expenditure on food.

[7] This paragraph and Table 1 concern farm commodity prices. The effects of policies on farm prices suggest the direction and potential magnitude of the impacts on food product prices, but the specific details of those food price impacts depend on the farm-retail price linkages, which are discussed in the next section.

[8] The production effects of various farm commodity payment programs are considered in Alston (2007a) and Sumner (2005) and in literature cited there.

[9] For example, Beghin and Jensen (this issue) report that the cost of corn in high fructose corn syrup is only 1.6 percent of the value of soft drink sales. The USDA Economic Research Service publishes data and information on its web page (www.ers.usda.gov) on farm-to-retail price spreads and components of marketing cost for different types of food, and for food away from home as well as food consumed at home (e.g., see Stewart 2006).

[10] Indeed, as documented by Leibtag and Ephraim (2008), the very large commodity prices increases from 2006 to 2008 have had an appreciable effect on food prices, albeit with smaller effects for more processed foods.

[11] This general conclusion is not conditioned on any specific model of farm-retail marketing margins or of the industrial organization of the marketing chain for food products. Since the cost shares of farm commodities in retail prices are relatively small for most commodities it follows that the impacts of farm price changes on retail prices are likely to be small under an imperfectly competitive marketing system as well as with a competitive system. Furthermore, we have no reason to speculate that farm commodity programs have increased the degree of market power exercised by marketing firms.

An alternative measure of support for agriculture is the Producer Support Estimate (PSE) computed by the OECD.[12] This measure includes all transfers to producers whether through government expenditure or other means, some of which are at the expense of consumers rather than taxpayers. The counterpart Consumer Support Estimate (CSE) effectively measures the net effect of agricultural policies on consumers from taxpayer expenditures, which benefit them by reducing prices, and other policies such as import tariffs, which raise consumer prices.[13] PSEs and CSEs are available for OECD countries, computed commodity-by-commodity and in total across all commodities. Here, borrowing from Miller and Coble (2007) we compare measures of aggregate PSEs and CSEs for the United States with measures of total food consumption expenditure.[14]

Over the period 1986–2001, the U.S. PSE for total agriculture ranged from a high value of $36.2 billion in 1986 to a low of $14.6 billion in 1995, with the variation mainly reflecting movement in world market prices for farm commodities. Over the same period the U.S. CSE ranged from a low of -$8.9 billion in 1986 (meaning that in 1986 farm programs effectively taxed consumers, such that they paid higher prices for food, and transferred this amount from consumers to farmers) up to a high of $4.7 billion in 1995 (meaning that in 1995 consumers paid lower prices as a result of farm programs). Over the same interval, consumer expenditures on food in the United States grew from $357 billion in 1986 to $634 billion in 2001. The PSE ranged between almost 3% and a little over 10%, averaging 5.8% of consumption expenditure. The CSE ranged between a tax of 2.5% (in 1986) and a subsidy of almost 1% (in 1995), with the average corresponding to a tax equal to 0.4% of annual consumption expenditure. That is, on average, the net effect of U.S. farm policy was to raise the buyer cost of food commodities and increase prices paid by consumers for food.

Evidence from international comparisons

The U.S. evidence supports the view that farm subsidies have not been a significant cause of obesity trends in the United States. Simple causation from farm subsidies to obesity is also 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, 2003). However, Australia phased out its farm commodity programs, over the 1980s and 1990s (Alston, 2007b).

Limited use to date has been made of international cross-sectional data, which is probably the most likely context to yield meaningful direct evidence on the links between policy and rates of obesity. Cutler et al. (2003) analyzed international data on prevalence of obesity and examined the roles of various factors, including prices and policies. Loureiro and Nayga (2005) regressed the percentage of overweight (or obese) people against various economic variables in OECD countries using annual data for 1990 to 2003. Here we combine some of our own ideas with elements of the approaches tried in these previous studies.

