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Farm-to-Food Price Dynamics

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Summary

Heightened commodity price volatility since 2008—driven by major market-shifting events, including increased demand for corn under strong federal biofuels incentives, a prolonged surge in China's soybean import demand, and the severe U.S. drought of 2012—has generated many questions about linkages between farm commodity prices and U.S. food price inflation from Members of Congress and their constituents. This report responds to those concerns by addressing the linkage between farm and retail food prices. Retail food price inflation is addressed in CRS Report R40545, *Consumers and Food Price Inflation*.

Price is the primary mechanism that links raw farm commodities through the various levels of the market system to the retail food product. The nature of price transmission between farm and retail levels depends, in general, on the size of the farm share of the retail price and the degree of market competition at each stage of the marketing chain. For example, the farm share represents nearly 58% of the retail value of a dozen eggs. Similarly, it ranges from 30% to 50% for most fresh meat retail product prices. In contrast, the farm share is only about 8% of cereal and bakery product prices.

An array of costs is layered on top of the price of a raw agricultural commodity at each stage of the marketing chain as it moves to the consumer. As a result, the farm share of a food product's price declines as it moves to the retail outlet. Since 1950, the average farm share has been declining as a share of total consumer food expenditures, falling from about 41% in 1950 to 17.4% in 2013. This has important implications for farm-to-retail price linkages because the smaller the share of farm value in the retail product, the smaller will be the effect of a change in farm price on the retail price.

Economic analysis of farm-to-retail price transmission leads to three generalizations: first, causality usually runs from changes in farm prices to changes in retail prices; second, time lags in retail price response to farm price changes are generally months in length, even for perishables like milk, meat, and fresh fruits and vegetables; and third, retail prices appear to respond asymmetrically, with adjustments to increases in farm prices occurring faster and with greater pass-through than adjustments to decreases in farm prices. This last generalization is often referred to as "sticky" retail food prices—that is, retail prices follow commodity prices upward rapidly, but fall back only slowly and partially when commodity prices recede.

"Sticky" retail price behavior is supported by empirical evidence; however, economic theory does not fully explain the observed phenomenon. Economists have noted that certain aspects of consumer behavior, store inventory management, and retailing strategies may limit retail prices from adjusting fully to downward farm price movements. As a result, the presence of asymmetric price transmission alone does not necessarily imply abnormal or excessive market power.

Comparisons of price data for major food groups confirm that farm-to-retail price transmission behaves slowly, with substantial lags and asymmetry. For example, the rise in farm prices that occurred between 2006 and mid-2008 was substantially larger and occurred about six months earlier than the rise in corresponding retail food product prices. Similarly, the subsequent fall in farm prices from their 2008 peaks preceded the downturn in corresponding retail food prices by several months.

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Introduction

Producers, consumers, and Members of Congress have expressed strong interest in the connection between farm prices for agricultural commodities and retail prices for food products. Their interest and concerns have been heightened in recent years (particularly since 2006[1]), as prices for many farm commodities have soared to record highs—first in 2008, and again in 2011, 2013, and 2014—pulling wholesale and retail prices along with them. While farm prices eventually receded in each instance, most retail prices held firm or declined only slightly (**Figure 12**).

Questions Related to Farm-to-Retail Price Movements

These episodes of asymmetric farm and retail price movements have been followed closely in the news media[2] and have generated many questions from interest groups and Congress.

- What is the relationship between the price of raw agricultural products at the farm and the prices of food products that consumers purchase in retail outlets or at restaurants? Are they subject to the same economic forces?
- Is there necessarily a lag in retail price response to farm price changes, and, if so, what is the nature of that lag?
- If farm prices rise or fall by a certain percentage, will retail food prices rise or fall by a similar amount, or are retail prices "sticky"—that is, do they tend to follow farm prices up, but not down?
- What are the principal factors that influence U.S. food prices as commodities move along the marketing chain from producers to consumers?
- What is the "farm share" of a retail food price, and does it matter?
- What are the primary and secondary data sources for information concerning all of the above issue areas, and how is that information used to help market participants and policymakers make informed decisions?

Note to Readers

This is one of several CRS reports that respond to concerns about the nature, causes, and effects of farm and food price movements. This specific report describes the linkages between farm, wholesale, and retail food prices.

A related report, CRS Report R40545, *Consumers and Food Price Inflation*, Consumers and Food Price Inflation, provides both background and complementary information for the material presented in this report. It describes how aggregate food price inflation is measured and compares recent price inflation for both at-home (i.e., retail) purchases and away-from-home consumption, as well as by major food groups. In addition, the report briefly discusses the potential economic and food security implications of food price changes.

[1] Monthly farm-prices received reached then-record highs in 2008 for several major farm commodities including milk, cattle, eggs, rice, wheat, corn, soybeans, barley, and hay; see CRS Report RL34474, *High Agricultural Commodity Prices: What Are the Issues?* for a discussion of the factors behind the rise in commodity prices.

[2] For example, "Food Bill Still High? Blame 'Sticky' Prices," *Journal Gazette and Times-Courier*, October 19, 2008; Scott Kilman and Laren Etter, "Grain Costs Down, Groceries Not," *Wall Street Journal*, March 13, 2009; "Food Prices Continue to Rise, Despite Fall in Overall Inflation," *The Land*, online, January 29, 2009.

Another related report, CRS Report R40152, *U.S. Farm Income Outlook for 2015*, U.S. Farm Income, describes the income outlook for the U.S. agricultural sector based on semi-annual (February and August) USDA forecasts for agricultural production and expenses, as well as for farm-level commodity prices and asset values.

An earlier report, CRS Report RL33204, *Price Determination in Agricultural Commodity Markets: A Primer*, Price Determination in Agricultural Commodity Markets: A Primer, describes unique characteristics of market conditions for agricultural products in general, as well as for specific types of agricultural commodities. It also reviews both the U.S. Department of Agriculture's (USDA's) forecast and reporting procedures and their relevance to commodity price formation, and the critical role of price discovery played by futures contract exchanges.

Report Objective

This report examines the elements contributing to the cost of our food—from the cost of the raw commodity at the farm, through the processing and marketing costs until it is sold to consumers. It also reviews the nature of price transmission between farm and retail prices, and briefly describes how food costs and marketing margins are measured by the government. It includes a discussion of the evidence concerning "sticky" retail prices (i.e., the idea that retail prices adjust upward quickly when farm prices rise but respond slowly, and possibly not fully, to farm price declines). In a final section, the report uses national average price data to examine farm-to-retail price linkages for several major commodities during the 2006-2013 period, when volatile prices characterized many agricultural markets. In so doing, it attempts to shed light on the evolving structure of U.S. food price formation while providing answers to the above set of questions.

Food: A Value-Added Commodity

When a consumer spends a dollar for food at the supermarket, not all of the dollar reaches the farmer. As the raw ingredients for retail food items move along the marketing chain from the farm to a grain elevator or collection terminal, then on to a processor, a wholesaler, and finally to the retail customer, an array of costs is layered on top of the price of the raw agricultural commodity (**Figure 1**). These marketing costs include labor expenses for handling, sorting, cleaning, and packaging the product; transportation charges to move the product along at each stage; and fees for processing, storing, insuring, financing, and retailing the product (e.g., store maintenance and utilities, refrigeration, labeling, shelf display, and advertising and promotional costs).

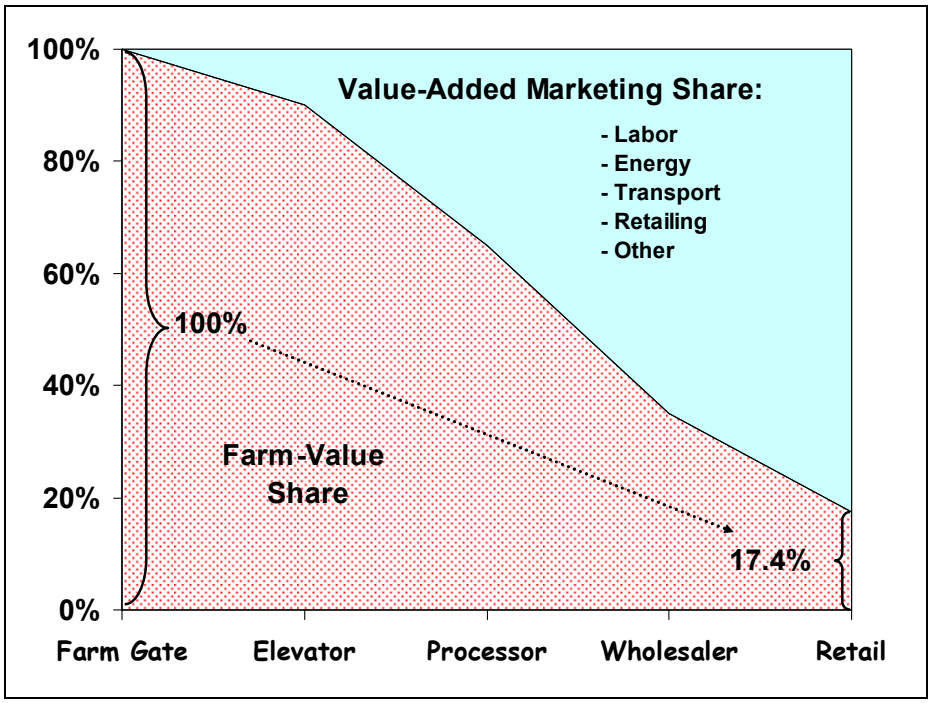
The farm share of the market price declines as a commodity moves from the farm to the retail outlet and consumer. The relative importance of the marketing costs (or marketing value-added) versus raw farm input costs varies widely across retail food products depending on the degree of processing and transformation. For eggs, fresh meat, and raw fruits and vegetables, this marketing chain may be significantly shorter than for highly processed products, such as a box of breakfast cereal or a ready-to-eat meal. Marketing costs can also vary by type of retail outlet—for example, consider the differences for a farmer's market, big box discount store, local supermarket, in-store deli, 24-hour quick-mart, or ballpark concession stand—as some outlets include substantially more marketing and retailing costs than others.

The consumer's food dollar can be divided into two major components (**Figure 1**):[3]

[3] The U.S. Department of Agriculture's (USDA's) Economic Research Service (ERS) has developed a methodology for monitoring and reporting on the value-added nature of food prices paid by U.S. consumers. ERS, "Food Dollar Series" (continued...)

- the **farm-value share**, which measures proceeds of farm commodity sales tied to a food dollar expenditure and sold to non-farm establishments; and
- the **value-added marketing share**, which is the market value added to farm commodities that are embodied in a food dollar expenditure.

Figure 1. Value Added to Farm Products Along the Marketing Chain



Source: The retail share is for 2013 from ERS, Food Dollar Series, USDA, downloaded June 8, 2015; at http://www.ers.usda.gov/data-products/food-dollar-series.aspx. All other category shares are imputed by CRS.

Farm Price vs. Farm-Value Share vs. Farm-Production Share

Note that the farm value and farm share should not be confused with the farm price.[4] The **farm price** represents the value at the farm for a unit of agricultural commodity (e.g., a bushel of wheat or a pound of potatoes).

The **farm-value share** of a retail price (estimated at 17.4% in 2013) represents the value of, or costs of producing, the farm commodities that go into a typical dollar's worth of food. In other words, it is the retail price represented by the amount of raw agricultural commodity needed to produce that retail product. For example, a bushel (60 lbs) of wheat may cost $4 at the farm, whereas a loaf of bread may cost $1 at the grocery store. The loaf of bread contains substantially less than 60 lbs of wheat. ERS has estimated that a $1 loaf of bread contains about 5¢ worth of wheat.[5]

The **farm-production share** of a retail food product is the portion of the farm share that actually stays with the farmer. In 2013, ERS estimated the farm-production share at 10.5%. The remaining 6.9% (of the farm-value share of 17.4%) went to agri-businesses and marketing industry groups that furnished inputs to the farm production process to produce the raw farm-gate commodity.

(...continued)

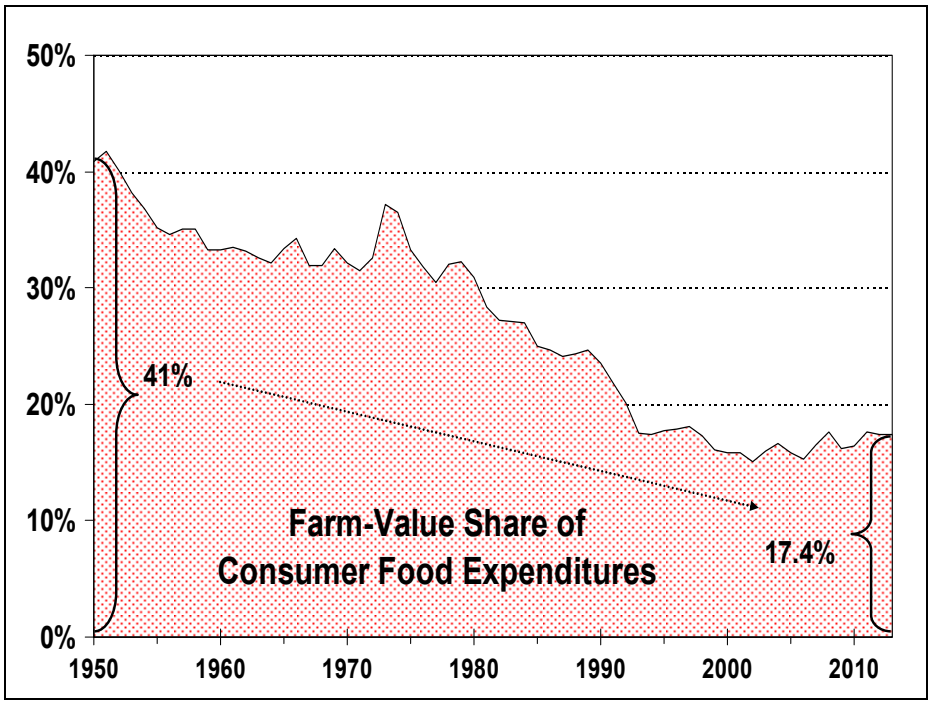
and "Price Spreads from Farm to Consumer," available at http://www.ers.usda.gov/data-products.aspx.

[4] Patrick Canning, "ERS Food Dollar Series Allows an In-Depth Look at Farm Level Components of the U.S. Food Dollar," *Amber Waves*, July 1, 2013.

[5] Downloaded from the ERS website in 2009. ERS has since discontinued reporting the farm share for bread.

Understanding the economic forces affecting both the farm-value and marketing value-added shares of the consumer's food dollar provide useful information concerning the potential effect of a farm price change on retail prices, and vice versa.

Figure 2. Farm Share of U.S. Food Expenditures Has Declined Since 1950



Source: Derived from multiple ERS data sets: Food Expenditures and Food Dollar Series, USDA, downloaded June 8, 2015, at http://www.ers.usda.gov/data-products/food-dollar-series.aspx.

