CHAPTER 7

STATISTICAL ANALYSIS OF BID PRICES FOR FIVE FSA COMMODITIES

Introduction

The statistical analysis aimed to answer the following questions:

◆ How do variations in related agricultural commodity prices affect FSA bids?

◆ Are FSA bid prices affected by declining FSA auction volumes?

◆ Do PL480 (international) shipments affect FSA domestic bids?

◆ Do FSA bid prices vary with requested package sizes? By how much?

◆ Do other product characteristics affect bid prices? By how much?

◆ Do bid prices show important seasonal variations?

◆ How important are transport costs?

◆ Do changes in the number of bidders affect FSA bid prices? By how much?

◆ What factors drive changes in bidder numbers?

The first question, the relationship of agricultural commodity prices to FSA bid prices, relates to FSA's ability to predict likely bid prices and to agency decisions to cancel auctions when prices are unacceptably high. For most commodities, changes in related agricultural commodities are the most important factor driving temporal changes in FSA bid prices, and many agricultural commodity prices fluctuate sharply through time. The analysis aims to identify typical responses of FSA bids to changes in commodity prices; with that information, FSA should be better able to identify those cases in which bid prices are unusually high.

The other questions relate to issues that FSA has some influence over. There have been fairly large changes over time in FSA monthly purchase volumes for both domestic and foreign (PL480) programs. In principle, if monthly volumes had a large effect on prices, FSA could consider altering purchase strategies in an attempt to reach volumes associated with the lowest prices. If the data were to show strong seasonal effects, FSA could move to shift the temporal pattern of purchases to low-priced months. Either decision would impose storage and transactions costs on clients, such as school lunch programs; the information from the analyses could help clients decide whether the price gains from volume shifting were large enough to offset any added costs.

Similarly, clients purchase a variety of specific products (for example, pasta can be spaghetti, macaroni, or rotini) in a variety of package sizes. Statistical information on the price effects of these choices can guide clients in making better decisions.

Over time, the typical number of bidders in FSA auctions has generally declined; moreover, during any given year, there are often large variations in the number of bidders participating in different auctions. Our analysis attempts to identify the effect of the number of bidders on prices, and to identify the factors affecting variations in the number of bidders. Information on the issues can help FSA to better identify those commodities, locations, and periods in which actions to increase competition would be most effective.

Methods

ERS investigated the above issues with regression analyses of FSA bid prices. Most regressions focused on the low bids in FSA auctions, although some analyzed all bids. The regression analyses aim to estimate the effect of variations in particular variables (for example, the number of bidders) on FSA bid prices, while controlling for other variables. For example, suppose that, on average, low bids in FSA auctions were higher in those auctions in which only a single bidder participated. That pattern could appear because of a lack of competition, but it could also appear if single-bidder auctions were more likely in auctions for delivery to high-cost, remote locations, or if single-bidder auctions were more likely during periods of high agricultural commodity prices. In regression analyses, we try to control for those other factors so we can more precisely identify the reasons for observed statistical relations. In other words, our analyses are designed to ask whether prices are higher in single-bidder auctions for given levels of agricultural prices and transport costs.

Regression analyses can be flexible in the sense that we can use them to see whether effects are linear or nonlinear. For example, it is reasonable to think that adding an extra bidder in a market with a single bidder might have a bigger effect on prices than adding another bidder in a market that already has six bidders; in short, the effect of adding a bidder varies with the number of bidders. Our analyses are designed to assess alternative specifications of how one variable might affect another.

No analysis is perfect. We will not be able to control for all possible factors that affect bid prices, and we will not be able to test among all possible (or even likely) ways in which the variables affect price. But we can provide a substantial amount of useful information. This chapter summarizes the key findings. Data sources and variable definitions were summarized in chapter 6.

Summary of Results from the Regression Analysis

We summarize the key findings below. Our discussion is organized around groupings of key related variables, and we attempt to emphasize the size of our reported effects and their implications in our discussions. Exact regression results, which contain a large number of separate coefficients and associated statistical tests, are reported in appendix B.