Table 2 compares rates of obesity in 2005 with rates of overall farm support (measured using PSEs over the period 1986–2001) for a selection of OECD countries. It can be seen that obesity rates are much lower in Japan, South Korea, and France (countries that provide relatively large subsidies to farmers) than in the United States and Canada (countries that provide substantial but smaller subsidies). Obesity rates in Australia and New Zealand, which do not subsidize their farmers much at all, are higher than in France and Japan but still lower than in the United States. This table shows that there is no clear connection between support for farmers in a country and obesity in that country. For instance, the countries of the European Union (shaded) all have the same farm support policies, under the Common Agricultural Policy, and thus the same PSEs, but their obesity rates range from close to the highest in the table (Greece) to close to the lowest (France). If anything, the correlation between obesity rates and PSEs is negative, as illustrated by Cutler, Glaeser, and Shapiro (2003a,b).

Of course, it is not the producer subsidies that matter. In Europe, Japan, and Korea the high producer subsidy rates have been achieved mainly at the expense of consumers and, like U.S. policies for dairy and sugar, farm supports in Europe, Japan, and Korea have discouraged consumption. The more appropriate comparison is between obesity rates and the measure of farm subsidy effects on incentives for consumers, measured using CSEs. From inspection of the numbers in Table 2, we cannot rule out a positive correlation between the CSE and the rate of obesity, consistent with the findings of Loureiro and Nayga (2005).[15] The high consumer costs of farm support in the EU, Japan, and Korea may have contributed to their lower rates of obesity. But this is a complex question that cannot be answered seriously from a crude comparison of aggregate measures such as these.[16] Importantly, and as discussed above, the overall average CSE for the United States was negative—indicating that farm subsidies entailed a net tax on consumers—but close to zero such that the magnitude of the effect, if any, must have been very small.

Food prices, food consumption, and obesity

The law of demand applies to food. Policies that cause lower prices of food encourage food consumption and, ultimately, contribute to obesity. Thus we would expect farm commodity policies that make food commodity prices cheaper (or more expensive) ultimately to contribute to increasing (or reducing) the problem of obesity. Consistent with this expectation, U.S. farm subsidies for the most part have not made food commodities significantly cheaper, but U.S. obesity rates are higher than obesity rates in other countries that tax food commodities substantially. However, the links from food commodity prices within a country and consumer prices paid for food may be weak.[17]

[12] The Producer Support Estimate (PSE) is the percentage of producers' gross income coming from government intervention. It is an indicator of the annual monetary value of gross transfers from consumers and taxpayers to support agricultural producers, measured at farm gate level, arising from policy measures which support agriculture, regardless of their nature, objectives or impacts on farm production or income.

[13] The Consumer Support Estimate (CSE) is the consumer analogue of the PSE. It is an indicator of the annual monetary value of gross transfers to (from) consumers of agricultural commodities expressed as a percentage of the value of consumption expenditure, measured at farm gate level, arising from policy measures which support agriculture, regardless of their nature, objectives or impacts.

[14] The data were taken from the OECD web site (see notes to Table 2) and the USDA ERS web site http://www.ers.usda.gov/Briefing/CPIFoodAndExpenditures/Data/table11.htm.

[15] Loureiro and Nayga (2005) found a statistically significant, negative effect on obesity rates from increases in the implicit taxation of consumers through farm programs as measured by the CSE.

[16] Imputing fundamental causation is even harder. As demonstrated by Anderson and Hayami (1986) for instance, countries that have a comparative disadvantage in food production tend to tax food imports and thus food consumption, especially if they are rich, and other factors that account for obesity (or lack of it), such as custom and culture, and even genetic predisposition for obesity, may be related in some fundamental way to the agroecological and economic factors that determine patterns of comparative advantage.

[17] The magnitude of the farm-to-retail marketing margins may be affected by imperfect competition, storage, adjustments in input costs and costs of adjusting prices. It is beyond the scope of this paper to investigate these issues in detail.