The farm-value share of consumer food expenditures also has fallen by more than half, from 41% in 1950 to 17.4% in 2013 (**Figure 2**). This means that U.S. farmers have been receiving an increasingly smaller share of what consumers pay for many retail food products over time. However, this should not be misconstrued to suggest that marketing costs are too high or that farmers' well-being has declined. These statistics do not address either of those issues. Marketing services expand in direct response to consumer demand for more marketing services, which, in turn, occurs for a variety of reasons.[6]

Farm-Value Share of Total Consumer Food Purchases

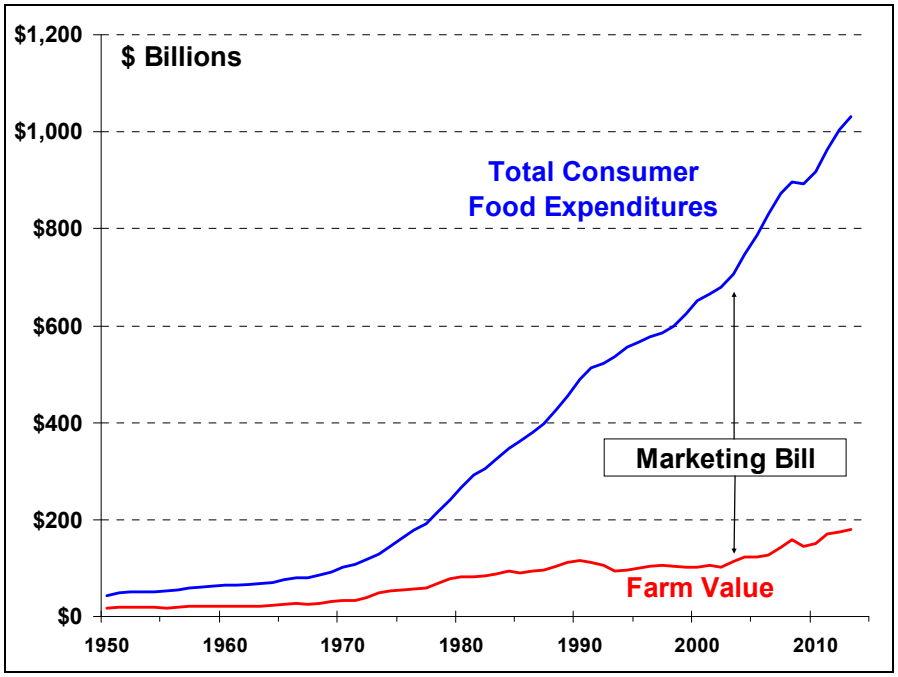
Total U.S. consumer food expenditures—for both at-home and away-from-home food—have expanded rapidly from about $102 billion in 1970 (**Figure 3**) to nearly $1,032 billion (in nominal dollars) in 2013.[7] However, a substantial portion of the increase in consumer food expenditures

[6] For more information, see the discussion under "Consumer Income and Expenditures," in CRS Report R40545, *Consumers and Food Price Inflation*.

[7] CRS has combined the new ERS Food Dollar Series (which covers 1993 to the present) with data from the original ERS marketing bill data series (despite the different methodologies underlying the two series) to be able to make generalizations concerning the U.S. food marketing bill over an extended period of time.

has been attributable to general price inflation rather than an increase in the volume of foods purchased.

Figure 3. Evolution of U.S. Food Expenditures, the Marketing Bill, and the Farm Share of U.S. Foods, 1950-2013



Source: See source and notes for **Figure 4**.

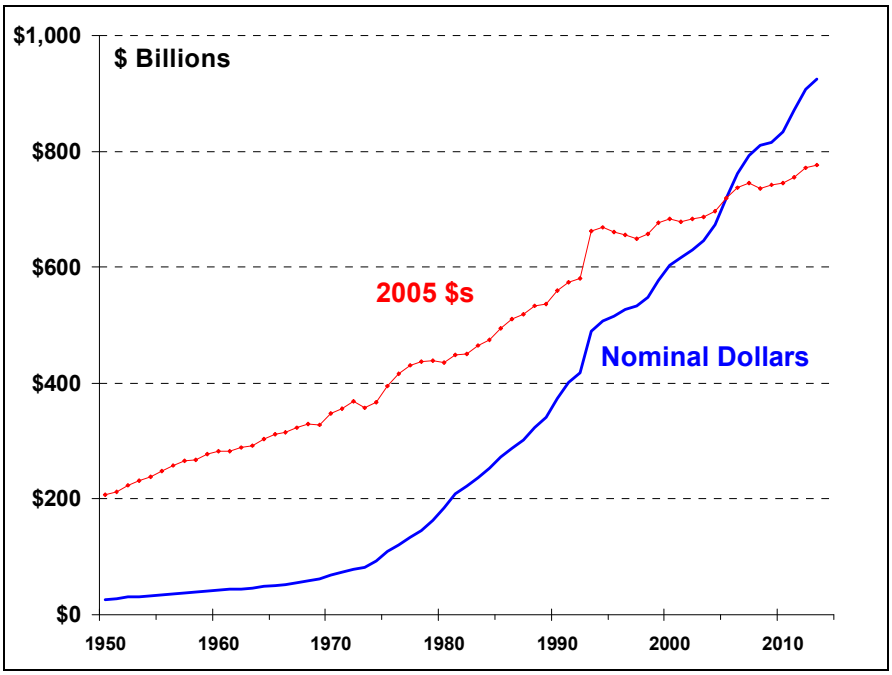
A breakout of farm and marketing shares (**Figure 4** and **Figure 5**) suggests that most of the price inflation has occurred in the marketing bill rather than the farm share.

- The U.S. food marketing bill rose from $69.2 billion in 1970 to over $925 billion in 2013 (**Figure 4**)—that is, costs for marketing services such as transportation, processing, and retailing have grown in both nominal and real terms.
- In contrast, the farm value of consumer food expenditures has risen in nominal terms, from $32.7 billion in 1970 to nearly $180 billion in 2013, but in real terms peaked in 1973, declined until 2002, and has gradually risen since (**Figure 5**).

A breakout of the farm share for at-home-food (i.e., retail grocery and food outlets) and away-from-home-food (e.g., restaurants and other purchased ready-to-eat foods) expenditures reveals that the market-value-added component of away-from-home-food expenditures has been rising substantially faster than for at-home-food expenditures (**Figure 6**).

- The farm share for at-home-food expenditures has been relatively stable in the range of 22% to 26%, whereas the farm share for at-home-food expenditures fell from 9.8% in 1997 to a lower range of 5% to 6% since 2000.

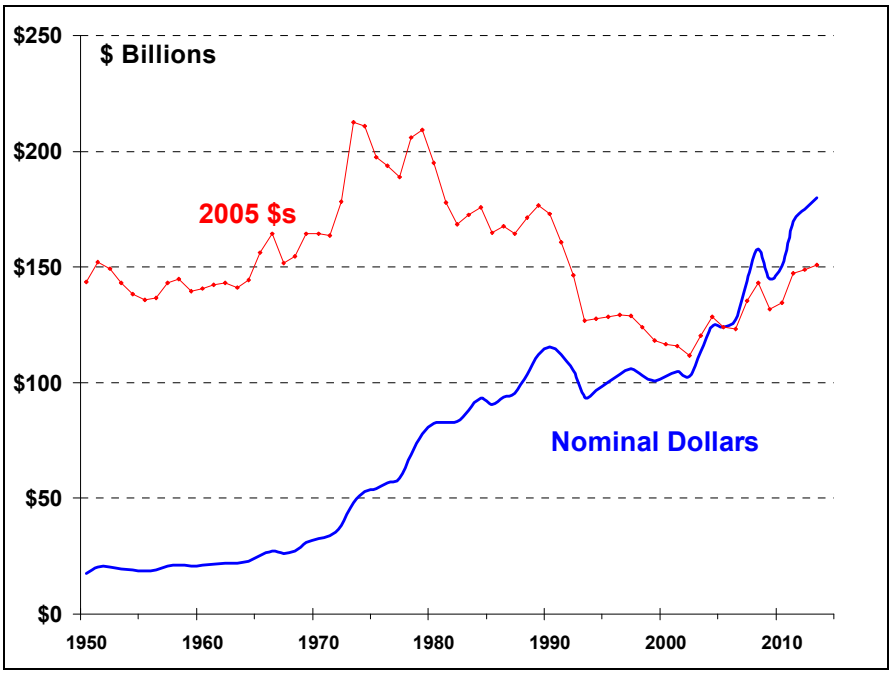
Figure 4. U.S. Food Marketing Bill of Total Food Expenditures, Real and Nominal, 1950 to 2013



Source: Derived from multiple ERS data sets: Food Expenditures and Food Dollar Series, USDA, downloaded June 8, 2015; at http://www.ers.usda.gov/data-products/food-dollar-series.aspx.

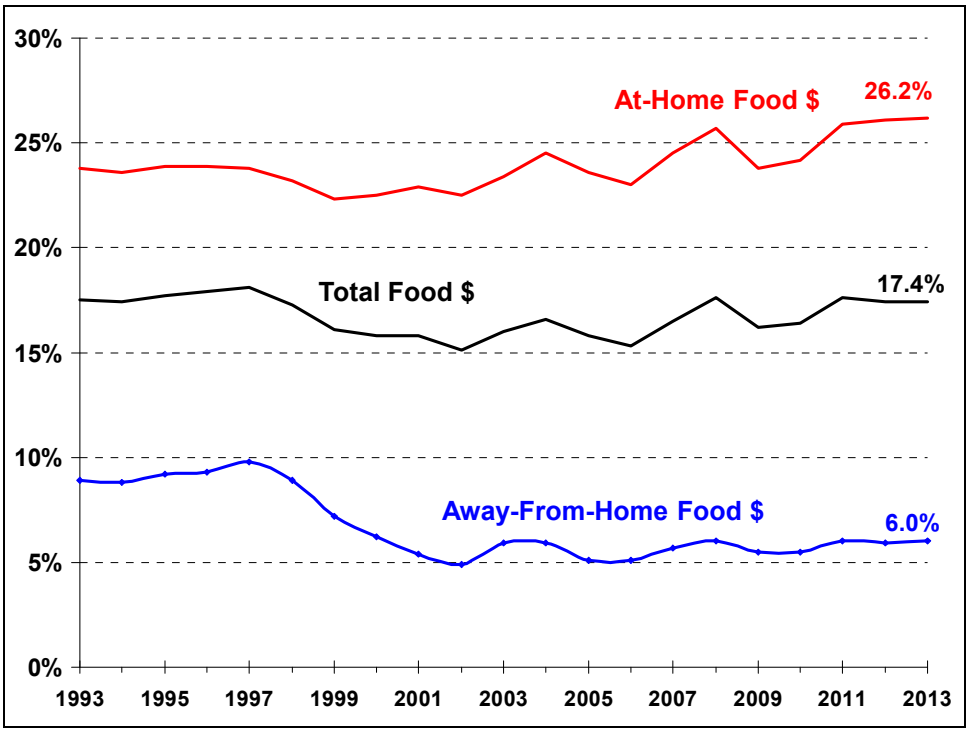
Notes: Nominal consumer expenditure data are deflated by the all-item Consumer Price Index (CPI), Bureau of Labor Statistics (BLS).

Figure 5. U.S. Farm Value of Total Food Expenditures, Real and Nominal, 1950 to 2013



Source: See source and notes for **Figure 4**.

Figure 6. Farm Share of At-Home Food Dollar Is Relatively Stable Since 1993, But Has Declined for Away-From-Home Food Dollar



Source: ERS, Food Dollar Series, USDA, data as of June 8, 2015.

Farm Share of Retail Price Varies by Food Groups and Individual Foods

In addition to its estimate of total food expenditures, ERS also constructs food market baskets for consumer at-home expenditures on selected food subgroupings (**Table 1**), as well as for several important individual food products within those subgroups (**Table 2**).[8] Annual estimates of farm share and marketing spreads are presented for each of these.

The food group market baskets contain the average quantities of food from a particular food group purchased by a typical American household during a one-year base period—they include only at-home expenditures; away-from-home expenditures are excluded. The farm share varies considerably among these different food products and groupings.

As a rule of thumb, the farmer receives a smaller portion of the shopper's dollar for foods requiring a higher degree of processing or special handling. Among the major food groups, the principal example of this "rule of thumb" is cereals and bakery products, where the farm share was just 8.3% during the 2007 to 2009 period. Cereals and bakery products involve a substantial degree of processing, first through a flour mill, then through a food processing plant, where the

[8] For information on how the market baskets are derived and then used to estimate the farm and marketing bill shares, see *Documentation*, "Price Spreads from Farm to Consumer," ERS, USDA, at http://www.ers.usda.gov/data-products/price-spreads-from-farm-to-consumer/documentation.aspx.

grain flour is combined with other products and baked before being packaged and shipped off to retail outlets. In addition, substantial costs are involved in shipping bakery products (e.g., each item is individually shelved so as not to crush ready-to-eat products). Finally, most cereal and bakery products are subject to substantial advertising and retailing costs, as competition for consumer interests can be fierce.

Table 1. Farm Shares for All Foods and 10 Major Food Groups

Food Group[a]	3-Year Average[b]	Farm Share (%)[c]	Marketing-Bill Share (%)[d]
Eggs	2010-2012	57.9	42.1
Beef	2012-2014	52.5	47.5
Broilers (composite)	2010-2012	42.5	57.5
Fresh Fruit	2011-2013	34.6	65.4
Dairy	2011-2013	32.6	67.4
Pork	2012-2014	31.1	68.9
Fresh Vegetables	2011-2013	24.7	75.3
Fats and Oils	2007-2009	24.0	76.0
Processed Fruits and Vegetables	2006-2008	17.0	83.0
Cereals and Bakery Products	2007-2009	8.3	91.7
Total Market Basket	**2011-2013**	**17.5**	**82.5**

Source: Derived from ERS data sets: Price Spreads from Farm to Consumer (http://www.ers.usda.gov/data-products/price-spreads-from-farm-to-consumer.aspx) and Meat Price Spreads (http://www.ers.usda.gov/data-products/meat-price-spreads.aspx), USDA, downloaded June 8, 2015.

a. Includes foods purchased for at-home consumption only. Farm values for fresh fruits and fresh vegetables are based on prices at first point of sale and may include marketing charges, such as grading and packing for some commodities.

b. Most recent three-year period with available data.

c. The value of the farm input contained in a retail food product, expressed as a share of the retail price.

d. The non-farm share of the retail food dollar.

In contrast to cereal and bakery products, eggs require relatively little extra processing, although a significant amount of crating and handling is involved. The average farm share for eggs was estimated at nearly 58% during 2010-2012. Similarly, fresh meat products for beef (52.5%) and broilers (42.5%) also had relatively high farm shares.

The lower farm shares for dairy (32.6%) and pork (31.1%) suggest that both these food groups undergo more processing and marketing, perhaps including more selective cuts and special retail packaging for pork, than for either beef or eggs in general. Similarly, the farm shares for fresh fruits (34.6%) and fresh vegetables (24.7%) suggest that, as perishable fresh products are shipped greater distances, handling and sorting, shelving and crating, refrigeration, shipping, and labeling have become increasingly important components of retail prices.

Table 2 presents estimated farm shares for several individual food items. The rule of thumb mentioned earlier clearly holds—the more highly processed food items have significantly lower farm shares than less processed products. For example, the average retail price for minimally processed eggs had an estimated farm share of 57.9%. In contrast, the average retail price for more highly processed ice cream had an estimated farm share of 16.6%. Citrus fruit products appear to involve substantial handling and shipping costs in their final retail prices, as the estimated farm share for grapefruit, oranges, and lemons ranged from about 12% to 19%.

Table 2. Average Farm Share of Selected Food Products

Food Type	3-Year Average	Food Item	Average Farm Share of Retail Price (%)
Animal products	2012-2014	Eggs, Grade A large, 1 doz.	57.9
Animal products	2011-2013	Whole Milk,1 gal.	52.5
Animal products	2012-2014	Beef, fresh, 1 lb.	52.5
Animal products	2010-2012	Poultry meat (composite), 1 lb.	42.5
Animal products	2011-2013	Cheese, natural cheddar, 1 lb.	31.7
Animal products	2012-2014	Pork, fresh, 1 lb.	31.1
Processed Fruit	2010-2012	Orange juice concentrate, reconstituted, 1 gal.	27.9
Crop products	2011-2013	Flour, wheat, 1 lb.	26.3
Crop products	2011-2013	Sugar, 1 lb.	25.9
Crop products	2008-2010	Margarine, 1 lb.	25.5
Fresh Fruit	2010-2012	Apples, red delicious, 1 lb.	25.2
Fresh Vegetables	2011-2013	Fresh—Lettuce, 1 lb.	23.6
Fresh Vegetables	2011-2013	Broccoli, cut, 1 lb.	22.2
Fresh Fruit	2011-2013	Fresh—Lemons, 1 lb.	18.7
Animal products	2011-2013	Ice Cream, regular, 1 gal.	16.6
Fresh Vegetables	2011-2013	Potatoes, 1 lb.	16.4
Fresh Fruit	2011-2013	Fresh—Oranges, California, 1 lb.	16.0
Fresh Fruit	2011-2013	Grapefruit, 1 lb.	12.4

Source: USDA, ERS; based on data from government and private sources; available as the "Individual foods" database at http://www.ers.usda.gov/Data/FarmToConsumer/pricespreads.htm. Otherwise calculated by CRS from available BLS and USDA data.

