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The Economic Performance of Food-Manufacturing Industries in Idaho

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As part of the global economy, agriculture and agribusiness of the State of Idaho have been significantly affected by the structural changes taking place in the food-supply chain. Constantly changing consumer preferences, new technologies, and globalization represent both challenges and opportunities for the food-supply-chain participants. The very diverse agriculture of Idaho provides a favorable market environment for agricultural producers and food companies to become involved in various food-manufacturing activities. This paper focuses on the quantitative evaluation of the economic performance of food-manufacturing industries in Idaho, using U.S. Economic Census data for 1997 and 2002. The results have implications for the strategic decision-making of the food-supply-chain participants and government authorities.

Idaho has a very diverse agriculture. Approximately 144 agricultural commodities are produced in the state, and Idaho is ranked in the top ten in the nation for 23 crops and livestock (Idaho Department of Agriculture 2005). This situation provides incentives for food-manufacturing companies to locate their establishments in this area to be close to the suppliers of agricultural raw materials. In addition, it encourages agricultural producers to become involved in food-manufacturing activities. Food-manufacturing industries are important sectors of the Idaho economy and are significant contributors to the state's economic and social development.

This paper analyzes the economic performance of food-manufacturing industries in Idaho between 1997 and 2002. The analysis is conducted using data on major economic indicators reported by the U.S. Economic Census and focuses on a four-digit level of industry classification. Some of the economic indicators examined are the number of establishments, number of employees, annual payroll, value added, and value of shipments. This information is used to construct and analyze a number of economic ratios characterizing the economic effectiveness of manufacturing industries.

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The results of the study have important implications for the strategic decision-making of the food-supply-chain participants and government, as they provide evidence on the current and projected economic performance of food-manufacturing industries in Idaho. This information also could be used to identify entrepreneurship opportunities for the food-supply-chain participants in the analyzed region.

Section 2 discusses the data and presents definitions of the economic indicators used to measure economic performance of food-manufacturing industries. Section 3 outlines a methodology of the analysis, and Section 4 discusses the results. Finally, a conclusion of the study is presented.

Data And Definitions¹

The analysis of economic performance of food-manufacturing industries is conducted using U.S. Economic Census data (geographic series reports) for 1997 and 2002. The food-manufacturing industries subject to the analysis are animal food manufacturing (NAICS 3111), grain & oilseed milling (NAICS 3112), fruit & vegetable preserving & specialty food manufacturing (NAICS 3114), dairy product manufacturing (NAICS 3115), meat product manufacturing (NAICS 3116), bakeries & tortilla manufacturing (NAICS 3118), and other

¹ The detailed definitions are presented on the U.S. Economic Census web page. The definitions are slightly modified for this paper due to space constraints.

food manufacturing (NAICS 3119).² The following economic indicators are analyzed for each food manufacturing industry: number of establishments, number of employees, number of production workers, number of production-worker hours, annual payroll, value of shipments, value added, cost of materials, and capital expenditures.

An establishment is a single physical location at which business is conducted; it may or may not be identical with a company (firm or enterprise). The number of employees includes all full-time and part-time employees on the payroll. The number of production workers includes workers engaged in fabricating, processing, assembling, inspecting, receiving, storing, handling, packing, warehousing, shipping, maintenance, repair, recordkeeping, and other services closely associated with these production operations. The number of production-worker hours includes all hours worked or paid for at the manufacturing plant. The annual payroll includes the gross earnings of all employees on the payroll paid in the calendar year.

The value of shipments indicator includes the received or receivable net selling values, "Free on Board" (FOB) plant (exclusive of freight and taxes), of all products shipped (primary and secondary) as well as all miscellaneous receipts (e.g., contract work performed for others). Cost of materials refers to direct charges actually paid or payable for items consumed or put into production during the year; in particular, it includes the cost of materials or fuel consumed. Capital expenditures represent the total new and used capital expenditures reported by establishments in operation; these are the expenditures related to new and used machinery and equipment as well as permanent additions and major alterations to manufacturing establishments. The value-added indicator is usually used to characterize the economic performance of food-manufacturing industries. It is the difference between the value of shipments and costs of materials, supplies, containers, fuel, plastic, purchased electricity, and contract work. The value-added indicator avoids the duplication resulting from the use of products of some establishments as materials by others.

² Two industries are excluded from the analysis due to a data-availability problem: sugar & confectionary product manufacturing (NAICS 3113) and seafood product preparation & packaging (NAICS 3117). Only the number of establishments is reported for these two industries.

