
Tenth District Survey of Manufacturers

By *Tim R. Smith*

Manufacturing is a major force in the Tenth District economy, accounting for the largest share of output in the region and one of the largest shares of employment. Moreover, many manufacturing jobs are among the highest paying jobs in the district. Yet little information is available to track the performance of this major sector. Monthly employment data provide the most current information, but these data are only available with a considerable lag.

To provide up-to-date information about manufacturing conditions in the Tenth District, the Federal Reserve Bank of Kansas City has developed a quarterly survey of manufacturing plants. Beginning in the fourth quarter of 1995, the results of the survey will be published in each issue of the bank's *Regional Economic Digest*.

This article provides background information for users of the manufacturing survey. The first section of the article discusses how the panel of manufacturing plants was selected to represent the district's manufacturing sector. The second section shows what information the survey gathers and how to interpret the information. The third section traces the survey results over the past four quarters—a period of testing and refining survey procedures.

Tim R. Smith is a senior economist at the Federal Reserve Bank of Kansas City. Deron Ferguson, an assistant economist at the bank, helped prepare the article.

The final section compares survey results with other indicators of manufacturing activity.

THE SURVEY PANEL

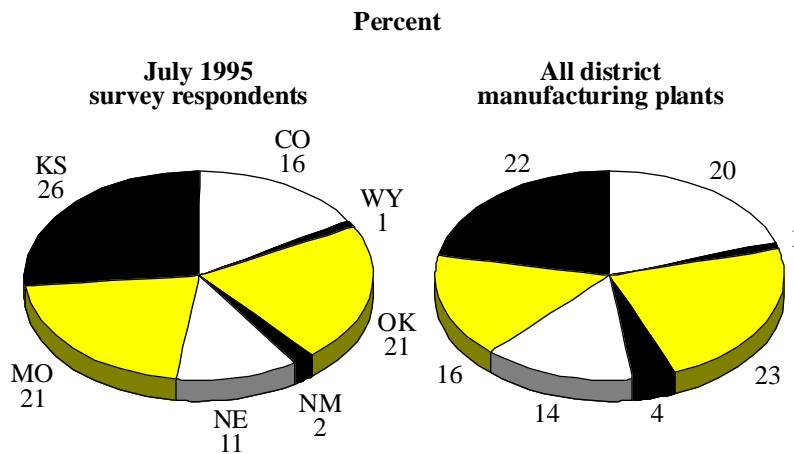
The survey was designed to gather timely information about manufacturing conditions from a panel of about 300 manufacturing plants that are representative of the district's manufacturing sector. The survey panel was carefully chosen to reflect both the geographic distribution and industrial makeup of the district's manufacturers. Since the response rate will typically be less than 100 percent, the locations and industries of the actual respondents will vary from quarter to quarter depending on which plants participate in the survey.

Only manufacturing plants that are currently operating in the Tenth District were selected for the survey panel. Key individuals at each plant—such as plant managers, purchasing managers, and financial controllers—were invited to participate. When the first survey was mailed in October 1994, more than 200 plants agreed to participate. New plants were added during each of the next three quarters, so that by July 1995 the survey panel consisted of 274 potential respondents.¹

The survey panel closely parallels the *geographic distribution* of manufacturers in the district.² Chart 1 shows the proportions of all manufacturing plants in each district state. Kansas and Oklahoma have

Chart 1

GEOGRAPHIC DISTRIBUTION OF TENTH DISTRICT MANUFACTURING PLANTS



Note: Percentages do not add to 100 due to rounding.

the most plants, while New Mexico and Wyoming have the fewest. The chart also shows that the manufacturing plants responding to the July 1995 survey (73 percent of the panel) were distributed across district states in about the same proportions as all manufacturing plants.

The panel also closely parallels the *industry mix* of the district's manufacturing sector. Table 1 shows the proportions of all manufacturing plants in each industry. The four industries with the largest numbers of plants are food products, machinery, printing and publishing, and fabricated metals. The table also shows a similar industry mix for the manufacturing plants responding to the July 1995 survey.