ERS's Food Dollar Series

USDA's Economic Research Service (ERS) measures annual expenditures by U.S. consumers on domestically produced food as part of its food dollar series.[9] This data series is composed of three primary series—the marketing bill series, the industry group series, and the primary factor series—that shed light on different aspects of the food supply chain.

Marketing bill statistics for food commodities have been published annually since the 1940s by ERS. The Agricultural Marketing Act of 1946 mandated that USDA measure the costs of marketing U.S. agricultural commodities. Due to measurement problems, the discontinuation of several underlying data sources, and increased interest in evolving supply-chain relationships, ERS, in 2011, replaced the original marketing bill series with the new food dollar series. The food dollar series uses input-output analysis to calculate the food dollar and its components for the years 1993 to 2013. The series is updated annually.

ERS uses input-output analysis to generate food dollar estimates (and food-and-beverage dollar estimates) for three food expenditure categories—total expenditures, at-home expenditures, and away-from-home expenditures (**Figure 6**). For each expenditure category, three primary dollar series are generated:

1. The **marketing bill** series (**Figure 7**) measures the food dollar share accruing to farmers from the sale of raw food inputs (the farm share), with the remainder accruing to food supply chain industries involved in all post-farm activities that culminate in final market food dollar sales (the marketing bill).
2. Because the market value of all food dollar expenditures equals the value added by all food dollar supply chain industries, the **industry group** value-added series (**Figure 8**) divides the food dollar into total value added for 10 industry groups: farm and agribusiness; food processing; packaging; transportation services; energy; retail trade; foodservices; finance and insurance; advertising; and legal and accounting services.
3. The **primary factor** series (**Figure 9**) divides the food dollar into the value contributions of four primary production factor groups—salary and benefits, property income, output taxes, and imports. Then a cross-tabulation table divides the food dollar into the primary factor returns for each industry group.

A Closer Look at the Food Dollar

Marketing Bill Share

The marketing bill series is based on sales proceeds of all food products of U.S. farm-origin consumed in the United States (both at-home and away-from-home). By definition, the difference between the retail price of a food product and its farm value is the marketing bill (referred to earlier as the farm-to-retail price spread or marketing margin). As such it includes all costs associated with getting the raw commodity from the farm to the consumer (including any profits).

Proceeds from each food dollar expenditure are divided into two sub-components of market value:

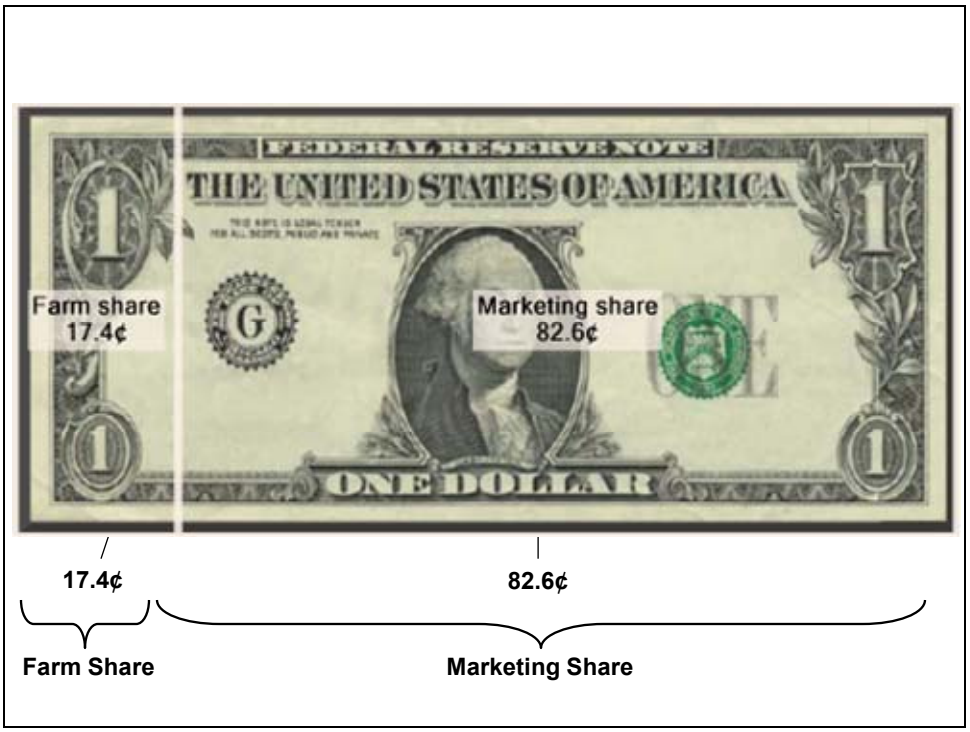
[9] The ERS Food Dollar Series includes data extending back to 1993; see ERS, Food Dollar Series database; available at http://www.ers.usda.gov/data-products/food-dollar-series.aspx. For a discussion of the methodology underlying the ERS Food Dollar Series, see *A Revised and Expanded Food Dollar Series*, Patrick Canning, ERS Report No. 114, February 2011.

- **Farm share** measures proceeds of farm commodity sales tied to a food dollar expenditure and sold to non-farm establishments. It does not include sales of farm commodities that are incorporated into other commodities and resold to a domestic farm industry—this eliminates double counting.
- **Marketing bill** is the market value added to farm commodities that are embodied in a food dollar expenditure, measured as $1 minus the farm share.

The size of the national aggregate marketing bill is affected by changes in the amount and type of products consumers buy. For example, restaurant meals have more marketing costs associated with them and are therefore more expensive than foods at grocery stores. So, as consumers spend more of their food budget at restaurants, the marketing bill increases. Similarly, as consumers purchase more highly processed food products, such as microwave-ready dinners, relative to less processed meats, eggs, and dairy, the marketing bill increases. Also, as food products travel greater distances to reach consumers, their marketing bill increases.

Since 1950, the U.S. marketing bill has increasingly taken a larger share of the consumer food dollar, growing from 59.1% of consumer food spending to 82.6% in 2013 (**Figure 2**). That same year USDA estimated the average farm share at 17.4% (**Figure 7**) out of an estimated $1,032 billion. The remaining 82.6% covered the cost of transforming the raw farm commodities into food products and getting them to retail store shelves, restaurants, and other outlets.

Figure 7. U.S. Food Dollar Breakout by Marketing Share, 2013



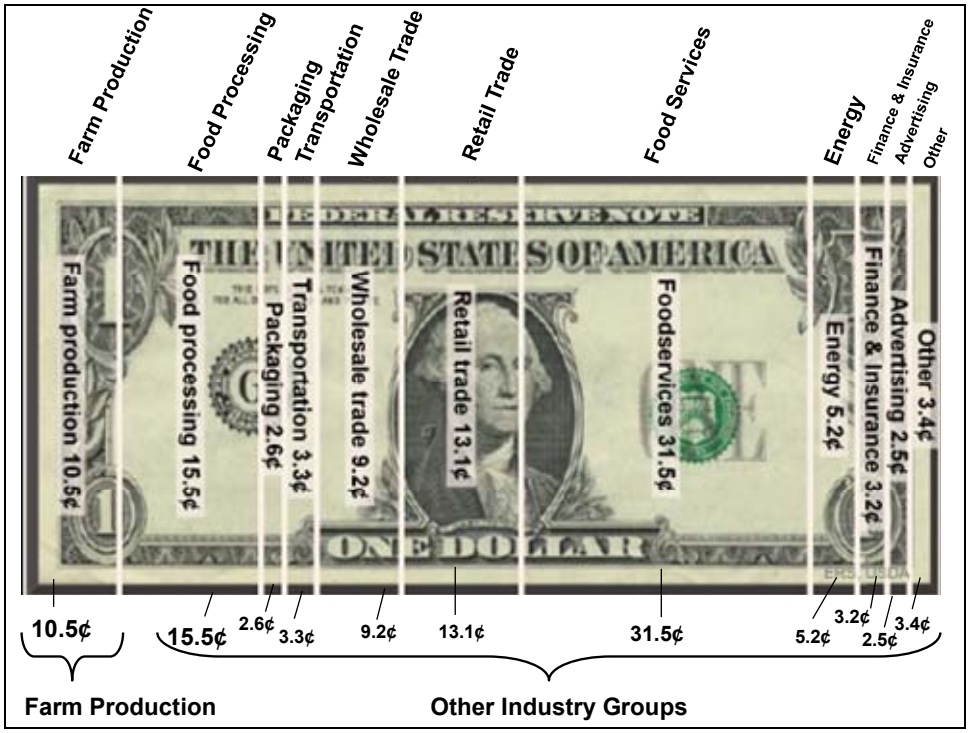
Source: ERS, Food Dollar Series, USDA, data as of June 8, 2015, at http://www.ers.usda.gov/data-products/food-dollar-series.aspx.

Industry Group Shares

Besides showing how much the marketing system as a whole receives, the national marketing bill provides a good indication of how these expenditures are divided among such marketing inputs as processing, energy, packaging, transportation, retailing, and so forth. Moreover, it enables measurement of annual changes in the individual components of the total marketing bill.

Industry groups are establishments grouped together by type of product or service provided. The major industry group components of the marketing bill (**Figure 7**) and their respective marketing-bill shares are listed and described below.[10]

Figure 8. U.S. Food Dollar Breakout by Industry Group, 2013



Source: ERS, Food Dollar Series, USDA, data as of June 8, 2015, at http://www.ers.usda.gov/data-products/food-dollar-series.aspx.

- **Farm and Agribusiness (10.5%)**—all establishments classified within the agriculture, forestry, fishing, and hunting industry, and all subcontracting establishments.
- **Food Processing (15.5%)**—all establishments classified within the food and beverage manufacturing industries, and all subcontracting establishments.
- **Packaging (2.6%)**—all establishments classified within the packaging, container, and print manufacturing industries, and all subcontracting establishments.

[10] See Food Dollar Series, "Documentation," ERS, USDA, at http://www.ers.usda.gov/data-products/food-dollar-series/documentation.aspx#primary.

- **Transportation (3.3%)**—all establishments classified within the freight services industries, and all subcontracting establishments.
- **Wholesale Trade (9.2%)**—all non-retail establishments that resell products to other establishments for the purpose of contributing to the U.S. food supply, and all subcontracting establishments.
- **Retail Trade (13.1%)**—all food retailing and related establishments, and all subcontracting establishments.
- **Foodservice (31.5%)**—all eating, drinking, and related establishments, and all subcontracting establishments.
- **Energy (5.2%)**—oil and coal mining, gas and electric utilities, refineries, and related establishments, and all subcontracting establishments.
- **Finance and Insurance (3.2%)**—all financial services and insurance carrier establishments, and all subcontracting establishments.
- **Advertising (2.5%)**—all advertising services and related establishments, and all subcontracting establishments.
- **Other (3.4%)**—establishments providing legal, accounting, and bookkeeping services, and all subcontracting establishments.

Primary Factor Shares

Primary factors (**Figure 9**) are assets employed by establishments to use or transform products purchased from other establishments (intermediate inputs) to produce and market a different product.[11] These assets add market value to the purchased intermediate products.

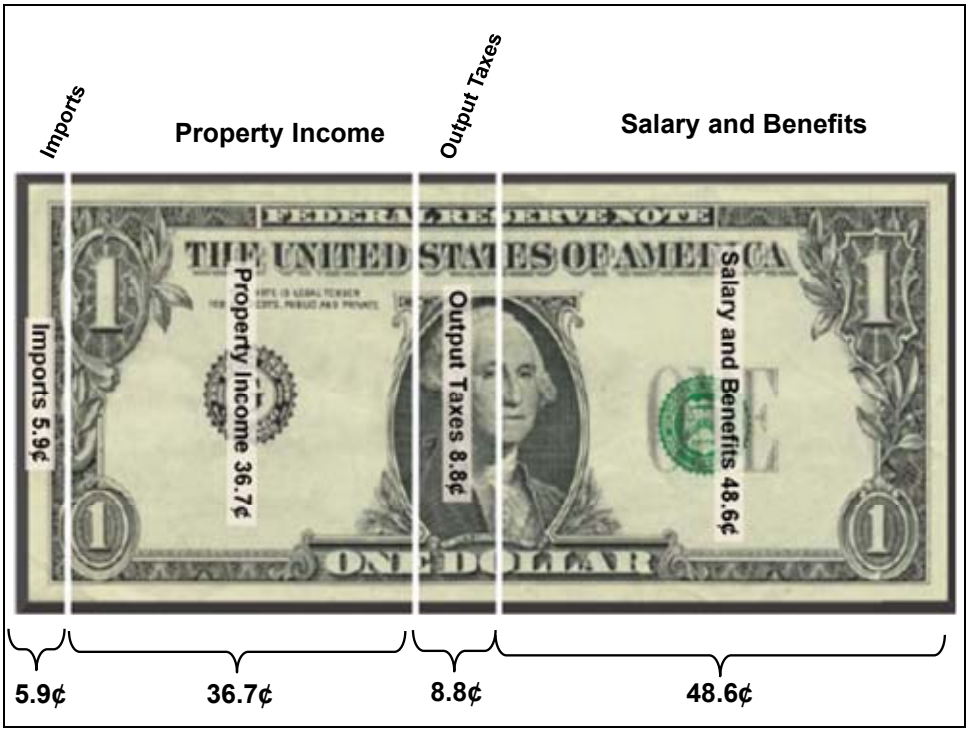
In the food dollar accounts, value added is recorded as income to primary factors as follows:

- **Salary and benefits (48.6%)**—pre-tax employee wages plus employer and employee costs for employee benefits for domestic hired labor—for services on behalf of a domestic establishment that directs sales towards fulfilling the supply of food to the U.S. market.
- **Property income (36.7%)**—pre-tax income or capital gain accruing to owners of non-labor primary factors of production—for example, machinery, equipment, structures, natural resources, product inventory, and other tangible or intangible assets—for services on behalf of a domestic establishment that directs sales to the U.S. food supply.
- **Output taxes (8.8%)**—excise, sales, property, and severance taxes (less subsidies), customs duties, and non-tax fees—are levied by federal, state, and local governments independently of establishment dispersals to primary factor owners. Taxes that are tied to outlays for domestic labor and capital, such as income-based taxes, are not reported separately but are included in the primary domestic factor returns.

[11] Ibid.

- **Imports (5.9%)**—food and non-food commodities that are imported from international sources and are used as inputs (e.g., petroleum imports for energy and transportation) by U.S. food supply chain industries producing for the U.S. market.

Figure 9. U.S. Food Dollar Breakout by Primary Factor, 2013



Source: ERS, Food Dollar Series, USDA, data as of June 8, 2015, at http://www.ers.usda.gov/data-products/food-dollar-series.aspx.

In 2013, half of every food dollar expenditure went to the salary and benefits of domestic workers, slightly more than a third was spent as property income, and the remainder was split between the U.S. government (as output taxes) and international assets as imports to the supply chain.