Table 2
Rates of obesity versus rates of farm support, food prices, and income

Country	Percentage of males and females, 15 years and older who were overweight or obese in 2005				Measures of farm support 1986-2001 average		Big Mac[a]	GDP/Cap[b]
	Overweight (BMI > 25)		Obese (BMI > 30)					
	Male (percent)	Female (percent)	Male (percent)	Female (percent)	PSE (percent)	CSE (percent)	(index)	(index)
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
United States	75.6	72.6	36.5	41.8	23.6	−1.5	1.00	1.00
Greece	75.7	61.3	27.7	24.5	54.0	−33.7	0.91	0.35
Australia	72.1	62.7	23.8	24.9	9.6	−5.2	0.74	0.61
Canada	65.1	57.1	23.7	23.2	27.0	−17.0	0.86	0.67
New Zealand	68.7	68.2	23.0	31.5	5.6	−6.3	0.81	0.41
Britain	65.7	61.9	21.6	24.2	54.0	−33.7	1.16	0.72
Austria	61.0	53.2	21.3	20.3	54.0	−33.7	1.32	0.68
Germany	65.1	55.1	20.9	20.4	54.0	−33.7	1.18	0.64
Spain	55.8	47.7	15.6	15.8	54.0	−33.7	1.14	0.42
Portugal	58.5	49.2	13.7	16.1	54.0	−33.7	1.10	0.29
Belgium	51.9	40.7	13.3	9.5	54.0	−33.7	1.34	0.64
Italy	52.7	38.3	12.9	12.6	54.0	−33.7	1.18	0.52
Switzerland	54.1	56.7	12.4	18.7	89.1	−53.7	1.68	0.94
Sweden	54.5	44.9	11.8	10.9	54.0	−33.7	1.42	0.82
Denmark	52.5	39.1	10.6	7.1	54.0	−33.7	1.61	0.85
Holland	48.0	44.0	10.4	11.5	54.0	−33.7	1.24	0.66
Ireland	51.5	41.7	10.3	9.1	54.0	−33.7	0.98	0.82
France	45.6	34.7	7.8	6.6	54.0	−33.7	1.36	0.63
South Korea	40.2	43.8	4.1	10.1	72.3	−67.0	1.11	0.36
Japan	27.0	18.1	1.8	1.5	69.9	−55.3	1.16	1.05
Average	57.1	50.0	16.2	17.0	49.9	−32.2	1.17	0.65

Note: Countries are ranked according to the male obesity rate in column (3).
Source: Compiled by the authors using various sources, as follows.
Data on PSEs and CSEs: The OECD publishes estimates of Producer Support Estimates (PSEs) and Consumer Support Estimates (CSEs). The estimates include support for major field crops and livestock products, but include no data for fruits or vegetables. Estimates are provided for the European Union as a whole, not for the individual member states. The measures are defined, described, and documented on the OECD web site: http://www.oecd.org/document/59/0,3343,en_2825_494504_39551355_1_1_1_1,00.html. The estimates used here were taken from http://caliban.sourceoecd.org/vl=1032391/cl=23/-=1/rpsv/ij/oecdstats/16081056/v13n1/s1/p1.
Big Mac: The data set was compiled for 1986-2003 by Michael R. Pakko and Patricia Pollard for use in the Federal Reserve Bank of St. Louis Review. They collected their data from various issues of the Economist magazine. Data for 2004–07 were also collected from the Economist magazine (http://www.economist.com/).
BMI Data: Prevalence of overweight and obesity data were reported in the WHO SuRF2 Report (http://www.who.int/ncd_surveillance/infobase/web/surf2/start.html). The data were taken from the WHO Global InfoBase (http://www.who.int/infobase/report.aspx).
GDP Data: GDP per capita and the GDP deflator for local and US currencies are from the Word Bank's World Development Indicators (http://web.worldbank.org/WBSITE/EXTERNAL/DATASTATISTICS/0, menuPK:232599~pagePK:64133170~piPK:64133498~the SitePK:239419,00.html.
[a] The Big Mac ratio is the average value over 1986 to 2007 of the ratio of the country-specific price converted to U.S. dollars at the market exchange rate to the U.S. price in U.S. dollars.
[b] GDP/Cap is the ratio of country specific value of GDP per capita in U.S. dollars to U.S. per capita GDP.