The size of the plants in the survey panel ranges from two employees with less than \$10 million in annual sales to 6,000 employees with more than \$500 million in annual sales (Chart 2). Notwithstanding the wide range of plant sizes represented in the survey, about half the plants employ between 100 and 249 workers and sell \$10-\$49 million in products annually.³

CONTENT OF THE SURVEY

The Tenth District Survey of Manufacturers collects information about several indicators of real manufacturing activity and prices. The information is similar to that collected by some other Federal

Chart 2

SIZE CHARACTERISTICS OF SURVEY PANEL

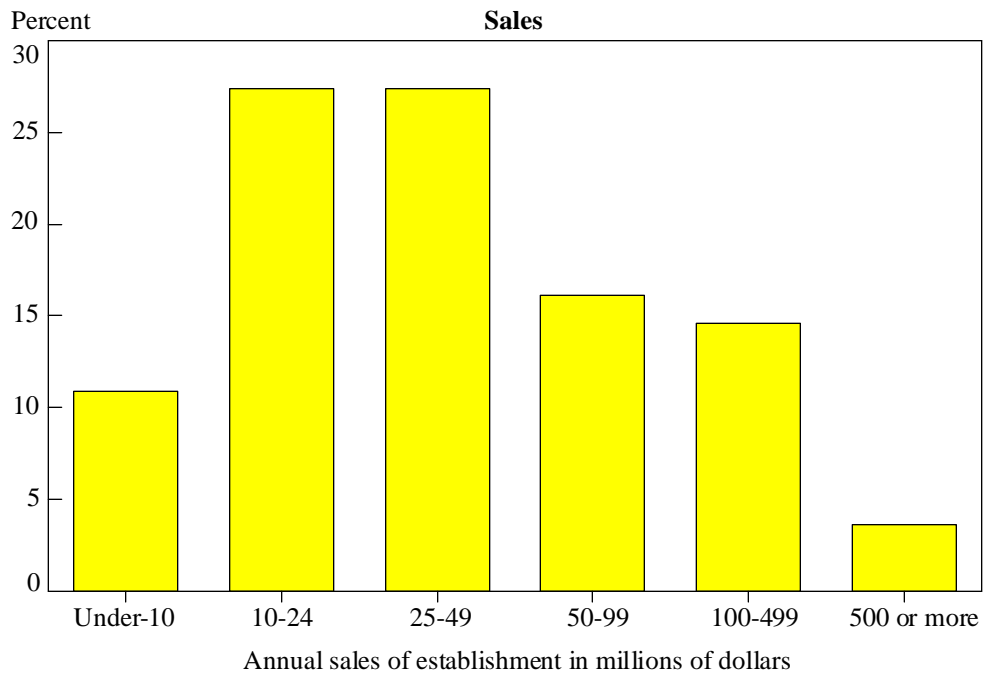
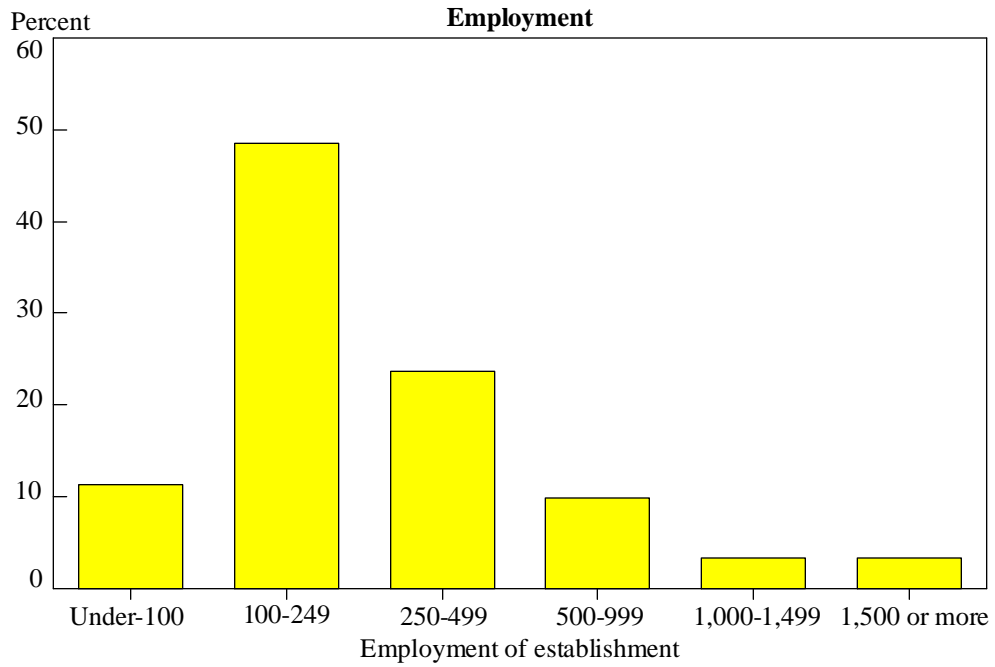


