Acquired Plants Have Higher Initial Labor Productivity Than Nonacquired Plants

We constructed an empirical econometric model similar to one used by McGuckin and Nguyen (1995) and Lichtenberg and Siegel (1992a) to examine the impact of pre-acquisition plant labor productivity on ownership change. With this model, we accounted for intervening factors and were able to evaluate whether plants bought "good assets," i.e., highly productive plants or "bad assets," i.e., poorly performing plants. A full description of the model and definitions of all the variables are provided in the appendix. The key variables are labor productivity (as defined earlier), plant size (total number of employees), and plant specialization (value of a plant's primary product as a share of the value of plant shipments). Primary products are the major products of a plant. For example, primary products for meatpacking plants include ground beef, boxed beef, carcasses, etc. All other products, such as poultry products or nonmeat products, are considered secondary products.

Econometric results of the full model are given in appendix tables 1, 2, and 3. Columns 1, 3, and 5 for appendix tables 1 and 3; and columns 1 and 3 only for appendix table 2 have the 1977-82 results. Columns 2, 4, and 6 for appendix tables 1 and 3; and columns 2 and 4 only for appendix table 2 contain the 1982-87 results. The models are highly significant in all cases. Results shown in the tables indicate that initial relative labor productivity, plant size, and plant specialization have generally significant and positive effects on mergers and acquisitions, i.e., encourage a buyer to make an acquisition, when all other factors are held constant.

Only cheese (both periods) and fluid milk and oilseeds for 1977-82 deviate from the positive and significant pattern for labor productivity. Cheese making for 1977-82 has a negative coefficient while the others are positive but not significant. The negative coefficient for plant size for oilseeds plants is the only unexpected result for plant size. Coefficients for specialization for meatpacking (1982-87), feed (1982-87), and oilseeds (both periods) differ from the expected positive results. Overall, the results are consistent with those of McGuckin and Nguyen (1995) in that buyer firms preferred to acquire large, highly specialized, and productive plants.

Our general finding that firms acquired productive plants differs from Lichtenberg and Siegel (1992a), who found that firms acquired less productive plants. There are two likely reasons. First, Lichtenberg and Siegel (1992a) considered all manufacturing plants with at least 250 employees. We, on the other hand, evaluated very specific food industries and plants of all sizes.[7] Second, our model controls for plant specialization while Lichtenberg and Siegel's (1992a) model does not.

To illustrate the importance of plant size and plant labor productivity in M&A decisions, we provide estimates of the probability of a plant's being acquired at selected percentiles of plant labor productivity and plant size (tables 4, 5, and 6). The tables clearly show that plant labor productivity and size are key determinants of the acquisition decision.

[7]As pointed out by an anonymous reviewer, we could directly compare our results with Lichtenberg and Siegel (1992a) by considering only plants with more than 250 workers. While this is a good suggestion, we cannot perform the analysis because census data access rules prevent us from doing so.

Table 4
Meat and poultry plant acquisition probability rises with plant size and labor productivity

Industry	Percentile for relative labor productivity	Percentile for total employment: 1977-82 10	1977-82 50	1977-82 90	1977-82 95	1982-87 10	1982-87 50	1982-87 90	1982-87 95
		Probability							
Meatpacking									
	10	0.21	1.03	3.86	4.86	0.06	0.93	6.86	10.32
	50	0.54	4.20	17.96	22.52	0.44	2.75	11.32	15.18
	90	0.86	7.71	31.67	38.69	2.38	7.35	18.03	21.86
	95	1.05	9.84	38.90	46.80	3.55	9.31	20.24	23.94
Meat processing									
	10	0.35	2.28	6.97	8.77	0.69	2.83	8.99	11.26
	50	0.57	4.10	12.61	15.74	1.80	6.94	19.72	23.94
	90	0.78	5.88	17.84	22.05	3.78	13.44	33.69	39.55
	95	0.88	6.80	20.42	25.12	4.68	16.17	38.83	45.08
Poultry slaughtering and processing									
	10	19.97	38.48	55.82	59.87	2.98	9.22	19.41	22.07
	50	27.56	49.70	67.82	71.68	4.68	14.88	30.44	34.24
	90	39.03	64.04	80.76	83.87	7.00	22.22	43.19	47.89
	95	43.26	68.62	84.33	87.11	8.20	25.80	48.82	53.75

Source: ERS estimates based on U.S. Census Bureau data and on the parameter estimates of the nonlinear probit model of plant acquisitions. Sample sizes: 2,977 plants for 1977-82 and 1,867 plants for 1982-87 in meatpacking, 1,804 plants for 1977-82 and 2,078 plants for 1982-87 in meat processing, and 1,272 plants for 1977-82 and 1,207 plants for 1982-87 in poultry slaughtering and processing.

Consider meatpacking as an example. The upper left-hand corner cell of table 4 indicates the probability that a meatpacking plant in the 10th percentile of relative labor productivity and 10th percentile of plant size in 1977 would be acquired over 1977-82. This probability is 0.21 percent.

Proceeding horizontally, a plant in the 95th percentile of size and 10th percentile of labor productivity in the meatpacking industry had a 4.86-percent probability of being acquired over 1977-82. Similarly, a plant in the 95th percentile of plant labor productivity and 10th percentile of plant size in the meatpacking industry had a 1.05-percent probability of being acquired. Finally, a plant in the 95th percentile of plant labor productivity and 95th percentile of plant size has about a 47-percent probability of being acquired. The last four columns in the table show the probabilities of being acquired by percentile and labor productivity for 1982-87. For meatpacking, they indicate a similar trend but with lower overall probabilities of being acquired.