Linkages Between FSA Prices and Agricultural Commodity Prices

FSA purchases basic products that are closely linked to agricultural commodities. Some agricultural commodities display wide price swings through time, and these swings can have strong impacts on FSA product prices. Our statistical analysis allows us to identify the effects of agricultural commodity price changes on FSA bid prices. For this analysis, and those that follow, we regressed low bids in FSA auctions on the average delivery month spot price of the agricultural product, as well as the change in the agricultural price for 1 month back and 1 month forward. Other controls included product characteristics, the number of bidders, measures of auction volume, fixed monthly effects, and fixed State effects. Table 7-1 shows the results.

We list the related agricultural commodity for each of our five FSA products. The list is not exhaustive; for example, all-purpose flour uses wheats other than No. 2 soft white, but that price series gave the best fit to our data. In vegetable oil, two price series, for cottonseed oil and for soybean oil, gave the best statistical fit to the data when they were both used.

We represent the effect of agricultural price changes in two ways. First, we show the estimated effect on FSA prices of 10-percent increases in agricultural prices. The two flour products (bakery and all-purpose) show the strongest responses, 7.0 percent and 7.9 percent. By contrast, pasta prices are noticeably less responsive to wheat price changes, with a 3.4-percent increase in pasta prices following a 10-percent increase in durum wheat prices. Pasta requires more processing than flour, with the result that durum wheat is a smaller part of total pasta costs; hence wheat price changes have weaker effects on pasta prices than on flour prices.

The evaluation performed above asked how FSA product prices changed in response to uniform 10-percent increases in agricultural commodity prices. But some agricultural commodity prices fluctuate widely, while others do not. The final column looks at agricultural price effects in another way. It shows the estimated change in FSA product prices in response to a "typical" large change in an agricultural commodity's price.

Here, "typical" is defined as a two-standard-deviation change in price. If prices are normally distributed, then roughly 95 percent of observed prices will fall within two standard deviations of the mean price (that is, from two standard deviations above the mean to two standard deviations below). The calculated standard deviation will be quite small if prices in the sample show little variation, and it will be large in samples in which prices vary widely. In our analysis, "typical" large price changes have very little effect on peanut butter prices because peanut prices varied very little in 1992-96. By contrast, flour prices can easily vary by 20 percent in response to typical wheat price changes because wheat prices show some substantial variation and because flour prices are quite sensitive to wheat price changes.

The price effects in these models should be thought of as longrun effects; for example, they show how flour prices change in response to a 10-percent increase in wheat prices over those observed 1 year earlier. The models also show that FSA bid prices do not respond nearly as strongly to shortrun month-to-month fluctuations in agricultural commodity prices. In general, if agricultural commodity prices were to rise by 10 percent in a month, the resulting FSA bid prices could be expected to rise by about one-fifth as much as the numbers shown in table 7-1 (bakery flour bid prices would rise by 1.4 percent instead of 7 percent).

The longrun effects for wheat-based products are larger than one would expect to see for normal commercial distribution. As a first approximation, if an agricultural commodity price rose by 10 percent, we would normally expect manufacturer product prices to rise by an amount directly proportional to the share of the commodity in manufacturer costs. For example, U.S. Census Bureau data show that wheat accounts for 59 percent of flour mill costs; we would, therefore, expect flour prices to increase by 5.9 percent, following a 10-percent increase in wheat prices. But table 7-1 shows that FSA flour prices were more sensitive to wheat prices, with all-purpose flour rising by 7.9 percent and bakery flour by 7.0 percent. Following the same reasoning, Census data suggest that pasta prices should rise by 1.9 percent (wheat accounts for 19 percent of pasta costs), but FSA pasta prices rose by 3.4 percent in response to a 10-percent increase in wheat prices. Similarly, FSA peanut butter prices rise by 5.5 percent for each 10-percent increase in peanut prices, whereas Census data suggest that commercial prices would rise by about 3.5 percent. Only in vegetable oil were FSA prices in line with expectations: Census data suggest that vegetable oil prices should rise by 4.7 percent in response to a 10-percent increase in underlying agricultural commodity prices, while FSA prices rose by 4.0 percent.