Linking Farm and Retail Prices

Price is the primary mechanism by which various levels of the market system are linked. While farmers and consumers sometimes do meet directly in farmers' markets, in most cases the raw farm product is separated from the retail food product by a complex processing and distribution system.[12] Farm-to-retail price changes may originate from three potential sources: (1) changes in farm prices; (2) changes in prices of marketing inputs along the farm-to-retail marketing chain; or

[12] Much of this discussion is based on William G. Tomek and Kenneth L. Robinson, "Marketing Margins," Chapter 6 of *Agricultural Product Prices*, 4th ed. (Ithaca, NY: Cornell University Press, 2003), pp. 117-142.

(3) changes in retail prices. This section will briefly discuss the various factors involved in understanding farm-to-retail price linkages—in particular, how they are measured and what influences them.

Farm-to-Retail Marketing Margin

As defined earlier, the farm-to-retail price spread is the difference between the farm share (i.e., the portion received by producers) of a food product's price and the price paid by final consumers. To estimate a food product's farm-to-retail price spread, the farm share must first be calculated. Once the farm share of a retail price is determined, then the price spread itself is determined. Price spreads may be calculated at various stages along the market chain as, for example, the farm-to-wholesale margin, the wholesale-to-retail margin, and the farm-to-retail margin.

Measuring Farm-to-Retail Price Linkages

Farm and retail prices are linked by the evolving dynamic embodied in the marketing system's attempt to respond to consumers' demand for marketing services. Changes in consumer preferences for food products at the retail level (e.g., increased demand for consumer-ready food products) can drive the food marketing system to add more or fewer services to the commodities grown by farmers. As the mix and price of services required to transform raw agricultural commodities into consumer food products change, so too does a food product's farm and marketing shares.[13] As a result, the nature of price transmission between the price paid by the consumer for the retail food product and the farm price of the underlying agricultural commodity can be better understood by evaluating two key aspects of any particular food product: (1) the farm share of the retail price, and (2) the competitiveness of markets at each stage of the marketing chain.

Farm Share

The larger the share of farm value in the retail product, the greater will be the effect of a change in farm price, other things being equal. In direct contrast, the greater the degree and duration of processing and value-added that is accumulated between the farm and the consumers, the smaller will be the effect of a change in farm price on the retail price. In other words, more highly processed food products are likely to show less price response to a change in the related farm commodity price than are less-processed retail products like meat. (However, some factors affecting farm commodity prices, e.g., energy costs, may concomitantly affect marketing inputs and services, which, in turn, would impact retail prices.)

The share of marketing inputs and services embodied in retail food products has been growing steadily over time relative to the farm share, as shown earlier (**Figure 3**). This would suggest that retail price responsiveness to farm price changes has been gradually diminishing over time.

[13] Ibid.

Market Competition

Price transmission will tend to occur both more quickly and more fully to changes in market conditions for farm commodities that move through marketing chains subject to more highly competitive market conditions—that is, markets with a large number of buyers and sellers dealing in commodities that have several potential close substitutes and where market information is transparent and easily accessed by all participants—than for those subject to less competitive market conditions.[14] In uncompetitive markets, certain participants may wield an abnormal degree of market power, and, as a result, prices may be less responsive to changes in market conditions.

The growing concentration of processing and retail firms in many food product markets has led many to question whether certain market participants wield excessive market power and exert undue influence in price formation. This concern has attracted greater scrutiny to changing market structures within the U.S. food distribution network and their potential effect on farm-to-retail price linkages. However, several factors other than market power can also make measuring the farm-to-retail price spread a difficult exercise.

Potential Measurement Difficulties

First is the fact that many agricultural commodities are used for numerous final products. Take corn, for example. Corn's primary use traditionally has been as an energy source in animal feed rations. However, corn is also processed into a large number of food and industrial products, including corn oil, starch, high fructose corn syrup, corn flour, grits, corn meal, beverage alcohols, and ethanol. The demand for corn at the farm level is derived from the demand for each of these uses, each of which trades in its own market subject to its own set of economic conditions. The same is true for soybeans, sorghum, wheat, and most other raw agricultural commodities.

In other words, U.S. and international food-product consumers must compete with livestock and poultry feeding operations, and industrial and other types of non-food uses, for a portion of U.S. agricultural output. The portion of non-food uses has expanded rapidly in recent years with the emergence of agriculture-based biofuel production as a new source of demand for raw agricultural commodities. These multiple sources of demand weaken the price linkage between the price for any single retail product and its related farm commodity price.

Another emerging factor that weakens the direct farm-to-retail price linkage is the evolution of the U.S. food distribution network, which has experienced a substantial expansion in the number and type of outlets in recent decades. This includes the growth of big box discount stores, the integration of ready-to-eat foods and/or deli sections at grocery stores, mini-marts, gas stations, pharmacies, other non-traditional outlets, and online food delivery services. As a result of this dynamic evolution in commodity markets and food retailing, simple pricing structures have increased in complexity, and the link between farmers and consumers is gradually becoming more diffuse, especially for highly processed products.

A prime example of this is how, in response to changing consumer preferences, grocery stores have been expanding consumer convenience by offering prepared entrees and side dishes ready

[14] For a discussion of agricultural markets for major field crops, see CRS Report RL33204, *Price Determination in Agricultural Commodity Markets: A Primer*, by Randy Schnepf.

for the oven, microwave, or even the dinner table. Many grocery store chains now include ready-to-eat food buffets and deli sections where made-to-take meals are prepared. All of these transformations are increasing the share of services needed to convert agricultural commodities into retail food products. This lowers the farm share of retail prices and weakens the potential retail price response to a change in a farm commodity price.

Farm-to-Retail Price Transmission

Vertical price transmission (hereafter referred to simply as price transmission) is the process by which changes in farm prices are transmitted along the marketing chain both downstream from farm to retail and upstream from retail to farm.[15] The adjustment to price shocks along the marketing chain is an important characteristic of the functioning of markets. Economists have identified three fundamental components that define the nature of price transmission:[16]

- **Magnitude.** How big is the response at each level to a shock of a given size at another level? This is referred to as the extent of pass-through. For example, a 100% pass-through from farm to retail would imply equal percent price changes at both the retail and farm level.
- **Speed of adjustment.** Do changes occur simultaneously, or are there significant lags in adjustment between marketing levels?
- **Asymmetry.** Do adjustments along the marketing chain differ depending on whether a shock involves a farm-level price rise or a decline? Another form of asymmetry involves whether adjustments differ depending on whether a price change is transmitted downward (from farm to retail) or upward (from retail to farm) along the marketing chain. This report focuses on the first asymmetry type—adjustment differences based on price rises versus price declines.

Asymmetry in price transmission directly encapsulates the concept of "sticky" retail prices mentioned earlier and addressed later in this report. To better understand asymmetric price transmission, consider two hypothetical examples (**Figure 10** and **Figure 11**) where a price rise at the farm level transmits both faster and more fully to the retail level than does a price decline. In the first scenario (**Figure 10**), an upward farm price shock of 40% occurs immediately at the start of the first month (M1). The farm price shock translates into a gradual 15% retail price rise that begins one month later and is spread over an entire month. In this case, the magnitude or degree of pass-through would be (15%)/(40%) = 37.5% with a two-month lag (M1 to M3).

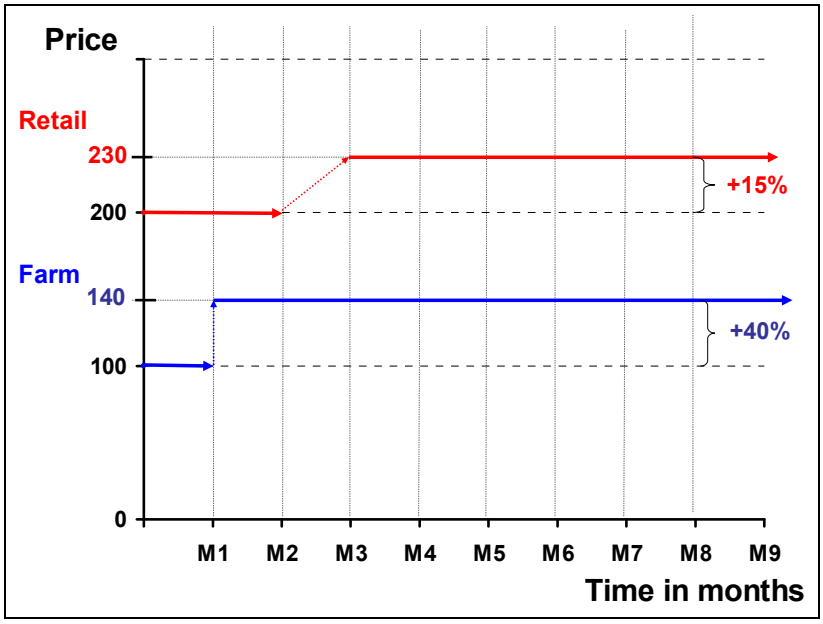
In contrast, the second example (**Figure 11**) is a downward farm price shock of 50% that eventually transmits into a 10% decline in retail prices. The retail price decline begins three months after the initial farm price shock and is extended over a three-month period for the 10% retail decline to fully occur. Most of the pass-through occurs during the fourth and fifth months, followed by a very gradual sixth month of decline. In this later example, the magnitude of pass-through is (10%)/(50%) = 20% with a six-month lag (M1 to M7).

[15] Horizontal price transmission is the linkage between prices at the same stage of the marketing chain but at different locations (also referred to as spatial price transmission). For a detailed discussion of analytical issues related to measuring and interpreting vertical price transmission, see "Analysis of Price Transmission Along the Food Chain," by Pavel Vavra and Barry Goodwin, *OECD Food, Agriculture and Fisheries Working Papers*, No. 3, OECD, Paris, 2005.

[16] Ibid., p. 3.

The implication of asymmetric price transmission as portrayed by these examples is that consumers at the retail level would not fully benefit from a price reduction at the farm level. In contrast, processors and retailers would likely benefit from such "sticky" retail prices. One could also envision a case where an upward shock to retail prices due to a surge in consumer demand is only partially passed through to farm prices such that producers would not fully benefit from the retail price increase.

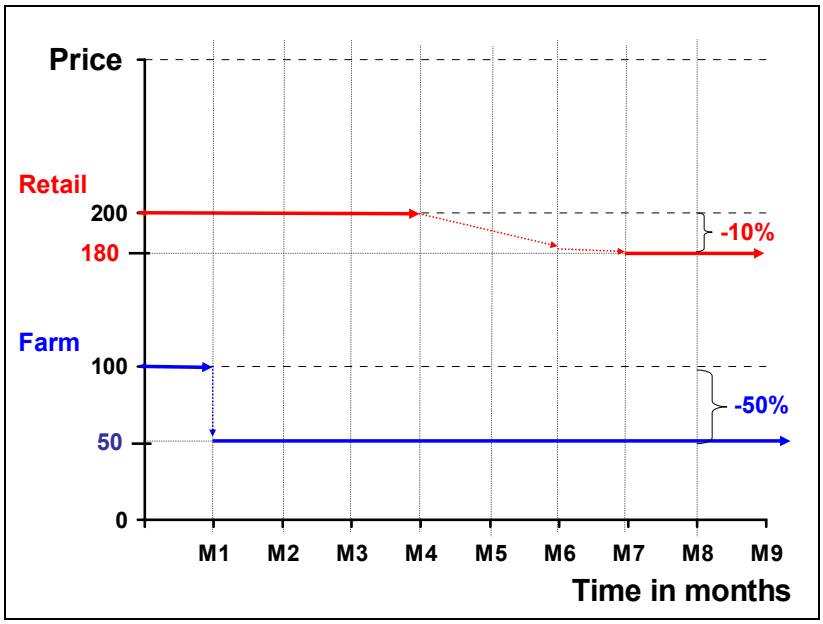
Figure 10. Hypothetical Price Transmission Following an Upward Farm Price Shock



Source: Hypothetical construct by CRS for exposition purposes only.

Note: In this example, the farm price rise occurs immediately at the start of the first month (M1) and is 40% of the initial farm price of 100. In contrast, the rise in the associated retail price begins one month (M2) later and takes one month to occur. When fully expressed, the retail price rise is 15% above the initial 200.

Figure 11. Hypothetical Price Transmission Following a Downward Farm Price Shock



Source: Hypothetical construct by CRS for exposition purposes only.

Note: In this example, the farm price decline occurs immediately (M1) and is roughly 50% of the initial price (100). In contrast, the decline in the associated retail price starts three months later (M4) and is spread over a three-month period, with most of the transmission taking place during the fourth and fifth months following the initial shock. When fully expressed, the full retail price decline is roughly 10% of the initial retail price of 200.

Agricultural producer groups are often annoyed when farm prices fall by more than retail prices, but economic analysis has shown that this can occur in a competitive market.[17] In other words, abnormal market power (e.g., monopoly, oligopoly, monopsony) need not be present for the phenomenon of asymmetric or "sticky" retail prices to exist. This is discussed further in the section of this report entitled "Why Do Retail Prices Tend to Be Sticky?"

What Is Known About Price Transmission?

While much empirical evidence exists in support of asymmetry between farm and retail prices, the empirical analysis is still inconclusive concerning the specific nature of price pass-through between farm and retail markets. This is perhaps largely because agricultural markets in general encompass such a vast array of commodities and products—each with their own particular set of product characteristics and market conditions. However, a broad review of economic analysis on the relationship between farm and retail prices leads to three generalizations:[18]

- first, causality usually runs from changes in farm prices to changes in retail prices;

[17] William G. Tomek and Kenneth L. Robinson, "Marketing Margins," Chapter 6 of *Agricultural Product Prices*, 4th Edition (Ithaca, NY: Cornell University Press, 2003), p. 119.

[18] Ibid., p. 131.

- second, time lags in retail price response to farm price changes are generally months in length, even for perishables like milk, meat, and fresh fruits and vegetables; and
- third, retail prices appear to respond asymmetrically, with adjustments to increases in farm prices occurring faster and with greater pass-through than adjustments to decreases in farm prices.

Why Do Retail Prices Tend to Be Sticky?

The general perception (supported by considerable empirical evidence) is that retail food prices are "sticky"—that is, retail prices follow commodity prices upwards rapidly, but fall back only slowly and partially when commodity prices recede. A common concern of policymakers is that this retail "stickiness" is due to imperfect price transmission perceived to be caused by market power and oligopolistic behavior at some stage of the marketing chain.[19]

According to economic theory, the "stickiness" of retail prices should be inversely related to the degree of retail competition in a locality. More retail shopping opportunities in close proximity would engender greater price competition and should diminish the "stickiness" of retail prices. The same would be true of wholesale prices and markets or any other stage of the marketing chain. However, economic theory does not fully explain the observed phenomena.

Economists have noted several exceptions to the "retail price competition" paradigm that may limit retail prices from adjusting fully to downward farm price movements, including certain aspects of consumer behavior, as well as store inventory management and retailing strategies. As a result, the presence of asymmetric price transmission alone does not necessarily imply the presence of excessive market power. This section briefly discusses some of the various factors that might produce asymmetric price transmission other than market power.

Consumer Behavior

First, consider how consumer behavior could encourage price stickiness. Consumers often must make their food purchases while considering tight budget constraints. However, several factors other than retail price may enter into their grocery purchase decision, including time and convenience of food acquisition, strong consumer store preference, or strongly established consumer shopping patterns (e.g., picking up groceries at the nearby store on the way home from work). Also, the average level of a consumer's wealth is important, since higher-income consumers tend to be less price-conscious and less likely to change stores or shopping patterns due to food price changes. All of these factors contribute to a lower price responsiveness by consumers to retail price changes, which, in turn, allows retail outlets to keep prices higher than they otherwise would (were consumers more price-responsive) without losing market share, revenues, or profits.

[19] Pavel Vavra and Barry Goodwin, "Analysis of Price Transmission Along the Food Chain," *OECD Food, Agriculture and Fisheries Working Papers*, No. 3, OECD, Paris, 2005, p. 3.