Methodology

The analysis follows two stages. At the first stage, food-manufacturing industries are analyzed using the following economic indicators: number of establishments, number of employees, annual payroll, value added, and value of shipments. First, the size of each industry, as indicated by each economic indicator under consideration, is determined for 1997 and 2002. Secondly, changes in the economic indicators between 1997 and 2002 are calculated. These changes characterize economic-development trends (growth or decline) of the analyzed industries.

At the second stage, a number of economic ratios characterizing the effectiveness of economic performance of food industries are constructed using previously mentioned economic indicators and some others, such as the number of production workers, number of production-worker hours, capital expenditures, and cost of materials (Table 1). The ratios are calculated for 1997 and 2002 and the differences between the two years are determined.³ An increase in any of these ratios is a positive trend characterizing a more effective use of economic resources (labor, materials, and capital) or a more effective overall economic performance.

When comparing economic indicators for 1997 and 2002, the number of establishments and the number of employees are directly comparable. In the case of economic indicators measured in monetary units (annual payroll, value added and value of shipments), the data for 1997 and 2002 are not directly comparable because of inflation. To compare the data, the 1997 dollar values are converted into 2002 dollar values using various producer-price indices (PPI) corresponding to the analyzed food manufacturing industries.

Results

Table 2 presents the size of food-manufacturing industries in terms of the number of establishments, number of employees, annual payroll, value added, and value of shipments in 2002, and changes in these economic indicators between 1997 and 2002. According to the majority of the analyzed indicators, the leading industry is fruit & vegetable pre-

³ For a more convenient interpretation, some of the ratios are multiplied by 100 percent.

Table 1. Economic-Effectiveness Ratios.

<i>Ratio characterizing the overall economic effectiveness</i>	
Value added ----- *100 percent	The ratio characterizes the effectiveness of production and marketing processes.
Value of shipments	
<i>Ratios characterizing the effectiveness of production-worker use</i>	
Number of production workers ----- *100 percent	Value added -----
Number of employees	Number of production-worker hours
<i>Ratios characterizing the effectiveness of resource use</i>	
Value added -----	Value added -----
Capital expenditures	Cost of materials

serving & specialty food manufacturing, followed by meat product manufacturing and dairy product manufacturing. In 2002, these industries employed 7,763, 3,188, and 1,563 people, respectively, which constituted 47 percent, 19 percent, and nine percent, respectively, of all employees in the food-manufacturing industries in Idaho. The annual payrolls generated in these three sectors were \$206 million, \$79 million, and \$51 million, respectively, which represented 45 percent, 17 percent, and 11 percent, respectively, of the total food-manufacturing payroll in 2002. Fruit & vegetable preserving & specialty food manufacturing generated \$1,616 million in shipments, which was approximately 32 percent of the total food-manufacturing value of shipments. Meat product manufacturing and dairy product manufacturing generated \$1,222 and \$1,138 million in shipments, respectively, which constituted 24 percent and 22 percent, respectively, of total food manufacturing in 2002.

In terms of the number of establishments, the leading industry is meat product manufacturing (48 establishments), followed by bakeries & tortilla manufacturing (42 establishments) and fruit & vegetable preserving & specialty food manufacturing (34 establishments). These industries' shares of the total number of establishments in the food industry in 2002 were 22 percent, 19 percent and 16 percent, respectively. Other food manufacturing is the fourth-largest sector, followed by animal food

manufacturing, dairy product manufacturing, and grain & oilseed milling.

Food-manufacturing industries as a group experienced remarkable growth between 1997 and 2002.⁴ The total number of establishments increased by 43 percent to 220 in 2002. The number of employees increased by almost three percent to 16,664 in 2002. The annual payroll grew by 20 percent. There were \$1,885 million of value added and \$5,087 million of shipments generated by the industry in 2002. These economic indicators increased by almost 28 percent and 24 percent, respectively, in 2002 compared to 1997. The majority of individual food-manufacturing industries experienced expansion during the analyzed period. The number of establishments and value of shipments in all industries increased between 1997 and 2002. In the case of value of shipments, the highest growth rates were in grain & oilseed milling (89 percent), animal food manufacturing (78 percent) and meat product manufacturing (53 percent). The fastest growth in value added was observed in animal food manufacturing (177 percent), dairy product manufacturing (98 percent) and grain & oilseed milling (60 percent). There is a pattern suggesting that the smallest industries

⁴ There is not enough information to analyze changes in the economic indicators in the case of bakeries & tortilla manufacturing and other food manufacturing, except for the number of establishments.

Table 2. Food-Manufacturing Industries in Idaho, 1997–2002: Size and Economic-Development Trends.