The results imply that some FSA prices may be more sensitive to changes in agricultural commodity prices than commercial products are, an issue explored further in chapter 8, where we compare trends in FSA prices to trends in average manufacturer and retailer prices for similar products. This sensitivity is not undesirable, since it can come about if FSA is getting highly competitive prices for the products that it buys. In that case, agricultural commodity costs could be larger shares of FSA product costs than of commercial product costs.

Table 7-1: Projected effect of changes in agricultural commodity prices on FSA product prices

FSA commodity	Related agricultural commodity	Effect on FSA price of 10 percent increase agricultural price	Effect on FSA price of typical increase in agricultural price
		Percent	
All-purpose flour	No. 2 soft white winter	7.9	21
Bakery flour	No. 1 hard red winter wheat	7.0	19
Pasta	Durum wheat	3.4	16
Vegetable oil	Cottonseed & soybean oil	4.0	16
Peanut butter	Peanuts	5.3	5

Notes: The measures are derived from regressions of low bids on agricultural commodity prices, volume, product characteristics, measures of competition, seasonality terms, and fixed State effects. The typical increase in an agricultural price is a two-standard-deviation change in price.

Effects of Geographic Location on FSA Bid Prices

The FSA data clearly show that bid prices vary with the location to which the product is to be delivered. We identified the locational pattern of prices by entering separate variables representing each State into our regression analysis. The resulting estimates show how average bid prices vary across States, given product and packaging characteristics, seasonality controls, auction volumes, agricultural commodity prices, and levels of competition. Table 7-2 provides a summary of the results, by listing, for each of the five FSA products, the lowest price State, the highest price State, and the estimated price gap between the two.

Locational effects largely reflect transportation costs. The lowest price States are the States where production of the FSA product and the related agricultural commodity are concentrated—Kansas for flour and wheat, Minnesota for pasta and durum wheat, Georgia for peanuts and peanut butter, and Iowa for soybeans and salad oil. Very little transportation is required to deliver bakery flour to Kansas or peanut butter to Georgia. State effects increase as one moves away from production centers and incurs transport costs for the agricultural commodity, for the FSA product, or both. For flour, pasta, and peanut butter, prices are highest in New England and in the Middle Atlantic States.

Transportation costs are important parts of the final cost of the product for some locations and some commodities. For example, table 7-2 shows that prices for delivery of all-purpose flour to Maine are 31.1 percent higher, on average, than prices for delivery to Kansas. Other New England States face prices only slightly lower than Maine, and Middle Atlantic States (New Jersey, for example) see prices that are a little over 20 percent higher than Kansas prices. For distant locations like Maine, transport costs will account for over 20 percent of the delivered price of flour, while transport costs will account for less than 5 percent in Plains and Western Corn Belt States.

Transport costs are also less important for more highly processed products, like pasta and peanut butter. Prices rise for each product as one moves away from production centers, but prices for delivery of pasta to New England are only 12.7 percent higher than Minnesota prices because transport costs are a smaller share of the total for this product that has a higher value per hundredweight than flour.

Seasonality Effects

Each FSA product displays persistent seasonal movements in bid prices. These movements are analyzed in a model that already controls for agricultural commodity prices, so the seasonal effects capture movements in margins (the gap between product prices and agricultural commodity prices). The model includes separate variables for each month, and the results should be interpreted as showing differences in average prices across months, once one controls for agricultural commodity prices, product and packaging characteristics, measures of competition, and location and volume effects. Table 7-3 presents summary data on the monthly averages.

Flour and pasta products show persistent and fairly strong monthly effects. In each case, monthly peaks occur for products to be delivered in September, with

Table 7-2: Effects of geographic location on FSA commodity prices

FSA commodity	Low-price State	High-price State	Price gap
			Percent of low
All-purpose flour	Kansas	Maine	31.1
Bakery flour	Kansas	West Virginia	35.4
Pasta	Minnesota	New Hampshire	12.7
Vegetable oil	Iowa	Nevada	9.4
Peanut butter	Georgia	Rhode Island	7.5

Notes. The results are derived from the fixed State effects in the low bids regression, and measure the difference between the highest and lowest State effect.