Search Cost

Retail prices are local in the sense that consumers do not venture far to buy milk and fresh produce for daily consumption. When retail prices for certain food products rise, consumers may be reluctant to invest the time necessary to find cheaper alternatives. This concept is referred to as "search cost" by economists. A consumer will accept a "higher" retail price if the cost to change shopping patterns and search out a better price is perceived as exceeding the potential savings from such an act, particularly when the consumer would have to balance the savings for any one item obtained by switching grocery stores against possible price losses on other retail products in the new store.

Retail Inventory Management

Retail inventory management could also contribute to sticky prices. Large retail inventories purchased or forward-contracted during a period of high commodity prices may limit a shopkeeper's ability to lower prices. This would depend on how much profit margin exists on each item and how much loss on each item a store is willing or able to absorb. As a result of such inventory management issues, there is often a substantial time lag between farm and retail price changes—a decline in farm prices may take several months to pass through to retail stores as retail stores work through higher-priced inventories and contractual purchase obligations.

Menu Cost

The cost to a retail store of lowering prices may be prohibitive. Referred to in economic jargon as "menu cost," this refers to the costs associated with making changes in retail prices such as re-marking in-store price labels, updating advertisements and promotional flyers, and the like. Also associated with menu cost is the risk to the retailer's reputation from frequent price changes that send complex signals to shoppers. A retail store's perception of menu cost and its influence is also related to consumers' price responsiveness for a particular food item. For example, if the increase in sales generated by the lower price would fail to offset the cost associated with re-marking price labels, then a retail store would likely not lower its prices.

Market Uncertainty

Market price uncertainty regarding whether a price shock is permanent or temporary may influence retail price strategy, as firms are generally reluctant to chase temporary price movements. Such uncertainty may contribute to asymmetry in retail and farm price movements. For example, during periods when commodity and energy prices are particularly volatile (as in 2008), retailers may be reluctant to lower prices if there is a significant probability that their costs may turn around and rise quickly thereafter.

Volatile commodity prices generally translate into higher retail prices as dealers try to lock in profit margins in the face of uncertain costs. Subsequent "sticky" retail prices mean that consumers benefit only partially when commodity prices recede and are left with the perception (if not the reality) of paying for higher retail profit margins. In contrast, farm prices respond quickly to market conditions because most agricultural markets are highly competitive and because, unlike retailers, farmers have little say in the price at which they sell their products, only in the timing of such sales.

Incidence of a Change in Marketing Costs

In addition to the timing and pass-through aspects of price transmission, policymakers and market participants have also expressed concern over the incidence of an increase in the price of an input to the retail food production process (such as an increase in energy costs). Who bears the added cost? Is it:

- passed on to consumers in the form of higher prices,
- passed back to farmers in the form of lower prices, or
- absorbed by food processors in the form of lower revenues?

Most economists would agree that the time period under consideration is critical when evaluating the incidence of a change in a marketing input cost. Economic theory suggests that the price of the average food product will be more sensitive to an input price change in the short run than in the long run due to the time needed for price-induced behavioral adjustments to occur. For some commodities there may be a substantial time lag for food processors and consumers to adjust their behavior in response to a change in retail prices that result from a change in the price of a retail food product input. This may hold irrespective of the source of the input—e.g., whether an input purchase or technology adjustment in the case of food processors; an adjustment to inventories held by wholesalers or retailers; or a different consumption choice in the case of a consumer.

In the long run, both firms (food producers) and consumers have more time to adjust their behavior to relative input price changes, thereby mitigating the effects on consumer food prices. Some firms may exit the industry, while others may adjust their input mix by finding a cheaper alternative input or by altering the food processing technology so as to use less of the more expensive input or perhaps switch to a different input entirely. Finally, some firms seek out increased supplies of the more expensive input via imports or expanded domestic production (which would require a new growing cycle).

Similarly, in the long run, consumers have more time to substitute among food products in favor of obtaining their nutritional needs at the lowest cost. In so doing they shift their demand among individual food products.

In the short run, the time period is sufficiently short that wholesalers and retailers are unable to adjust their behavior or their technology or to acquire additional lower-cost supplies of the relevant marketing input. Then, food producers and consumers are limited in their response to an unexpected input price change. Under these conditions, a larger portion of an input price increase is usually passed along to consumers in the form of higher retail prices.

Extenuating Circumstances for Farm-to-Food Price Linkages

Certain characteristics of individual farm commodities can play an important role in determining the price transmission between the farm and the retail consumer. For example, livestock production tends to have a cyclical pattern driven by biological constraints in the gestation-birth process that limit producer response to market conditions. As a result, meat and dairy product prices are influenced by the long lag time involved in farm (or ranch) production adjustments to input (feed costs) or output price changes.

Annual crops tend to have seasonal patterns, although this pattern is strongly influenced by the storability of the individual commodity. Perishable products have a shorter shelf life and often require greater handling. As a result, prices for perishable products tend to show strong seasonal patterns; they are vulnerable to volatile swings as near-term conditions change; and long-term price formation is less correlated with current supplies and more correlated with producer behavior. In contrast, storable commodities (e.g., grains) can be moved in bulk and stored for several years at a time such that current supplies are an important factor in determining price volatility as well as both current and long-term price formation.

On the demand side, many food products have strong seasonal patterns of demand. For example, meat demand tends to rise in the summer months when grilling activity is at a maximum, and the demand for turkey is strongly correlated with the Thanksgiving and Christmas holidays.

Farm and Retail Prices Compared

During the 2006 to 2009 period, the news media reported on unusually wide variances between low farm and high retail prices, suggesting that perhaps some food retailers were profiting unfairly by engaging in price gouging.[20] The retail grocery business is highly competitive, making it unlikely that such activity could occur either on a large scale or for a sustained period of time. Sometimes consumers tend to focus on a single highly visible item that is purchased routinely (such as milk) to draw their conclusions about retail price responsiveness and market power, without fully understanding the time lag involved in a farm-to-retail price response for most commodities.

Another retail marketing consideration that may cloud retail price perceptions by consumers (about whether asymmetric price transmission has occurred) is the use of "loss leader" items, whereby a retail outlet sets the price for highly visible consumer items at below cost as a marketing strategy to attract consumers into the store. Supplementary consumer purchases of other goods with normal retail markups would then offset the loss on the leader items. Consumers may be easily confused when neighboring stores use different products as loss leaders, particularly in a period of volatile prices.

This final section uses national average price data to examine the farm-to-retail price linkages for several major commodities since 2006 when volatile prices characterized many agricultural markets.[21] This section is followed (in **Appendix**) by a series of comparisons of actual price data for certain select retail food products and their corresponding agricultural commodities.

Aggregate Price Indexes

Price indexes for major food groups are presented in a series of graphs to allow for a visual comparison of farm, wholesale (when available), and retail price movements for differences in

[20] For example, "Food Bill Still High? Blame 'Sticky' Prices," *Journal Gazette and Times-Courier*, October 19, 2008; Scott Kilman and Laren Etter, "Grain Costs Down, Groceries Not," *Wall Street Journal*, March 13, 2009; "Food Prices Continue to Rise, Despite Fall in Overall Inflation," *The Land*, online, January 29, 2009.

[21] To fully capture the potential time lags in price response between farm and retail prices, a long historical perspective is preferable. Since the rise in farm prices began in mid-2006, that year is selected as reference base—i.e., 2006 = 100.

magnitude, timing, and asymmetry in adjustment. National aggregate price indexes are presented in **Figure 12** and include:

- farm level represented by USDA monthly average farm price (MAFP) received for relevant food commodities,
- wholesale level represented by BLS Producer Price Index (PPI) for finished consumer foods, and
- retail level represented by BLS Consumer Price Index (CPI) for food-at-home purchases.

In 2008, prices for many farm commodities rose to record highs in the first half of the year. This scenario of rapidly rising farm prices (driven by tight supplies, drought, and other factors) occurred again three more times since 2009—late 2010 and early 2011, late 2012, and early 2014. In each case, the farm price run-ups eventually worked their way through the marketing system, first to wholesalers, then to consumers, where they translated into higher retail food prices.[22]

But the farm price rises were short-lived in each instance. Prices for most farm commodities eventually reversed direction and, in nearly every case, declined to such an extent that they gave back much, if not all, of the original rise. In contrast, most wholesale and retail prices leveled off or declined only slowly and only partially relative to the original price rise.

Grocer Margins

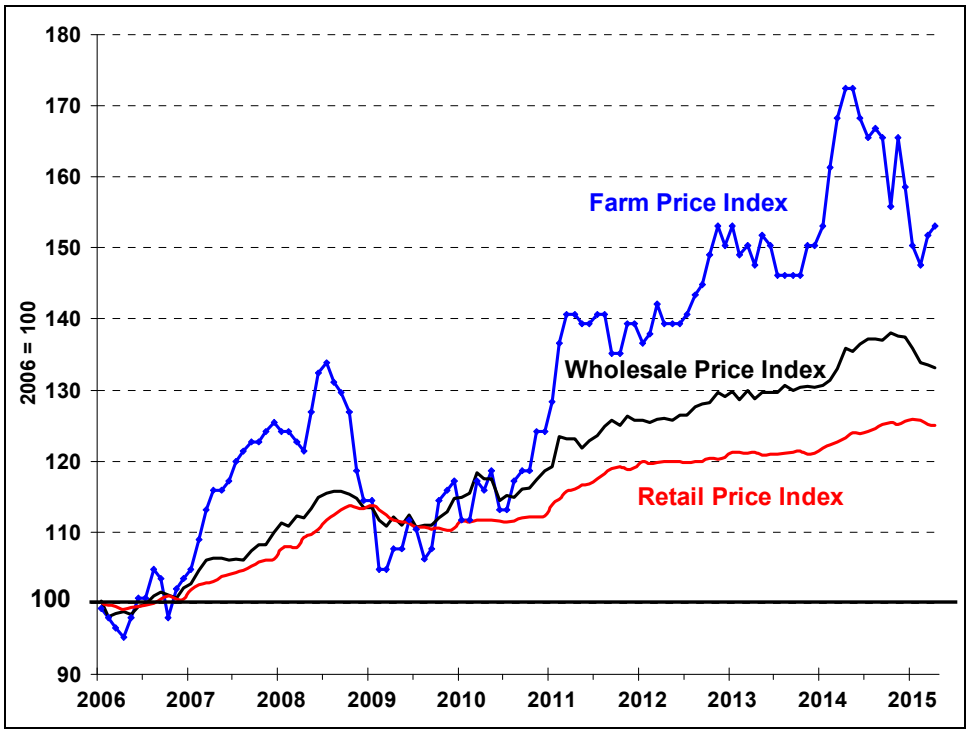
The spread between the food-at-home CPI (reflecting retail prices) and the PPI for finished consumer foods (reflecting wholesale prices) is often studied by market analysts as a gauge for grocer margins.[23] Clearly, by this comparison, the first three months of 2009 (**Figure 12**), when the CPI exceeded the PPI, represented a period of profitable margins for grocers (as did the first half of 2006). Of course, retail price changes vary widely by specific commodity and market.

Grocery store sales are generally competitive and, as a result, most prices stay within a fairly narrow trading range to avoid altering consumer behavior. In addition, the value added by the food marketing system is largely independent of farm prices, as evidenced when consumer prices have held steady or risen in the face of a decline in farm prices.

[22] As measured by the food-at-home CPI; see CRS Report R40545, *Consumers and Food Price Inflation*.

[23] "U.S. Govt. Data Show Food Prices Falling," *CME News for Tomorrow*, May 15, 2009.

Figure 12. Price Indexes for Farm, Wholesale, and Retail Food Products, 2006-2015



Source: The Farm Price Index is the farm food commodities prices-received index from the National Agricultural Statistics Service (NASS), USDA; the Retail Price Index is the Food-at-Home CPI, BLS; and the Wholesale Price index is the Producer Price Index (PPI) for Finished Consumer Foods from BLS.

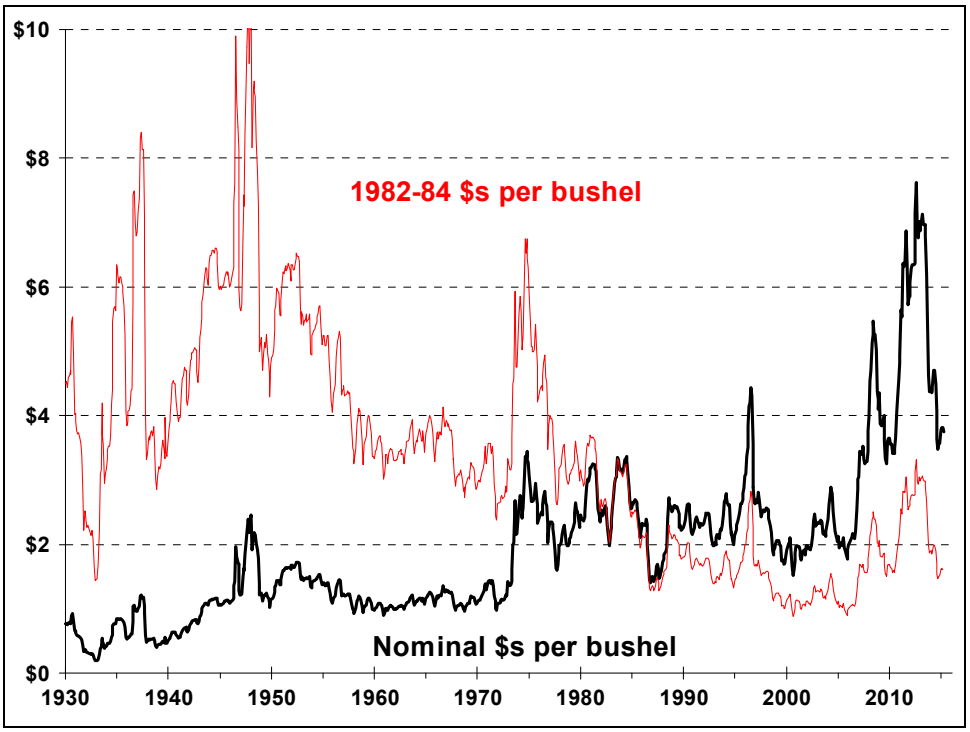
Declining Real Farm Prices

Historically farm prices have been subject to significant downward pressure due to tremendous gains in agricultural productivity resulting from improvements in farm machinery, cultivation and conservation practices, fertilizers and pesticides, animal husbandry, and animal and plant genetics. These productivity gains, in turn, have resulted in agricultural output tending to expand faster than demand. As a result, farm prices declined in real terms steadily from the late 1940s until 2006, as exemplified by the farm price of corn (**Figure 13**).

Several major market-shifting factors have emerged since 2006—including increased demand for corn under strong federal biofuels incentives, a prolonged surge in China's soybean import demand, and the severe U.S. drought of 2012—that resulted in tight U.S. and global grain and oilseed supplies and sharply higher farm and wholesale commodity prices through most of 2013.[24] Since 2014, a return to normal weather has helped farm production to catch up with demand and pressure most commodity prices lower.

[24] For a discussion of the rise in commodity prices since 2006 see CRS Report RL34474, *High Agricultural Commodity Prices: What Are the Issues?*

Figure 13. U.S. Monthly Farm Price for Corn, 1930-2015



Source: Nominal farm price (NASS, USDA) deflated by CPI (BLS), 1982-1984 = 100.