More direct, and perhaps corroborating, evidence may be gleaned by considering the consumer prices of food among countries.[18] To make such comparisons is difficult because of differences in currency and their purchasing power, and differences in consumption bundles used in consumer price indexes. The Big Mac index from The Economist—the annual country-specific price of a McDonald's Big Mac hamburger—is useful for this purpose since it holds the characteristics of the food product (representing a bundle of food commodities and other inputs) fairly constant across countries and over time.[19] Annual data on the Big Mac are available for a long list of countries since 1986, though the series are incomplete for some countries. We converted the index to U.S. dollars using market exchange rates, and then we converted the U.S. dollar prices to real terms, using the U.S. GDP deflator, and to U.S. equivalents by dividing the country-specific prices in (real or nominal) U.S. dollars by the U.S. price.[20] The second-last column of Table 2 shows the average of the annual values of this relative U.S. dollar Big Mac price over the period 1986–2007 (noting that for some countries observations were not available for every year). Reading down Table 2, like the CSE in column (6), the value of the Big Mac index in column (7) generally increases in size, while the corresponding rate of male obesity in column (3) increases. Thus there is some correlation between the effects of policy on consumer costs of food commodities (as measured by the CSE) and both the consumer costs of food (as measured by the Big Mac) and the prevalence of obesity. These correlations are illustrated in Figs. 2–4.

Fig. 2 plots the country-specific percentages of men and women who were overweight or obese in 2005 against the average value

[18] We do not present definitive econometric evidence on these points. The simple evidence presented here suggests plausible relationships. Other factors also influence consumption and obesity and a more comprehensive analysis would account for these other factors as well.

[19] The Big Mac index is obviously a relatively crude proxy for the general pattern of the full basket of food prices relevant to obesity. Stronger evidence of the same sort may be found if a better index could be obtained. The Big Mac index has the virtues of being available in a standard format for a standard product in many countries. It also covers a particular class of product (fast food with high caloric density) that has been implicated as among the causes of obesity.

[20] Since the market exchange rates are not purchasing power parity (PPP) rates, it may not be valid to compare the hamburger prices in real U.S. dollars based on market exchange rates between countries that have large differences in per capita incomes, but they should be comparable between countries that have reasonably comparable per capita incomes. Hence, the table includes data only for those OECD countries for which we have PSEs ad CSEs and for which per capita GDP in U.S. dollars in 2006 was equal to at least 30 percent of the U.S. value.