Table 7-3: Effects of seasonality on FSA commodity margins

FSA commodity	Low month	High month	Price gap
			Percent of low
All-purpose flour	August	September	6.2
Bakery flour	July	September	14.7
Pasta	June	September	8.7
Vegetable oil	September	February	7.6
Peanut butter	May	December	3.9

Notes: The measures are derived from the fixed monthly effects in low bids regressions, and report the difference between the high and low months.

monthly troughs occurring just 1 to 3 months earlier. For both pasta and all-purpose flour, schools purchase disproportionate amounts for delivery in September—14 percent of pasta auctions and 9 percent of all-purpose flour auctions are for September delivery. This is particularly interesting because data presented in chapter 8 suggest that FSA prices are closest to commercial flour prices in September—that is by far the least favorable month for FSA to buy flour. The results indicate that schools contemplating peak-period purchases could save 6-9 percent on the purchase price, and possibly more compared with commercial prices, by shifting purchases to an earlier month. To decide if that strategy makes sense, buyers would have to weigh the purchase price savings against storage costs and risks of product deterioration.

The seasonal movements most likely reflect changes in capacity utilization at mills. For example, retail demand for flour increases sharply in the fall, leading to increases in capacity utilization at flour mills. Mills operating at full capacity are less likely to bid on USDA purchases, and when they do bid, they are likely to bid high. By contrast, mills operating with excess capacity are likely to bid more aggressively for USDA production because winning a bid will not lead to the displacement of other production.

How FSA Bids Vary with Product Characteristics

The five FSA commodities analyzed in this section can be purchased in a variety of different package sizes and in several specific product types. Bid prices vary systematically with these product types, and table 7-4 summarizes the average effects on bid prices.

In the statistical analysis, one specific product is chosen as the base size and product type, and prices for other sizes and product types are expressed as percentage deviations from the base price. We used a common product as the base in each FSA commodity category—5-pound bags of unbleached all-purpose flour, unbleached bakery flour delivered in bulk, spaghetti in 1-pound boxes, vegetable oil in 1-gallon bottles, and smooth peanut butter in 12-ounce cans.

The results are in line with what one might expect. The price per hundredweight falls as products are shipped in larger package sizes, although the magnitude of the package size effect varies across commodity categories. In all-purpose flour, for example, prices fall by a little over 5 percent as one moves from 5-pound to 100-pound bags. Prices fall more in moving from 50- and 100-pound bags in bakery flour to bulk shipment (13 and 10 percent, respectively). Package size effects in vegetable oil are quite large; prices rise by 34 percent as one moves to a 48-ounce container from a 128-ounce (1-gallon) container, and falls by 22 percent if one moves to bulk delivery from the 128-ounce container.

Product characteristics also matter. Macaroni and rotini cost about 10 percent more than spaghetti, while reduced-fat peanut butter, introduced in small samples near the end of the period, carries a price premium of nearly 40 percent over regular peanut butter.

Table 7-4: Effect of product characteristics on FSA prices

FSA commodity & base product characteristics	Alternate product characteristics	Price effect
		Percent of base
All-purpose flour	10-lb. bag	-1.8
Base: 5-lb. bag, unbleached	50-lb. bag	-4.6
	100-lb. bag	-5.6
	Bleached, 5-lb. bag	+1.9
Bakery flour	50-lb. bag	+13.0
Base: unbleached, bulk	100-lb. bag	+9.8
	Bleached, bulk	-1.4
	Hearth, bulk, unbleached	+8.2
Pasta	Spaghetti, 2-lb. box	+4.0
Base: Spaghetti, 20-lb. box	Macaroni, 1-lb. box	+9.7
	Macaroni, 20-lb. carton	+1.3
	Rotini, 20-lb. carton	+8.1
Vegetable oil	Shtng/hydrog veg oil, 3-lb. can	+19.8
Base: veg oil, 1-gal. bottle	Shtng/hydrog veg oil, 50-lb. can	-2.0
	Shtng/hydrog veg oil, 1-gal.	+4.9
	Veg oil, 48-oz. container	+34.2
	Veg oil, bulk	-22.3
Peanut butter	Smooth, # 10 can	-1.2
Base: Smooth, 2-lb. can	Smooth, reduced fat, # 10 can	+38.5