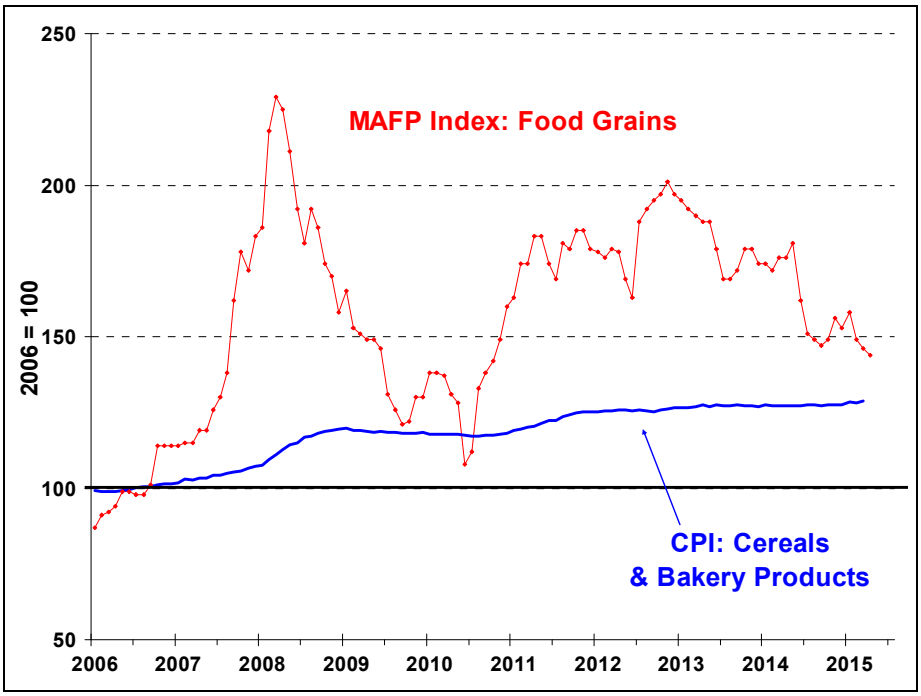
In contrast, the marketing bill has been subject to general inflationary pressures despite certain technological gains (e.g., in the processing, storage, and transportation sectors). As a result, the food marketing bill has risen rapidly in nominal dollars, and slowly but steadily in real terms (**Figure 4**). As a result, the farm share has tended to decline for most foods, while farm-to-consumer price spreads have widened. This is indicative of the extent to which the components of general inflation (i.e., energy, labor, rental rates, etc.) have increased in importance as a share of retail food prices.

Price Indexes for Major Food Groups

This section uses a series of charts (**Figure 14** to **Figure 20**) to compare price indexes for farm, wholesale (when available), and retail prices for several major food groups. The monthly average farm price (MAFP)-received data represent national averages that have been adjusted to comparable indexes where the average price for the year 2006 = 100. This allows a pure comparison across all prices indexes—farm (MAFP), wholesale (PPI), and retail (food-at-home CPI)—relative to their 2006 base. As mentioned earlier, most agricultural prices began their rise in 2006, making it an obvious point of comparison. Readers should note that, in every case:

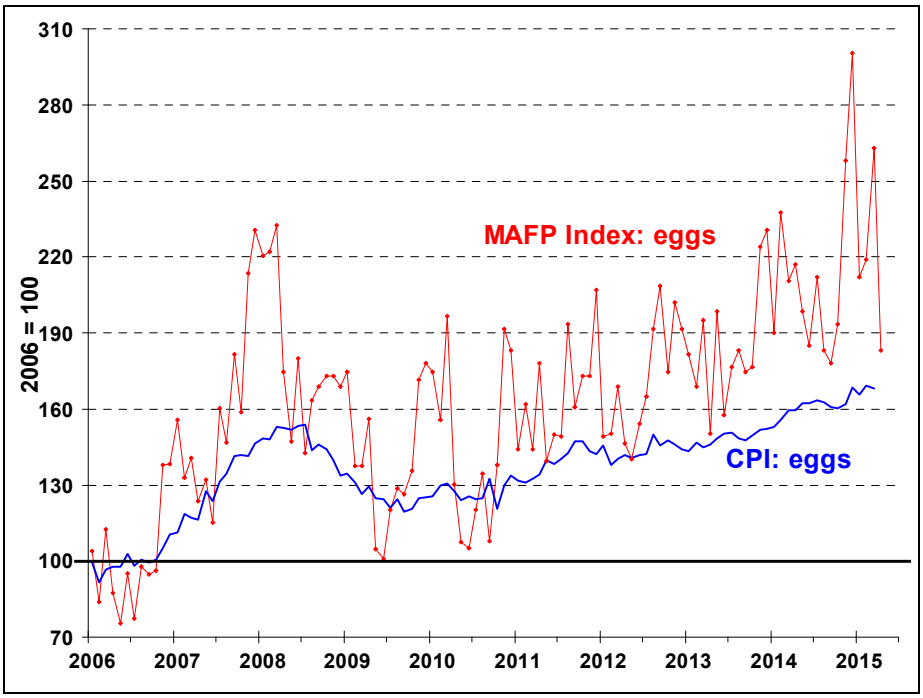
- the farm and wholesale price movements are substantially larger than the corresponding retail price movements; and
- the retail price peak follows the farm price peak with a lag of one to two months, with the exception of egg prices, where the farm and retail price indexes peaked in the same month, and cereal and bakery products, which peaked several months later than the farm price.

Figure 14. Cereal Price Indexes: Farm Food Grains vs. Retail Cereals and Bakery Product Prices



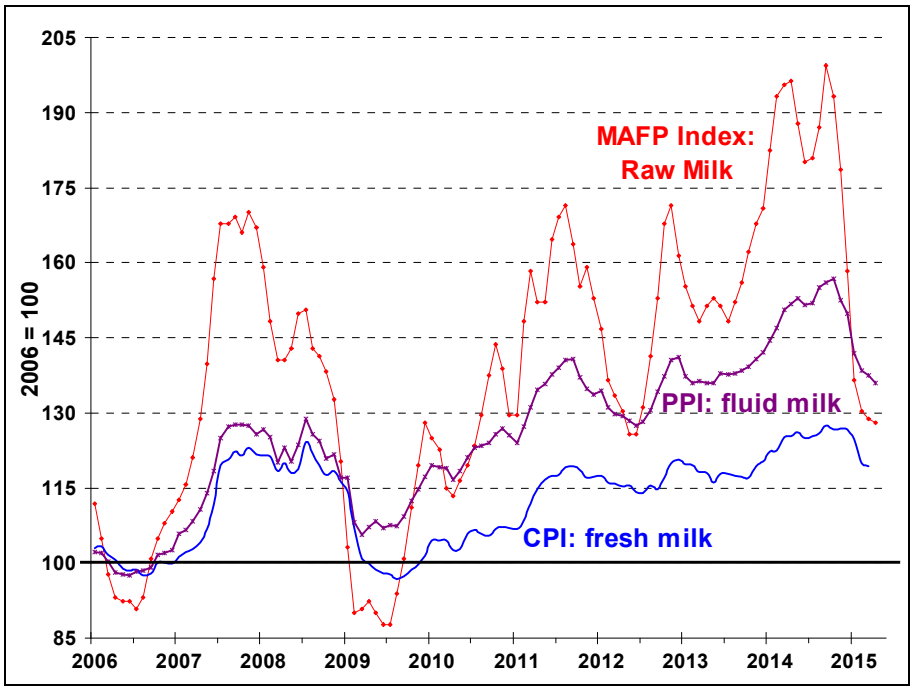
Source: Monthly average farm prices (MAFP) received are from NASS, USDA; Consumer Price Indexes (CPI) for major retail food groups are from the Bureau of Labor Statistics (BLS).

Figure 15. Egg Price Indexes: Farm Prices Received vs. Retail Prices



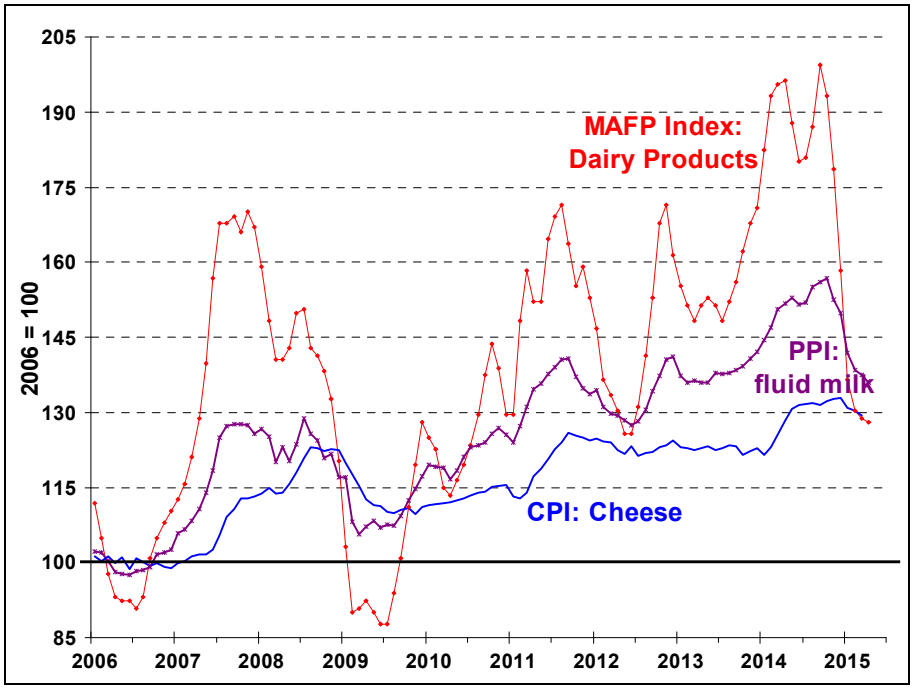
Source: Monthly average farm prices (MAFP) received are from NASS, USDA; Producer Price Index (PPI) and Consumer Price Indexes (CPI) for major retail food groups are from BLS.

Figure 16. Dairy Price Indexes: Farm Prices Received for Dairy Products, PPI for Wholesale Fluid Milk, and CPI for Retail Fresh Milk



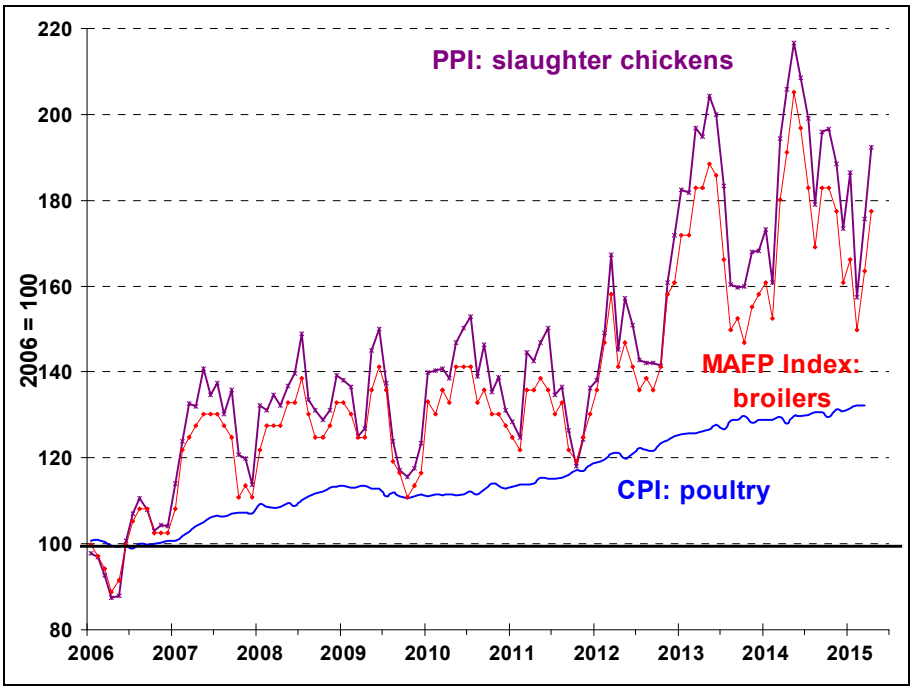
Source: Monthly average farm prices (MAFP) received are from NASS, USDA; Producer Price Index (PPI) and Consumer Price Indexes (CPI) for major retail food groups are from BLS.

Figure 17. Dairy Price Indexes: Farm Prices Received for Dairy Products, PPI for Wholesale Fluid Milk, and CPI for Retail Cheese



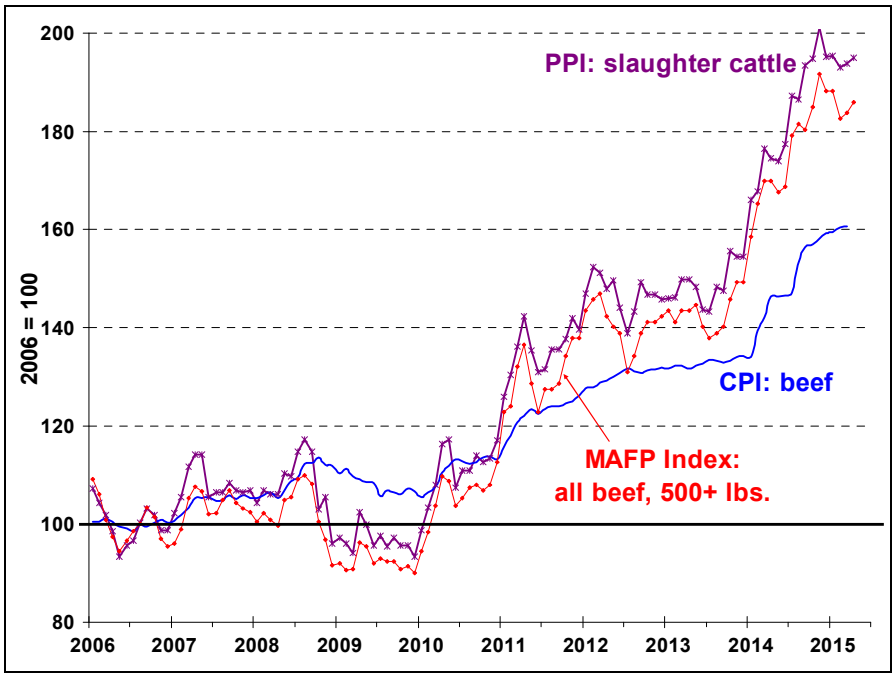
Source: Monthly average farm prices (MAFP) received are from NASS, USDA; Producer Price Index (PPI) and Consumer Price Indexes (CPI) for major retail food groups are from BLS.

Figure 18. Poultry Price Indexes: Farm Live Broilers, PPI for Wholesale Slaughter Chickens, and CPI for Retail Poultry



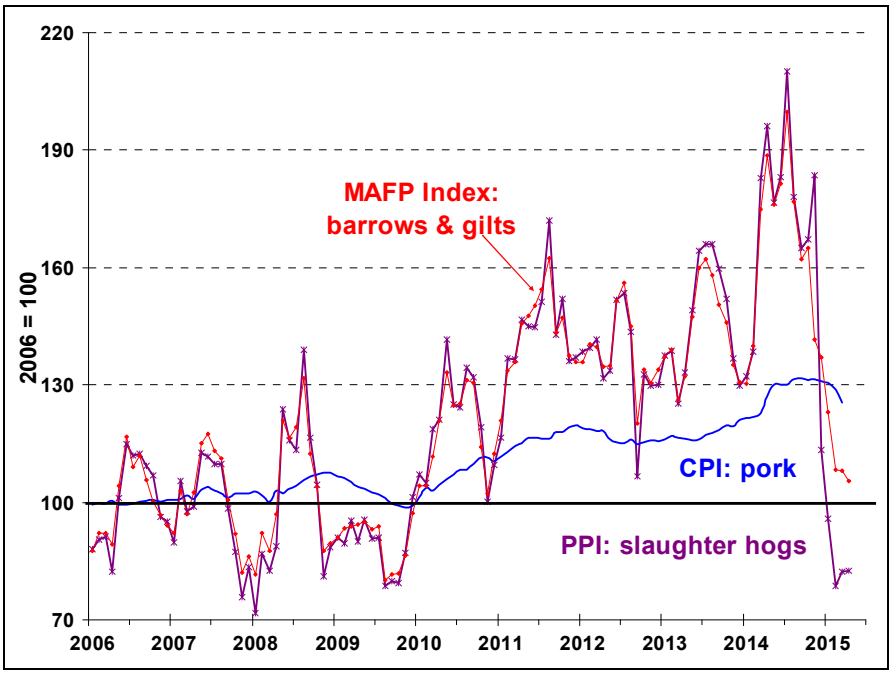
Source: Monthly average farm prices (MAFP) received are from NASS, USDA; Producer Price Index (PPI) and Consumer Price Indexes (CPI) for major retail food groups are from BLS.