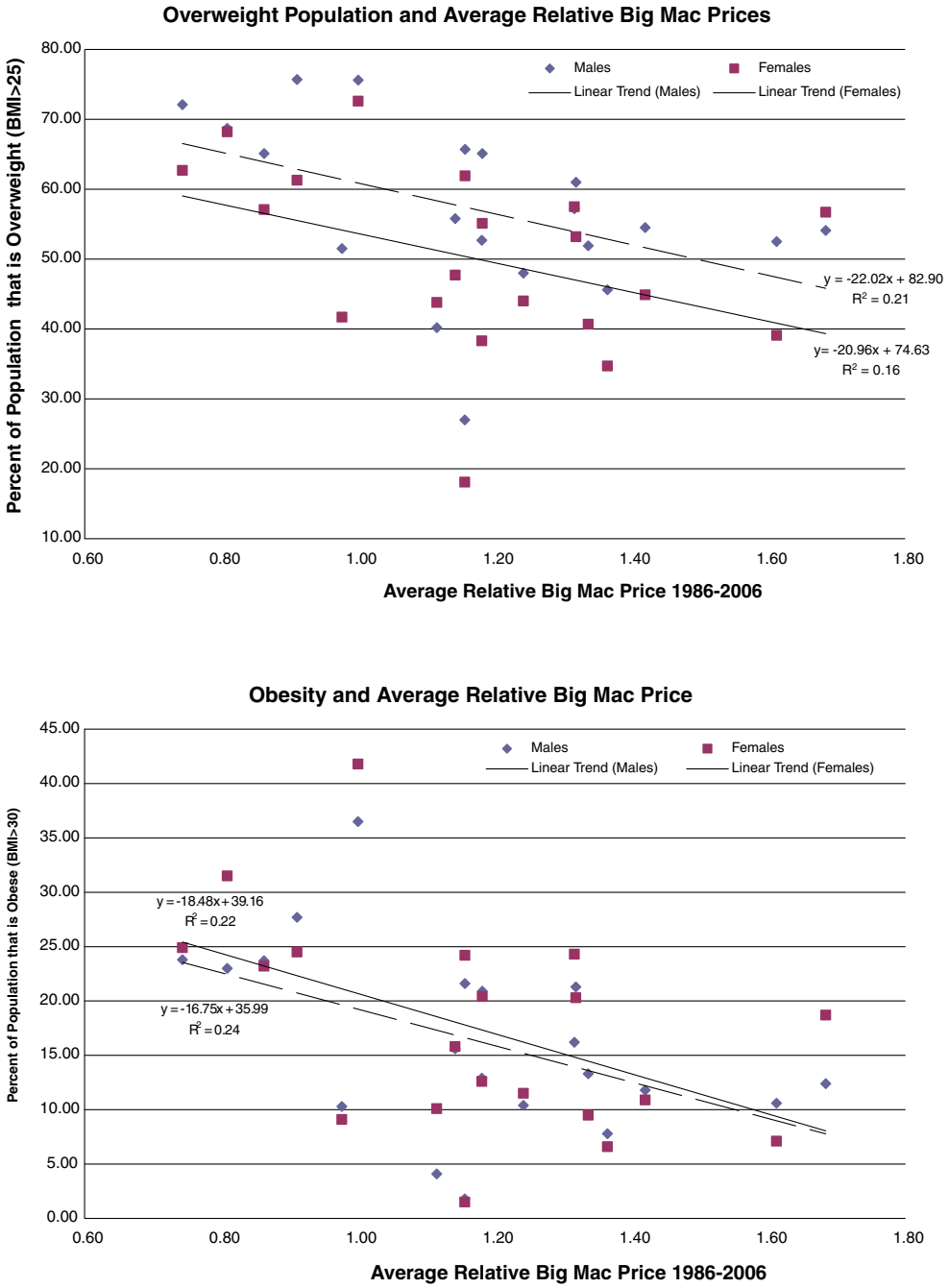
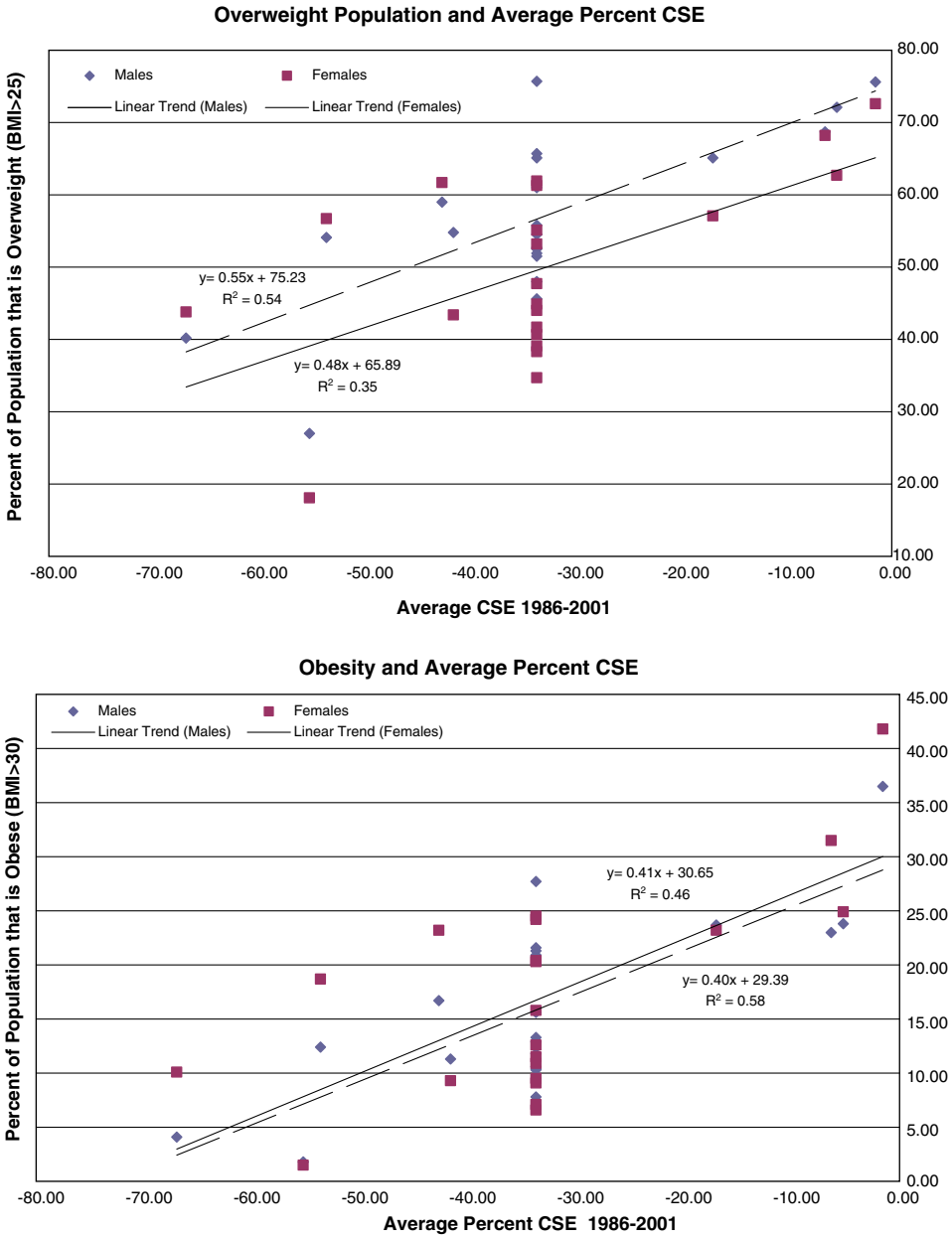