Purchase Volumes and FSA Prices

Monthly volumes of FSA commodity purchases declined sharply during the 1992-96 period. We wanted to assess the effect of that decline, if any, on prices. But that is not the only "volume effect" worthy of study in the dataset. FSA also purchases quantities of commodities for delivery overseas, and these monthly PL480 commodity volumes vary widely from month to month. We wanted to know if FSA foreign purchase volumes affected domestic purchase prices. In addition, the amount of product to be delivered to any specific domestic location in any particular auction also varies in the data; generally, one to five truckloads are up for bid for delivery to a particular location in a particular time window. We wanted to know if these variations in auction quantity had any effect on prices. Finally, inspection of the data reveals that there are large and persistent flows of product to some locations, but other locations receive only small and sporadic deliveries. We wanted to know if the total number of auctions for a location in the 1992-96 period had an effect on prices. That is, we suspected that remote locations that rarely received deliveries might be bid at higher prices. Table 7-5 summarizes the results of the statistical analysis of the effect of volume.

In general, auction quantities had small negative effects on price: moving from small (single-truckload) quantities to two- and three-truckload quantities would reduce bid prices by 0.5 percent to 1 percent in bakery flour, pasta, and vegetable oil, but had no discernible effects in all-purpose flour and peanut butter. Technically, that the coefficients on auction quantity in the all-purpose flour and peanut butter regressions were not significantly different from zero, and, with very large sample sizes, this means that the estimated coefficients were also very small. The other three regressions had statistically significant, negative coefficients, and the reported effects are the change in price attendant upon a two-standard-deviation change in quantity (see our earlier discussion of agricultural commodity price effects for why we use two-standard-deviation changes, and what they are).

Location volumes also mattered in that locations that regularly received deliveries generated bid prices that were between 0.5 percent and 1.5 percent lower than locations that rarely received deliveries. The effect, while small, appeared for four of the five FSA commodities; all-purpose flour was again an exception.

Three commodities are also shipped overseas as part of FSA's PL480 purchases—all-purpose and bread flour (we used all PL480 purchases of wheat flour), as well as vegetable oil. Mean monthly domestic purchases were close to mean monthly PL480 purchases, and the estimated coefficients of domestic and PL480 purchases were almost identical in each regression; that is, what appears to matter for prices is the total monthly volume

Table 7-5: Effects of purchase volumes on FSA prices

FSA commodity	Auction quantity	Total auctions at location	Volume measures	
			Monthly FSA commodity volume	Monthly PL480 commodity volume
All-purpose flour	No effect	No effect	U-shaped, small (1.5 percent) negative effect at mean	U-shaped, zero effect at mean
Bakery flour	Small (0.5 percent) negative effect	Small (1.5 percent) negative effect	U-shaped, modest (2.5 percent) & negative at mean	U-shaped, modest (3.5 percent) and negative at mean
Pasta	Small (0.5 percent) negative effect	Small (0.5 percent) negative effect	Large (6 percent) negative effect	n.a.
Vegetable oil	Small (1 percent) negative effect	Small (1 percent) negative effect	U-shaped, zero at means, negative at small volumes	U-shaped, zero at means, negative at small volumes
Peanut butter	No effect	Small (1 percent) negative effect	Large (7 percent) positive effect	n.a.

Note: n.a. means not applicable.

of USDA purchases, and not whether those purchases are foreign or domestic. In one sense though, PL480 purchases are more important: the standard deviation of PL480 volume is triple that of domestic volumes. That is, there is a lot more month-to-month variation in PL480 purchases, primarily because there are many months with low PL480 purchases.

The estimated effects of monthly purchase volume appear to be complicated, but the complicated effect is statistically quite significant, and the same pattern shows up in all three FSA commodities (therefore, there is good reason to believe that the complicated pattern is true and not some statistical artifact). The complicated effect is that the pattern is "U-shaped." That is, at low volumes of USDA purchases, increasing the volume of purchases will lead to lower bid prices. At high volumes (for example, when USDA is already purchasing large volumes through PL480), increases in domestic purchase volumes will lead to higher prices. The effects are not particularly large (in the range of 1-4 percent, depending on volumes). At sample means, the effects of changes in volume are close to zero.