Figure 19. Beef Price Indexes: Farm All-Beef (500+ lbs), PPI for Whole Slaughter Cattle, and CPI for Retail Beef



Source: Monthly average farm prices (MAFP) received are from NASS, USDA; Producer Price Index (PPI) and Consumer Price Indexes (CPI) for major retail food groups are from BLS.

Figure 20. Pork Price Indexes: Farm All-Hogs, PPI for Wholesale Slaughter Hogs, and CPI for Retail Pork



Source: Monthly average farm prices (MAFP) received are from NASS, USDA; Producer Price Index (PPI) and Consumer Price Indexes (CPI) for major retail food groups are from BLS.

Appendix. Farm Versus Retail Price Comparisons for Select Food Products

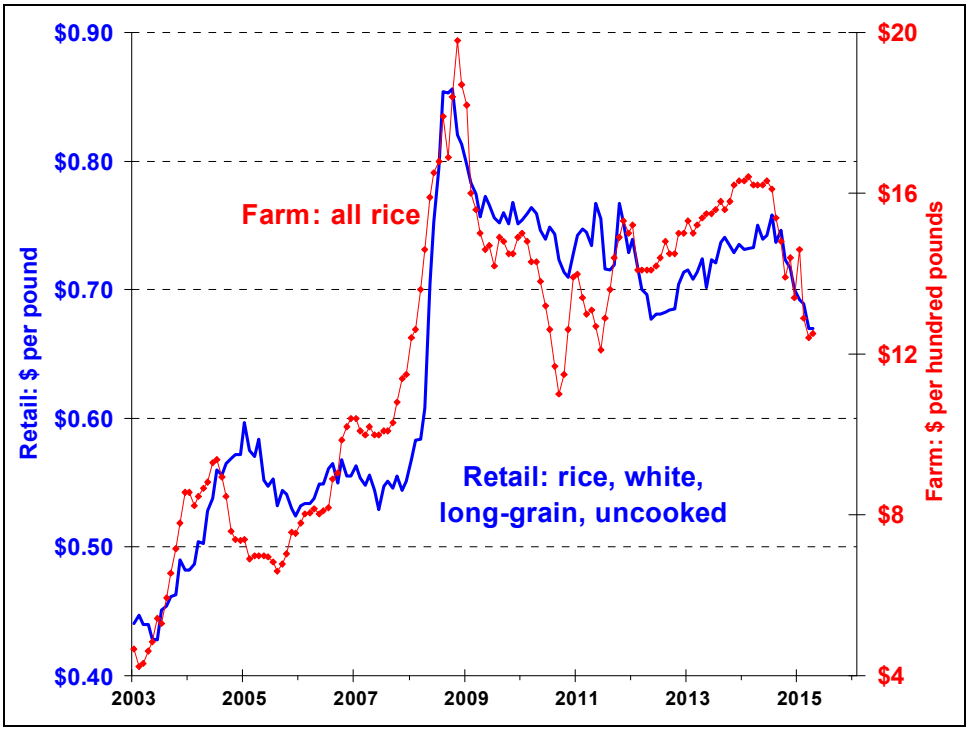
This appendix includes several figures that graph retail and farm prices for those food products that have clearly identifiable farm commodities as their raw ingredient. The farm prices are national average farm prices received as reported monthly by the National Agricultural Statistics Service (NASS) of USDA. The retail prices are U.S. city average retail prices as reported monthly by the Bureau of Labor Statistics (BLS).

In all the figures presented here, retail prices are highly correlated with the farm price of their corresponding raw commodity. In most cases, retail prices alter their direction in response to farm prices changes with only a slight lag.

Note to Readers

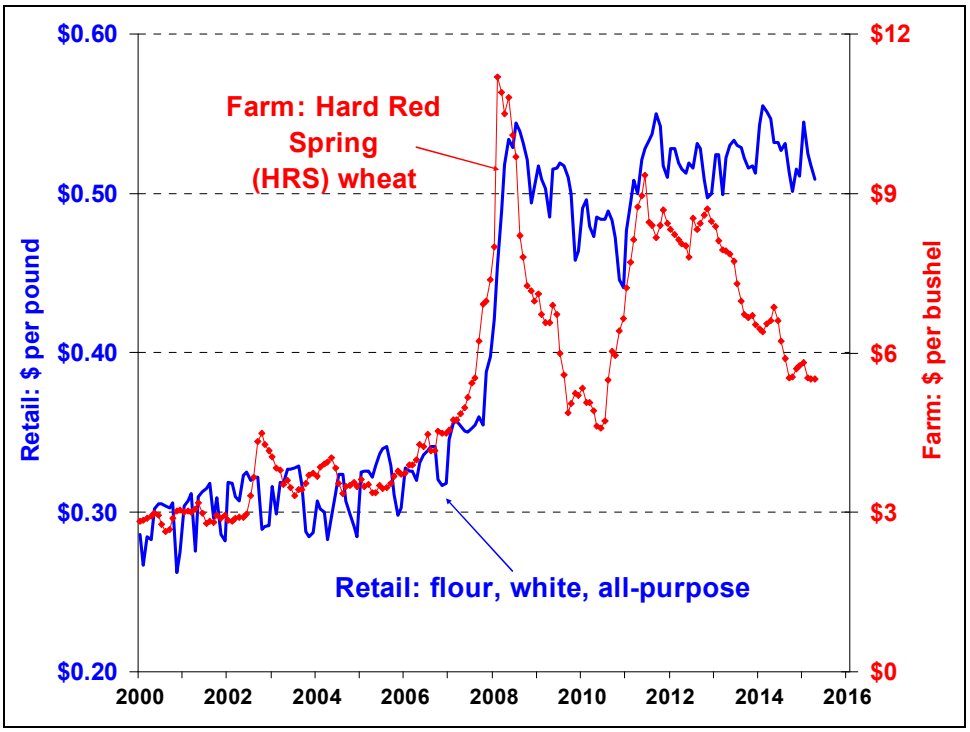
The farm and retail prices in the following charts each relate to a different axis with different measurement scales. As a result, these charts are not useful for evaluating farm-to-retail margins. Instead they are useful for evaluating differences in direction and response behavior between farm and retail prices.

Figure A-1. Rice Prices: Farm Rough, All-Rice Versus Retail White Uncooked Long-Grain Rice



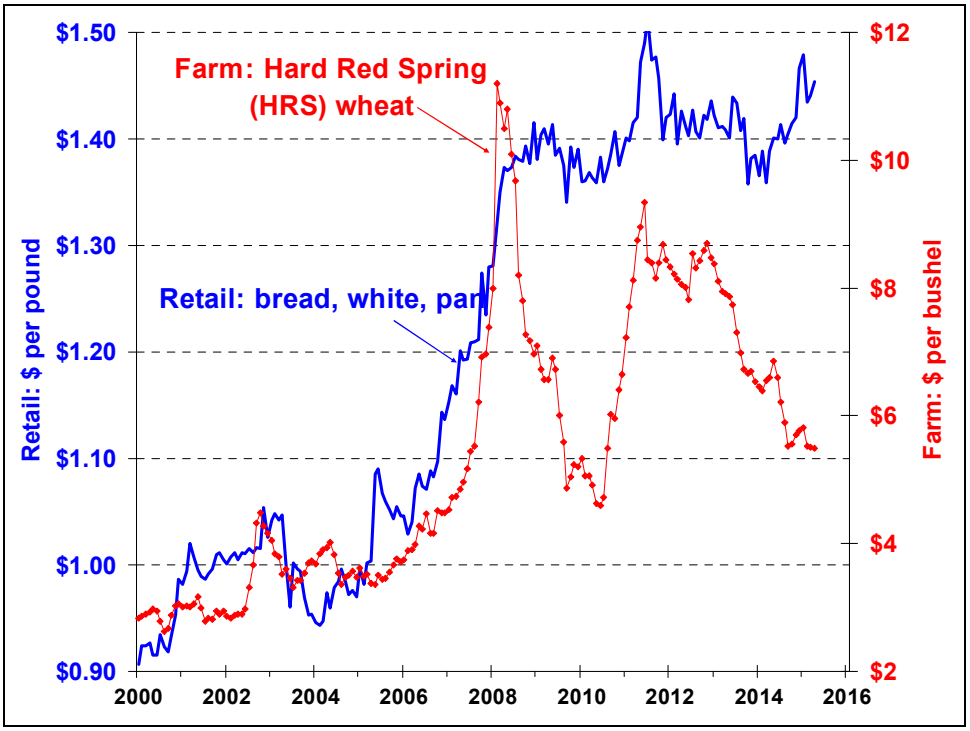
Source: Farm prices received data are from NASS, USDA; U.S. city average retail price data are from BLS.

Figure A-2. Wheat Prices: Farm High-Protein Wheat Versus White All-Purpose Flour



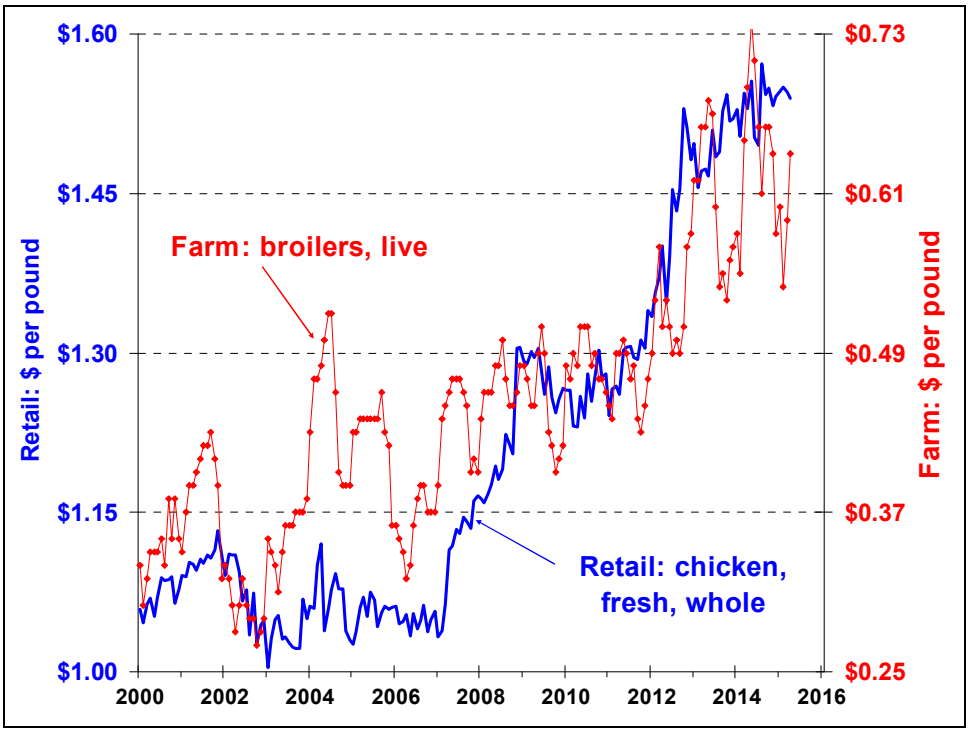
Source: Farm prices received data are from NASS, USDA; U.S. city average retail price data are from BLS.

Figure A-3. Wheat Prices: Farm High-Protein Wheat Versus White Bread



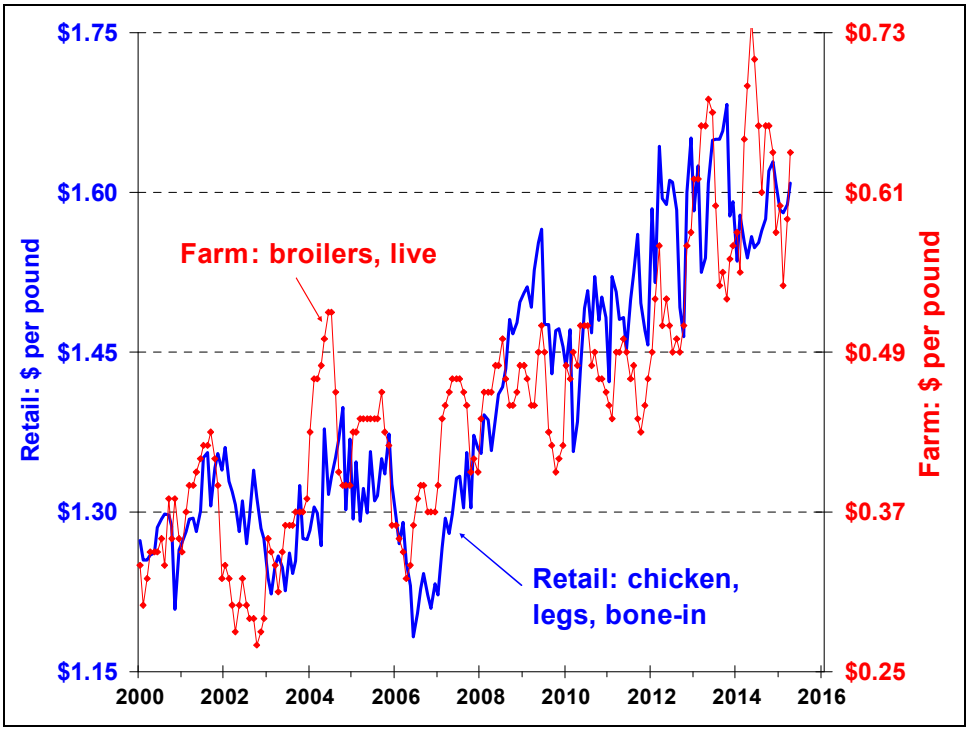
Source: Farm prices received data are from NASS, USDA; U.S. city average retail price data are from BLS.

Figure A-4. Chicken Prices: Farm Live Broilers Versus Retail Fresh Whole Chicken



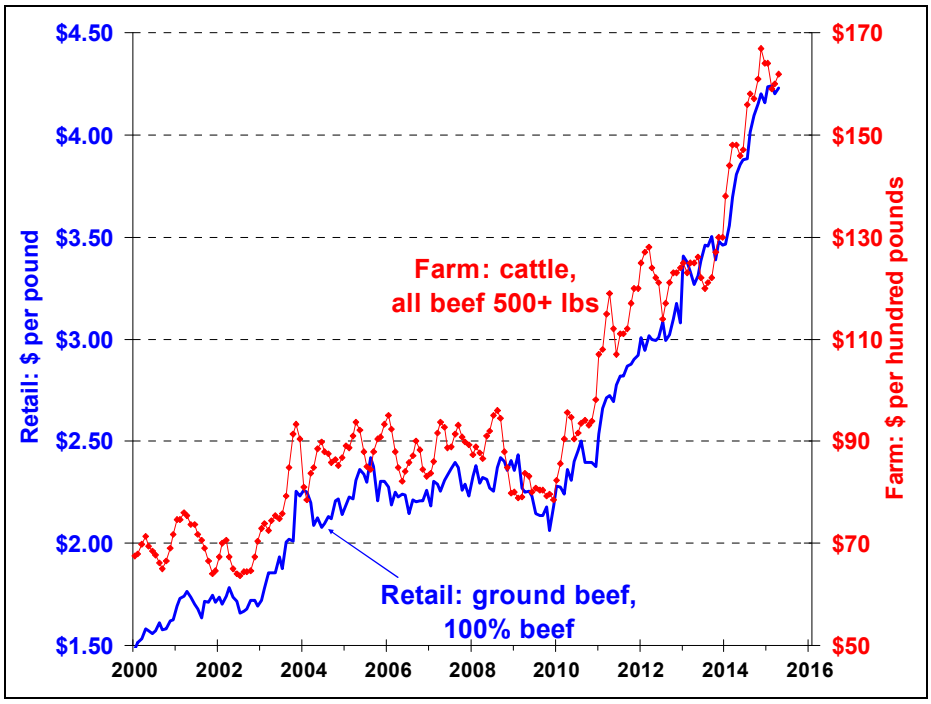
Source: Farm prices received data are from NASS, USDA; U.S. city average retail price data are from BLS.