The trend from lower probability to higher probability values as plant labor productivity and size increases is similar in 11 of the 16 cases shown in tables 7, 8, and 9. Plants in the 10th percentiles of plant size and labor productivity had less than a 5-percent probability of being acquired while plants in the 95th percentiles of plant size and labor productivity had probabilities of being acquired ranging from about 15 percent in fluid milk over 1982-87 to more than 57 percent in cheese making over 1977-82.

Table 5

Cheese and fluid milk plant acquisition probability rises with plant size and labor productivity in 1977-82 but not in 1982-87

Industry	Percentile for relative labor productivity	Percentile for total employment							
		1977-82				1982-87			
		10	50	90	95	10	50	90	95
		Probability							
Cheese making									
	10	2.22	6.23	12.20	13.71	0.00	0.01	0.23	0.47
	50	1.95	10.36	26.27	30.36	0.00	0.01	0.10	0.19
	90	1.75	15.05	42.26	48.68	0.00	0.00	0.04	0.07
	95	1.67	17.37	49.52	56.63	0.00	0.00	0.03	0.06
Fluid milk processing									
	10	2.28	7.43	13.99	16.06	0.29	2.29	6.84	8.99
	50	3.07	11.44	22.20	25.49	0.73	3.76	9.07	11.35
	90	4.04	16.69	32.46	37.05	1.63	5.82	11.71	14.01
	95	4.50	19.22	37.12	42.19	1.98	6.49	12.49	14.78

Source: ERS estimates based on U.S. Census Bureau data, based on the parameter estimates of the nonlinear probit model of plant acquisitions. Sample sizes: 1,199 plants for 1977-82 and 1,079 plants for 1982-87 in cheese making and 2,797 plants for 1977-82 and 1,823 plants for 1982-87 in fluid milk processing.

The exceptions included poultry slaughter and processing for 1977-82, cheese making and feed processing for 1982-87, and oilseeds for both periods. Poultry slaughtering and processing over 1977-82, feed processing over 1982-87, and oilseed crushing over 1982-87 differ in that even plants with low labor productivity and of small size had a substantial probability of being acquired. The general trend of more productive, larger plants having a greater probability of being acquired still holds. Cheese making plants, on the other hand, had almost no probability of being acquired over 1987-92. Only oilseed plants over 1977-82 have radically different probabilities of being acquired in that period.

In this case, the least productive plants had the greatest probability of being acquired. Our data do not allow us to see precisely why this industry differed so dramatically from the others. We do note, however, that the number of cottonseed crushing plants dropped by 33 percent over 1977-87 while the number of corn milling plants rose by about 25 percent and soybean processing plants by about 50 percent. This major change in industry composition meant that firms had to increase their capacity by building new corn milling and soybean processing plants and firms reduced capacity by closing cottonseed crushing plants, some of which may have been quite large. The only attractive acquisitions in such an environment may have been the smaller plants with specialty operations.

Summarizing, our regression and probability analyses indicate that mergers and acquisitions are positively correlated with labor productivity and plant size. Results are consistent with findings of Ravenscraft and Scherer (1987), Matsusaka (1993), and McGuckin and Nguyen (1995) for small plants but differ from Lichtenberg and Siegel's (1992a) conclusion that low labor

Table 6

Probability of being acquired rises with plant size and labor productivity in flour milling and feed processing over 1977-82 and 1982-87 and oilseed processing over 1982-87

Industry	Percentile for relative labor productivity	Percentile for total employment: 1977-82 10	1977-82 50	1977-82 90	1977-82 95	1982-87 10	1982-87 50	1982-87 90	1982-87 95
		Probability							
Cheese making									
	10	2.22	6.23	12.20	13.71	0.00	0.01	0.23	0.47
Flour milling									
	10	1.81	3.17	4.92	5.39	2.40	7.54	17.52	20.46
	50	6.02	10.86	16.84	18.39	5.90	15.46	30.60	34.55
	90	13.78	24.14	35.60	38.36	11.61	26.04	44.95	49.37
	95	17.53	30.10	43.30	46.37	14.29	30.40	50.16	54.60
Feed processing									
	10	1.28	4.01	9.83	11.74	60.51	78.75	93.79	95.66
	50	3.05	6.27	11.32	12.78	80.04	90.72	97.69	98.43
	90	6.26	9.22	12.87	13.82	92.07	96.71	99.27	99.51
	95	7.97	10.53	13.48	14.22	94.21	97.67	99.49	99.66
Oilseed processing									
	10	36.54	34.63	32.79	32.44	21.50	30.06	39.41	41.66
	50	15.69	15.25	14.82	14.74	29.90	34.01	38.13	39.09
	90	4.67	4.81	4.95	4.99	38.67	37.79	36.97	36.78
	95	3.12	3.30	3.47	3.51	41.85	39.12	36.57	35.99

Source: ERS estimates based on U.S. Census Bureau data, based on the parameter estimates of the nonlinear probit model of plant acquisitions. Sample sizes: 1,633 plants for 1977-82 and 1,563 plants for 1982-87 in flour milling, 2,690 plants for 1977-82 and 2,099 plants for 1982-87 in feed processing, and 984 plants for 1977-82 and 1,374 plants for 1982-87 in poultry slaughtering and processing.

productivity leads to ownership change. Results are most consistent with Baldwin (1991), who found that acquired Canadian manufacturing plants of all types had higher average labor productivity than other Canadian plants and Lichtenberg and Siegel (1992b), who found that plants involved in leveraged buyouts in U.S. manufacturing had above-average relative labor productivity during the 3 years after their buyouts.