Table 1

INDUSTRY MIX OF TENTH DISTRICT MANUFACTURING PLANTS

(Percent)

SIC	Industry	Actual distribution, 1992		Survey
		U.S.	District	respondents July 1995
20	Food and kindred products	10.2	13.1	12.9
22	Textile mill products	4.5	.4	.5
23	Apparel and other textiles	7.3	4.8	4.5
24	Lumber and wood products	3.9	3.4	2.5
25	Furniture and fixtures	3.1	2.0	2.0
26	Paper and allied products	5.2	3.9	4.5
27	Printing and publishing	7.7	11.1	8.5
28	Chemicals and allied products	4.7	4.3	4.0
29	Petroleum and coal products	.7	1.5	2.0
30	Rubber and misc. plastic products	6.5	6.3	5.0
31	Leather and leather products	.8	.7	1.0
32	Stone, clay, and glass	2.7	3.9	3.0
33	Primary metal industries	4.1	2.8	4.5
34	Fabricated metal industries	8.7	9.6	8.5
35	Machinery, except electrical	9.3	12.5	13.9
36	Electrical and electronic equipment	8.5	7.1	9.5
37	Transportation equipment	5.2	5.3	6.0
38	Instruments and related products	4.6	4.9	6.5
39	Misc. manufacturing	2.2	2.5	1.0
	Total	100	100	100

Notes: Actual distribution in 1992 included establishments with 50 or more employees. Only five plants in the survey panel had fewer than 50 employees. SIC is Standard Industrial Classification code.

Source: U.S. Department of Commerce, *County Business Patterns, 1992*.

Reserve Banks and the National Association of Purchasing Management (box). Manufacturers first report on the performance of their industry nationwide, which in turn helps to understand if changes in manufacturing conditions reported in the survey are unique to the Tenth District.

Respondents also report on conditions at their own plants. To help monitor overall conditions at district factories, respondents report on changes in production, shipments, new orders, order backlogs, supplier delivery time, materials inventories, and finished goods inventories. Responses about

OTHER MANUFACTURING SURVEYS

The Federal Reserve Bank of Kansas City's quarterly survey is similar to surveys conducted by the Federal Reserve Banks of Philadelphia, Richmond, and Atlanta. All four Federal Reserve Bank surveys ask a comparable set of questions and follow methodology similar to that of the National Association of Purchasing Management's (NAPM) long-running *Report on Business*. Bell and Crone, Chmura, and Rogers provide detailed information about the surveys conducted by the other Federal Reserve Banks. The NAPM *Report on Business* provides information about the NAPM survey. The main difference between the Kansas City Federal Reserve Bank's survey and those of other Reserve Banks and NAPM is the timing of the surveys. The Kansas City survey is conducted once each quarter, while the others are conducted once a month.