Figure A-5. Chicken Prices: Farm Live Broilers Versus Bone-in, Chicken Legs



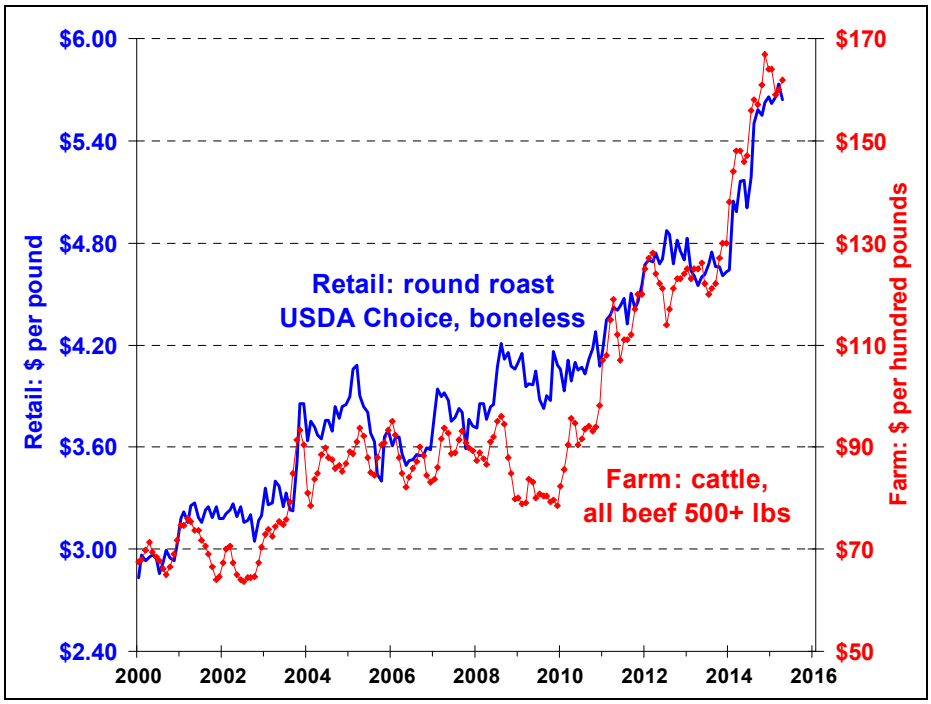
Source: Farm prices received data are from NASS, USDA; U.S. city average retail price data are from BLS.

Figure A-6. Beef Prices: Farm All-Beef Cattle (500+ lbs) Versus Retail 100% Ground Beef



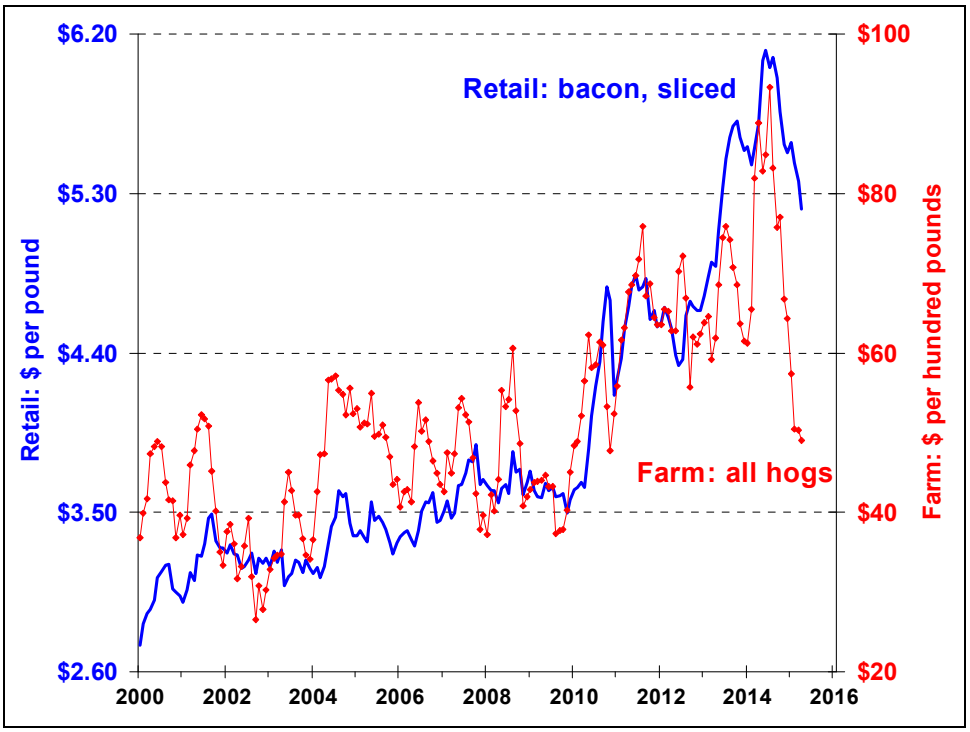
Source: Farm prices received data are from NASS, USDA; U.S. city average retail price data are from BLS.

Figure A-7. Beef Prices: Farm All-Beef Cattle (500+ lbs) Versus USDA Choice, Boneless Round Roast



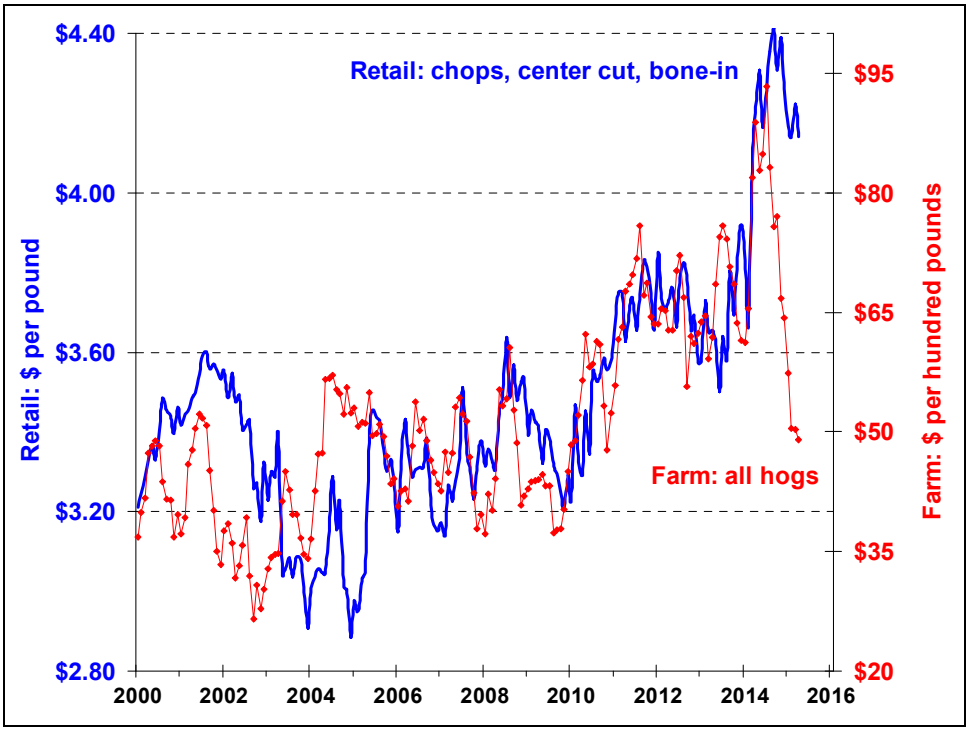
Source: Farm prices received data are from NASS, USDA; U.S. city average retail price data are from BLS.

Figure A-8. Pork Prices: Farm All-Hog Versus Retail Sliced Bacon



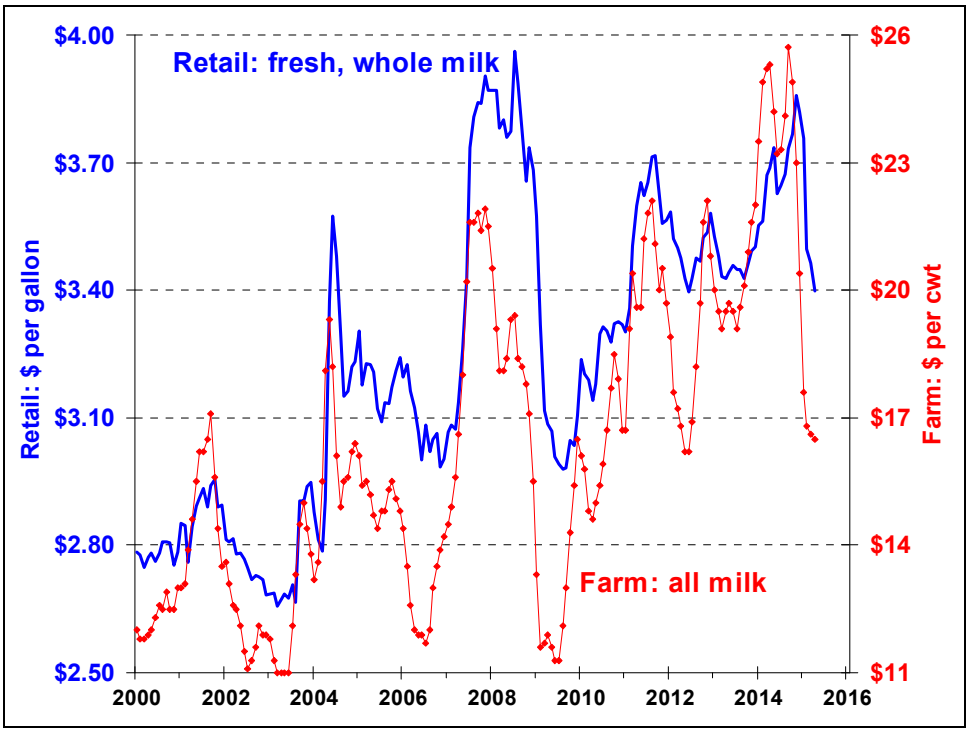
Source: Farm prices received data are from NASS, USDA; U.S. city average retail price data are from BLS.

Figure A-9. Pork Prices: Farm All-Hog Versus Chops (Center-Cut, Bone-In)



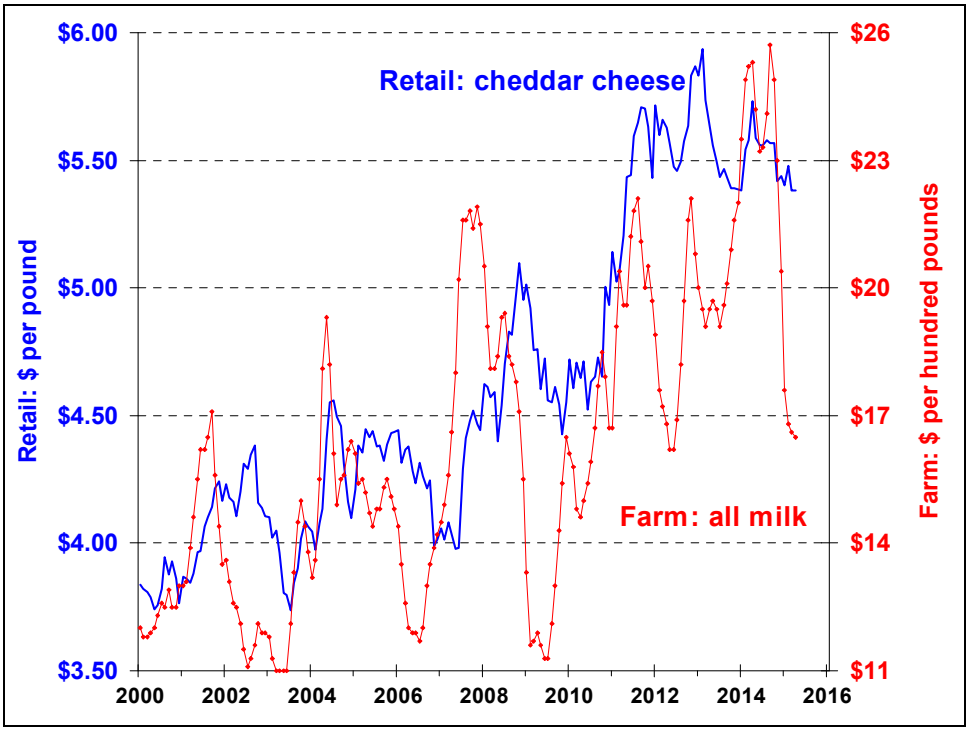
Source: Farm prices received data are from NASS, USDA; U.S. city average retail price data are from BLS.

Figure A-10. Dairy Prices: Farm All-Milk Versus Retail Fresh, Whole Milk



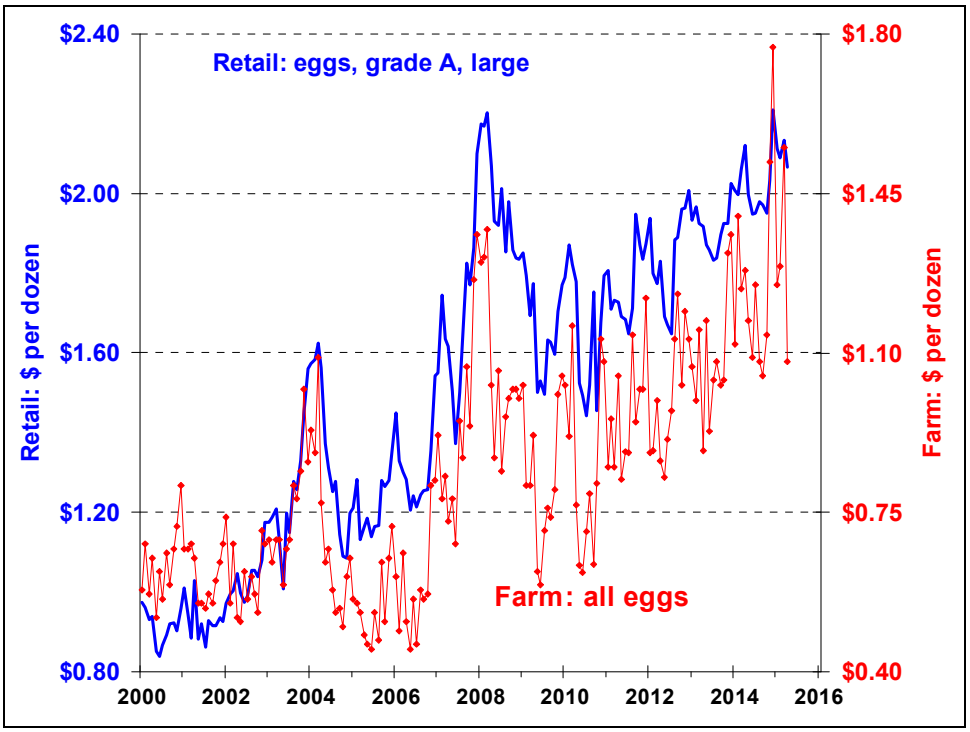
Source: Farm prices received data are from NASS, USDA; U.S. city average retail price data are from BLS.

Figure A-11. Dairy Prices: Farm All-Milk Versus Retail Cheddar Cheese



Source: Farm prices received data are from NASS, USDA; U.S. city average retail price data are from BLS.

Figure A-12. Egg Prices: Farm Versus Retail



Source: Farm prices received data are from NASS, USDA; U.S. city average retail price data are from BLS.

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