Fig. 2. Overweight and obesity versus big mac prices.

over 1986–2007 of the relative price of the Big Mac (the ratio of the country-specific price in U.S. dollars to the U.S. price), for the countries represented in Table 2. These graphs show that for these relatively rich countries, obesity is negatively correlated with the price of food, as represented by the Big Mac, although there is a great deal of variation around the downward-sloping simple trend line, with the United States (at the top) and Japan (at the bottom) a long way from the line. Fig. 3 plots the country-specific percentages of men and women who were overweight or obese in 2005 against the average value over 1986–2001 of the total CSE for food commodities, for the countries represented in Table 2. For all these countries, the CSE was negative indicating that agricultural policies transferred income to producers at least partly at the expense of consumers, by raising the buyer price above the world price. Higher rates of consumer taxation (larger negative CSEs) tend to be associated with lower rates of obesity, but again there is a great deal of variation around the trend. Fig. 3 plots the country-specific average value of the Big Mac index over 1986–2007 against the corresponding country-specific average value of the CSE over 1986–2001. The Figure indicates a generally positive relationship between a higher cost of food commodities in a country (as indicated by a larger negative value of the CSE) and the Big Mac price, supporting a conjecture that those countries that had lower obesity rates associated with higher consumer prices of food may have done so in part because they had policies that raised the buyer cost of food commodities.

This informal analysis of correlations among obesity, food prices, food commodity prices, supports a view that policies that reduce (or raise) the domestic price of food commodities can influence food prices, food consumption, and obesity. Thus, even



Note: CSEs are negative because farm subsidies made food commodities more expensive for consumers. The positive slope means that increases in CSEs, and lower consumer food prices, are associated with increases in obesity.

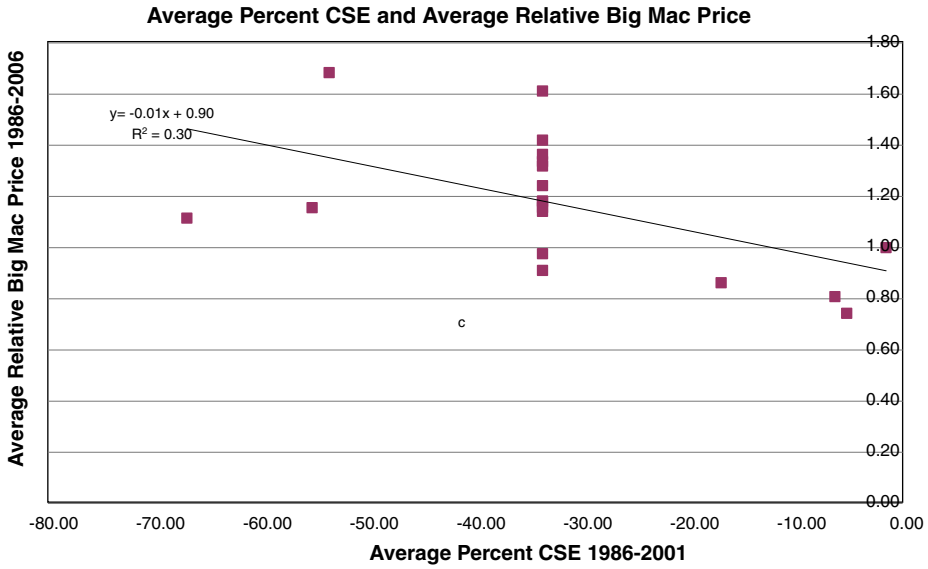
Fig. 3. Overweight and obesity versus CSEs.