NAICS code	Industry	2002 Number of establishments	2002 Number of employees	2002 Annual payroll (\$1,000)	2002 Value added (\$1,000)	2002 Value of shipments (\$1,000)
311	Food mfg	220 (42.9)	16,664 (2.6)	461,029 (19.8)	1,884,836 (27.5)	5,087,273 (23.9)
3111	Animal food mfg	23 (109.1)	286 (20.2)	10,076 (41.0)	55,246 (176.9)	139,243 (77.8)
3112	Grain & oilseed milling	7 (0.0)	141 (16.5)	5,828 (39.5)	35,870 (59.9)	140,553 (89.0)
3114	Fruit & vegetable preserving & specialty food mfg	34 (6.3)	7,763 (-18.9)	206,184 (-9.9)	868,794 (-3.2)	1,615,885 (0.8)
3115	Dairy product mfg	22 (4.8)	1,563 (-9.0)	51,354 (36.9)	308,603 (97.9)	1,137,596 (18.6)
3116	Meat product mfg	48 (100.0)	3,188 (54.5)	78,796 (102.8)	154,222 (57.0)	1,222,227 (53.4)
3118	Bakeries & tortilla mfg	42 (16.7)	576 (n/a)	15,331 (n/a)	44,232 (n/a)	56,779 (n/a)
3119	Other food mfg	25 (177.8)	1,364 (n/a)	33,485 (n/a)	130,313 (n/a)	214,557 (n/a)

n/a – data are not available for a reported industry.

are characterized by the highest growth rates. In contrast, the largest industry—fruit & vegetable preserving & specialty food manufacturing—experienced some decline in terms of the value added, number of employees, and annual payroll.⁵ These economic indicators decreased by three percent, 19 percent, and 10 percent, respectively.

Another approach to analyzing the economic performance of manufacturing industries is to examine the effectiveness of their economic activities and its changes over time. Five economic ratios were calculated for each industry (Table 3). The ratio of number of production workers to total number of employees (in percent) and the ratio of value added to the number of production workers hours (\$/hour) characterize how effectively production workers are used. In the majority of the analyzed cases, the share of production workers in the total number of employees falls in the 70–90 percent range. Approximately 90 percent of all employees are production workers in fruit & vegetable preserving & specialty food manufacturing. In the case of bakeries & tortilla manufacturing, this share is 50 percent. The average share characterizing all food-manufacturing industries as a group is 85 percent.

The ratio of value added to the number of production workers hours associated with all food-manufacturing industries is \$65/hour. This ratio ranges from \$25/hour (meat product manufacturing) to \$156/hour (animal food manufacturing). The industries with the highest ratios are animal food manufacturing (\$156/hour), grain & oilseed milling (\$148/hour), and dairy product manufacturing (\$118/hour).

The ratio of value added to capital expenditures and the ratio of value added to cost of materials characterize how effectively capital and material resources are used. The ratio of value added to capital expenditures associated with all food-manufacturing as a group is ten. It ranges from one (grain & oilseed milling) to 32 (animal food manufacturing). The three leading industries according to this ratio are animal food manufacturing (32), bakeries &

tortilla (30) and fruit & vegetable preserving & specialty food manufacturing (15).

The ratio of value added to the cost of materials corresponding to the total food manufacturing is 0.59. This ratio varies from 0.15 (meat product manufacturing) to 3.41 (bakeries & tortilla manufacturing). The three leading industries in this group are bakery & tortilla manufacturing (3.41), other food manufacturing (1.53) and fruit & vegetable preserving & specialty food manufacturing (1.17).

The ratio of value added to the value of shipments characterizes the overall effectiveness of production and marketing activities. In the case of all food-manufacturing industries as a group it is equal to 0.37, or 37 percent. This share (ratio) varies from 13 percent (meat product manufacturing) to 78 percent (bakeries & tortilla manufacturing). The three leading industries according to this economic ratio are bakeries & tortilla manufacturing (78 percent), other food manufacturing (61 percent) and fruit & vegetable preserving & specialty food manufacturing (54 percent).

Comparing the economic effectiveness ratios across different industries is not appropriate, as industries differ due to market structures, technologies, and demand and supply conditions. These differences among the industries are reflected in the level of value added and other economic indicators associated with a particular industry. However, it is possible to analyze changes in the economic-effectiveness ratios over time. For all food-manufacturing industries as a group, all five ratios increased during the period 1997–2002, suggesting that the effectiveness of economic performance of food-manufacturing industries increased.