Federal Reserve Bank of Philadelphia

The Federal Reserve Bank of Philadelphia's regional survey is the longest running survey of manufacturers by a Federal Reserve Bank. The survey began in 1968 and is conducted monthly. The survey covers the Third Federal Reserve District, which includes Delaware and the parts of Pennsylvania and New Jersey in and around the Philadelphia metropolitan area. Currently, the Philadelphia panel includes about 125 plants, with a response rate ranging from 40 to 60 percent. The Federal Reserve Bank of Philadelphia reports qualitative month-ago comparisons of several manufacturing indicators and expectations for six months ahead. These

results are published monthly in the bank's *Business Outlook Survey*.

Federal Reserve Bank of Richmond

The Federal Reserve Bank of Richmond began its regional survey in 1986. The monthly survey covers the Fifth Federal Reserve District, which includes the District of Columbia, Maryland, North Carolina, South Carolina, Virginia, and most of West Virginia. The survey uses a panel of about 300 plants, with an average response rate of about 40 percent. The Federal Reserve Bank of Richmond reports qualitative month-ago comparisons of several manufacturing indicators and quantitative average increases in prices for raw materials and finished goods prices. Expectations of price changes over the period six months ahead are also reported. These results are provided in a monthly press release.

Federal Reserve Bank of Atlanta

The Federal Reserve Bank of Atlanta began its regional survey in 1991. The monthly survey covers the Sixth Federal Reserve District, which includes Alabama, Florida, Georgia, and parts of Louisiana, Mississippi, and Tennessee. The survey uses a panel of about 215 manufacturing plants, with about 65 percent of the panel normally responding to the survey. The Federal Reserve Bank of Atlanta reports qualitative month-ago comparisons of several manufacturing indicators and expectations for six months ahead. These results are provided in a monthly press release and summarized quarterly in the Atlanta Federal Reserve Bank's *Regional Update*.

OTHER MANUFACTURING SURVEYS (continued)

National Association of Purchasing Management

The National Association of Purchasing Management began its national survey in 1931. This monthly survey uses a panel of purchasing executives in over 300 manufacturing companies. The panel—called the NAPM Business

Survey Committee—represents a cross section of 20 major industries in 50 states. NAPM reports qualitative month-ago comparisons of several indicators of manufacturing activity and an overall index of manufacturing activity—the Purchasing Managers' Index (PMI). The results of the survey are published monthly in the *NAPM Report on Business*.

changes in employment and the length of the work-week detect impacts on the work force. Responses about exports reveal changes in the importance of foreign customers to district plants, and responses about capital expenditures reveal longer range plans. To help monitor price pressures in the manufacturing sector, respondents also report changes in the prices of raw materials and finished products.

The design of the survey questionnaire helps reduce the time required to collect and process the survey information. Respondents report only on the *direction of change* in the various manufacturing indicators, rather than on the levels of the indicators.

Respondents compare manufacturing activity and prices during the survey month with three other periods: the previous month, the previous year, and six months ahead. The month-ago comparisons provide a snapshot of factory activity during the first month of every quarter. The year-ago comparisons provide some perspective for the current snapshot and help distinguish longer term trends from normal seasonal fluctuations.⁴ The comparison with expectations of activity six months ahead shows whether respondents expect recent changes in manufacturing activity to be long-lived or only temporary.

To help interpret the survey responses, results are accompanied by *diffusion indexes*. The indexes are calculated by subtracting the percentage of total respondents reporting decreases in a given indicator from the percentage of those reporting increases. For example, if 70 percent of the respondents report increases in production and 20 percent report decreases, the index for production would be 50. The indexes, which can range from 100 to -100, reveal the general direction of the indicators by showing how the number of plants with improving conditions offset those with worsening conditions. Index values greater than zero generally suggest expansion, while values less than zero indicate contraction. The closer index values are to 100, the more widespread are increases among respondents. The closer index values are to -100, the more widespread are decreases.⁵

SURVEY RESULTS AS A MEASURE OF MANUFACTURING ACTIVITY

The Tenth District Survey of Manufacturers provides timely information about changes in manufacturing activity during the survey month. The survey can also reveal longer run trends in the manufacturing sector. For example, the July 1995 survey shows a contraction of overall activity in