Our analysis is limited by one important problem of timing. Our domestic volumes measure the amount to be delivered in any month. But the PL480 variable measures the amount that is contracted for in any month, and contracting occurs some time before delivery. As a result, the two volume measures may not match up appropriately. We experimented with different ways of handling the problem, but the estimation results were unchanged.

Two commodities, pasta and peanut butter, do not have corresponding PL480 purchase volume. In each, monthly volume has large effects, but of opposite sign. Typical increases in pasta volumes are associated with 6-percent declines in pasta prices, while typical increases in peanut butter volume are associated with 7-percent increases in peanut butter prices. We suspected that these results might have been spurious, picking up trends in the data that were otherwise unaccounted for, but the estimated volume effects did not change when we took steps to account for time trends.

Effect of Competition on Bid Prices

The number of bidders varies across FSA auctions. Some commodities, like peanut butter, almost always have at least three firms bidding, and usually get four, five, or six. In bakery flour, pasta, and vegetable oil, auctions more typically attract only one or two bidders (chapter 6). Competition varies sharply over time, as well, in all five commodity groups. For example, in 1994, only 1 in 10 bakery flour auctions had more than 2 bidders, while half of the 1995 bakery flour auctions attracted more than 2 bidders (chapter 6).

Competition, as measured by the number of bidders, can affect the value of an auction's low bid in two ways. First, there could be a direct effect on bidder decisions: they may decide to offer lower bid prices in auctions with more bidders participating so as to improve their chances of winning. Second, there could be an indirect, or "selection," effect on the low bid, even if individual bidders do not change their bidding strategies in the face of more competition. With more bidders, there is a greater likelihood that someone with low costs (due perhaps to excess capacity) will participate, generating a lower low-bid price.

We can assess each of these effects with the FSA data that we have at hand. That is, we can see if the number of bidders affects the value of the low bid in FSA auctions by analyzing a dataset consisting of the low bids in each auction. Second, we can see whether competition has a direct effect on bidder strategies by using a dataset consisting of all bids, and testing to see whether bidders changed their bids in response to changes in the number of competitors.

Competition has important effects on FSA commodity prices (table 7-6). First, consider the analysis of low

Table 7-6: Effects of competition on FSA prices

FSA commodity	Low bids		All bids	
	Range of price effect	Single-bidder effect	Range of price effect	Single-bidder effect
	Percent			
All-purpose flour	11.4	7.2	4.0	3.6
Bakery flour	8.0	5.6	9.1	6.1
Pasta	10.9	3.9	0 (not sig.)	0 (not sig.)
Vegetable oil	8.6	5.3	11.2	7.9
Peanut butter	4.6	n.a.	6.9	n.a.

Note: "not sig." means not significantly different from zero in statistical tests.
n.a. means not applicable.

bids. In the first row, the "range of price effect" for all-purpose flour is reported to be 11.4 percent. The statistic means that, on average, low bids in all-purpose flour auctions with a single bidder are 11.4 percent higher than low bids in all-purpose flour auctions with the maximum number of bidders specified in the model, which in all-purpose flour is seven. The estimated "single-bidder effect" in all-purpose flour is 7.2 percent; that is, low bids rose by 7.2 percent as the number of bidders falls from two bidders to one. Combined, those two statistics suggest that some competition matters a lot: most of the effect of reducing the number of bidders (7.2 of 11.4 percent) occurs as we move between two bidders and one, while the effect of moving from seven to two is much smaller (4.2 percent).

Results in the other four FSA commodity groups are similar. As the number of bidders goes from two to one, low bids rose by 5.6 percent and 5.3 percent in bakery flour and vegetable oil, respectively. As the number of bidders goes from five (the maximum in each) to two, low bids rose modestly, by 2.4 percent and 3.3 percent respectively. Peanut butter had no single-bidder auctions: there, low bids rose (by 4.6 percent) as the number of bidders fell from six to two. Pasta shows some distinction in that prices rose more sharply (by 7 percent) as the number of bidders fell to two from five. Pasta low bids increased again, by 3.9 percent, as the number of bidders fell from two to one.