Animal food manufacturing and dairy food manufacturing follow the pattern characterizing the overall group; the economic effectiveness of these industries increased, as indicated by all five ratios. For meat product manufacturing, production-worker effectiveness decreased during the analyzed period. In the case of fruit & vegetable preserving & specialty food manufacturing and grain & oilseed milling, the share of value added in the value of shipments and the ratio of value added to the cost of material decreased. This indicates some decrease in the overall economic effectiveness of these industries. According to the other ratios, the economic effectiveness of these industries increased during the analyzed period.

⁵ A more-detailed analysis of food-manufacturing industries in Idaho (Bolotova 2007) at a more specific level suggests that some of the industries comprising this group have experienced a remarkable growth, and these are the smallest sub-sectors. However, this effect is cancelled at a four-digit level by a decline characterizing the larger sub-sectors of this group of industries.

Table 3. Food Manufacturing Industries in Idaho, 1997–2002: Effectiveness of Economic Performance.

NAICS code	Industry	2002		2002		2002		2002	
		Value added ----- Value of ship- ments (percent)	Number of production workers ----- Number of employees (percent)	Value added ----- Number of pro- duction-worker hours (\$/hour)	Value added ----- Capital expenditures	Value added ----- Cost of materials			
311	Food mfg	37 (2.9)	85 (1.3)	65 (12.1)	10 (6.9)	0.59 (4.7)			
3111	Animal food mfg	40 (55.8)	72 (7.3)	156 (154.2)	32 (139.2)	0.66 (96.2)			
3112	Grain & oilseed milling	26 (-15.4)	82 (5.0)	148 (26.2)	1 (n/a)	0.33 (-24.2)			
3114	Fruit & vegetable preserving & specialty food mfg	54 (-3.9)	90 (4.2)	62 (8.9)	15 (49.0)	1.17 (-6.7)			
3115	Dairy product mfg	27 (66.8)	83 (5.1)	118 (67.4)	7 (105.0)	0.37 (88.1)			
3116	Meat product mfg	13 (2.4)	87 (-1.4)	25 (-16.1)	13 (101.1)	0.15 (5.2)			
3118	Bakeries & tortilla mfg	78 (n/a)	49 (n/a)	99 (n/a)	30 (n/a)	3.41 (n/a)			
3119	Other food mfg	61 (n/a)	77 (n/a)	69 (n/a)	10 (n/a)	1.53 (n/a)			

Percentage changes in economic indicators between 1997 and 2002 are in the parentheses.
n/a – data are not available for a reported industry.

Conclusion

The food-manufacturing industries as a group experienced growth from 1997 to 2002. The number of establishments involved in food manufacturing in Idaho increased by 43 percent from 154 in 1997 to 220 in 2002. There were 16,238 people employed in the sector in 1997 and 16,664 people in 2002. The number of employees increased by 2.6 percent, and the annual payroll grew by 20 percent. While the value of shipments increased by 24 percent, the value added in food manufacturing grew by 27.5 percent. A higher growth rate of value added relative to the value of shipments is a positive feature of the food-manufacturing industries' economic development, suggesting that the industries added more value to the inputs in 2002 than in 1997. In addition, the resources were more effectively used by the industries in 2002 relative to 1997. The value added produced per production-worker hour increased by 12 percent from \$58 in 1997 to \$65 in 2002. The ratio of value added to the cost of materials increased by five percent, and the ratio of value added to capital expenditures increased by seven percent.

The economic performance of individual food-manufacturing industries in general follows the pattern of the overall group. The smallest industries tend to grow faster than the largest industries. The industries with the highest value-added are bakeries & tortilla manufacturing, other food manufacturing, and fruit & vegetable preserving & specialty food manufacturing. The shares of value added in the value of shipments characterizing these industries in 2002 were 78 percent, 61 percent, and 54 percent, respectively. Animal food manufacturing and dairy product manufacturing are the industries with the highest growth rate of value added. The share of value added in the value of shipments increased by 67 percent during the analyzed period for the dairy industry and by 56 percent for animal food manufacturing.

The results of this study could be used by decision-makers in a number of ways. First, the economic performance of an individual establish-

ment or a group of establishments belonging to the same company can be compared to the average economic performance characterizing a particular industry. Consequently, the production and marketing strategies may be modified in order to increase the economic effectiveness of the analyzed establishment(s). Second, the results may be used when decisions are made about whether to expand existing food-manufacturing operations. This information may be used by those decision-makers who consider getting involved in food manufacturing businesses. Third, financial institutions working in the region could use the results of this study in their relations with the food-supply-chain participants. Finally, the government authorities may use this information in their decision-making—for example, when various agricultural and food promotion programs are developed.

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