though U.S. farm subsidies in the past have not had significant effects on U.S. rates of obesity, and eliminating them would not contribute significantly to reducing obesity rates, other policies that have (or have had) more significant effects on food commodity prices may well have (or have had) more important effects on obesity.[21] Chief among these is public support for agricultural R&D.

Over the longer term, food commodity prices have fallen very substantially, mainly because of productivity gains resulting from public and private investments in agricultural R&D. In the United States, between 1950 and 2002, prices for agricultural commodities fell very substantially in real terms (relative to the GDP deflator)—by 54% for livestock products, by 72% for field crops, by 28% for vegetables and by 23% for fruits and nuts (Alston and Pardey, 2007). These price changes are sufficient to have had meaningful impacts on the costs of food and the prices paid by consumers for food products. Recall, food commodities represent about 20% of the current cost of food. If we were to reverse the technological changes in agriculture over the past 50 years, and roughly double the price of food commodities, the implied increase in the consumer price for food of about 20% would induce a significant demand response.[22]

[21] Clearly we could imagine alternative farm programs that would have different impacts on obesity and nutrition more generally. For example, high taxes on certain foods or their ingredients or large subsidies on foods thought to discourage overeating might have significant impacts on dietary patterns and nutrition outcomes. Such policy design questions are beyond the scope of this paper. Our analysis suggests, however, that policy incentives for producers of farm commodities are likely to have weak effects relative to policies that affect incentives for the consumers at risk.

[22] Some agricultural R&D has been devoted to food quality and specific nutritional characteristics of foods. The effects of such R&D are less well-documented than the broad productivity impacts highlighted here.



Note: The negative slope means that increases in CSEs are associated with reductions in prices of Big Mac hamburgers because increases in CSEs imply lower prices paid by buyers for the food commodities used as ingredients.

Fig. 4. Big Mac price versus CSE.

The fact that agricultural research may inadvertently encourage obesity does not constitute grounds for the government to cease to fund agricultural research. However, it does raise questions about the appropriate measurement of the social payoff to research and about the appropriate balance in the public research portfolio. The fundamental purpose of agricultural research is to release for other uses resources that would otherwise have been spent on producing and consuming food. Agricultural research has been successful in serving this purpose and has generated very substantial societal benefits. Cheap and abundant food is still a worthy goal—even though it may encourage excessive consumption and too much obesity, given externalities in the health care system. However, in the absence of other effective policies for correcting the externalities, current obesity trends raise important questions regarding the socially optimal research portfolio. An obvious question for future evaluation is whether the research portfolio should be rebalanced with a view to providing greater opportunities and incentives for U.S. consumers to improve their nutrition and thus reduce obesity rates.

Implications for U.S. policy

U.S. farm subsidy policy comprises a complex set of programs that affect production costs, production, commodity prices, and farm incomes. Economists have modeled and measured many impacts of these subsidies. Nonetheless, the detailed quantitative effects of these policies on human nutrition and obesity are difficult to discern precisely. Even the direction of the effect is not clear, since commodity-specific trade policy has clearly led to higher U.S. consumer prices of several major food commodities (such as dairy products, sugar, and orange juice). But, the most important point is that, even when the direction of effects seems clear, the magnitude of the effects must be small. Farm subsidies have had small effects on most farm commodity prices and even smaller effects on consumption.

U.S. farm subsidies have many critics. A variety of arguments and evidence can be presented to show that the programs are ineffective, wasteful, or unfair (e.g., see Alston, 2007a; Alston and Sumner, 2007; Sumner, 2005). Eliminating farm subsidy programs could solve some of these problems, but could not be expected to have large and favorable effects on consumer incentives to eat more-healthy diets such that obesity rates would be meaningfully reduced. Public agricultural research policy has had much larger long-term effects on food prices and consumption in the past and has greater potential to contribute to reducing rates of obesity in the future.

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