The results thus far suggest that changes in bidder numbers matter, but that such changes generally matter most where there are a small number of bidders. That is, the number of bidders affects auction prices most when there are only two or three bidders to begin with; when there are four or five bidders, auction prices are affected less by the number of bidders.

The results reported so far are based on an analysis of the low bids in each auction. We can try to gain additional information with an analysis of all bids in FSA auctions (sample sizes in the all-bids analyses are three to four times larger than in the low-bids analysis). Consider the all-purpose flour results first. When there is a single bidder, that bidder typically bids a price 3.6 percent higher than the bidder would bid in a situation that was identical except for the presence of two bidders. In other words, bidders do appear to change their strategies in response to changes in the number of bidders, but the effect is small; selection appears to dominate changes in bidder behavior.

The results in pasta provide stronger support for selection. There, the number of bids has no significant effect on bidder behavior (a bidder does not change a bid as the number of bidders changes). But low bids are substantially lower when there are many bidders. Taken together, the two results suggest that selection effects account entirely for the effects of competition on low bids in pasta.

Results differ in the other three FSA commodities. In bakery flour, vegetable oil, and peanut butter, bidders reduce their bids as the number of bidders rises, and the effects are larger than in the low bids dataset. Selection does not appear to be a driving force here, and the direct effects of competition matter most.

The effects of competition appear to be quite robust because of the regression specification that we use. In early models with few other controls, bid prices appeared to be higher where there were few bidders. We were concerned that the observed effects might be spurious. Specifically, we were concerned that remote locations that were more costly to serve might attract few bidders and might also generate high bid prices because they were costly to serve. But the final model reported here has an extensive set of controls, including the State that the product is to be delivered to, the flow of product to specific locations, and the characteristics of the items being auctioned. Holding all those constant, the results still show the number of bidders to have strong effects on bid prices.

Tables 6-3 through 6-7 show that competition appears to vary sharply over time, while table 7-6 shows that competition strongly affects bid prices. What factors drive the extent of competition? We have not been able to perform a complete analysis, but several factors stand out. Product volumes only modestly affect the number of bidders. As changes in national policy reduced CCC stocks, tables 6-3 through 6-7 show that FSA product volumes fell dramatically for each commodity between 1992 and 1996, by amounts ranging from 36 percent of 1992 pasta volume to 85 percent for bakery flour. Bidder numbers showed no such steady decline, but rather a mixed pattern of increases and decreases.

In interviews, some vendors stressed the importance of capacity utilization in manufacturing plants. They argued that, during periods of low utilization, vendors are more likely to bid on USDA products, and are more

likely to bid aggressively. They asserted that this was because USDA auction procedures generated competitive prices and, therefore, relatively low margins for vendors; they would, therefore, only aim to win auctions when USDA production was unlikely to replace other, high-margin, business. The data offer some support for this hypothesis. For example, in flour mills, capacity utilization peaks in the late summer and fall (August through November, for delivery to FSA clients in September through December). Those 4 months account for a roughly proportional share (34.7 percent) of all FSA all-purpose flour auctions but a hugely disproportionate share (84.8 percent) of the auctions that attract only a single bidder. In short, competition has a clear seasonal pattern, and the risks of attracting a single bidder rise sharply in the fall.

The data also show annual fluctuations in competition that do not necessarily follow patterns of capacity utilization. Our inspection of bidding records shows considerable persistence in patterns of bidding. That is, once a firm enters bidding, it tends to stay in, offering bids every month from at least some plants on at least some auctions. Similarly, once a firm drops out of bidding for USDA products, it tends to stay out, rarely coming back in. Very few firms come in and out of bidding status. Those patterns appear to suggest that FSA marketing of their auction programs may have had some effects on firms' decisions to participate. Further, each commodity had sharp reductions in bidder numbers in one year during the study period (all-purpose flour in 1993, bakery flour in 1994, pasta in 1993, vegetable oil in 1993, and peanut butter in 1992). None of the reductions held: average bidder numbers increased sharply in the year after the reduction for each commodity. That pattern may reflect simple market entry (declines in bidder numbers drove up prices and profits, thereby attracting more bidders), or it may reflect positive actions taken by FSA to attract more players. FSA needs to review their actions here in order to identify effective strategies.