Table 2

TENTH DISTRICT MANUFACTURING CONDITIONS, JULY 1995

Plant level indicators	July vs. June (percent)				July vs. year ago (percent)				Expected in six months (percent)			
	Increase	No change	Decrease	Diffusion index*	Increase	No change	Decrease	Diffusion index*	Increase	No change	Decrease	Diffusion index*
Production	29	34	36	-7	46	19	34	12	48	31	20	28
Volume of shipments	26	33	41	-15	45	19	35	10	48	27	23	25
Volume of new orders	26	34	38	-12	39	27	33	6	47	32	19	28
Backlog of orders	18	38	42	-24	25	35	37	-12	28	46	24	4
Number of employees	19	57	23	-4	41	28	31	10	25	59	14	11
Average employee workweek	15	64	21	-6	26	54	20	6	18	64	17	1
Prices received for finished product	17	70	12	5	49	33	17	32	31	58	10	21
Prices paid for raw materials	41	50	7	34	76	16	6	70	57	32	7	50
Capital expenditures	—	—	—	—	40	36	24	16	41	42	16	25
New orders for exports	14	63	8	6	25	48	13	12	27	53	6	21
Supplier delivery time	5	87	5	0	15	72	11	4	5	86	7	-2
Inventories:												
Materials	27	43	29	-2	46	28	25	21	16	52	30	-14
Plant's finished goods	27	47	21	6	42	32	21	21	19	49	27	-8
Industry activity, national level	23	44	30	-7	38	27	32	6	35	38	23	12

* The diffusion index is calculated as the difference between the percentage of total reporting increases and the percentage reporting decreases. Data were reported by 201 respondents representing the major manufacturing industries in Colorado, Kansas, Nebraska, Oklahoma, Wyoming, northern New Mexico, and western Missouri.

Table 3

SUMMARY OF TENTH DISTRICT MANUFACTURING CONDITIONS

(Diffusion indexes)

	1994	1995		
	October	January	April	July
	Current month vs. previous month			
Production	19	11	3	-7
Volume of shipments	20	8	1	-15
Volume of new orders	19	20	-5	-12
Backlog of orders	5	8	-11	-24
Number of employees	17	19	6	-4
Average employee workweek	8	-3	-4	-6
Prices received for finished product	9	23	7	5
Prices paid for raw materials	50	56	46	34
Capital expenditures	—	—	—	—
New orders for exports	10	6	7	6
Supplier delivery time	11	13	3	0
Inventories: Materials	4	12	10	-2
Plant's finished goods	-1	8	12	6
Industry activity, national level	20	11	5	-7
	Current month vs. year ago			
Production	48	42	23	12
Volume of shipments	46	40	22	10
Volume of new orders	43	36	24	6
Backlog of orders	4	21	13	-12
Number of employees	31	30	22	10
Average employee workweek	23	15	6	6
Prices received for finished product	29	38	33	32
Prices paid for raw materials	66	75	68	70
Capital expenditures	39	27	27	16
New orders for exports	20	13	17	12
Supplier delivery time	19	17	3	4
Inventories: Materials	19	32	29	21
Plant's finished goods	16	16	32	21
Industry activity, national level	53	41	24	6

Note: The diffusion index is calculated as the difference between the percentage of total respondents reporting increases and the percentage reporting decreases.

Table 3 (continued)

SUMMARY OF TENTH DISTRICT MANUFACTURING CONDITIONS

(Diffusion indexes)

	1994	1995		
	October	January	April	July
	Current month vs. six months ahead			
Production	44	56	39	28
Volume of shipments	46	57	44	25
Volume of new orders	41	55	36	28
Backlog of orders	11	22	11	4
Number of employees	24	29	18	11
Average employee workweek	6	11	8	1
Prices received for finished product	32	31	15	21
Prices paid for raw materials	64	63	50	50
Capital expenditures	37	37	26	25
New orders for exports	26	23	23	21
Supplier delivery time	15	13	-2	-2
Inventories: Material	-6	2	-5	-14
Plant's finished goods	-3	-3	-7	-8
Industry activity, national level	43	50	29	12

Note: The diffusion index is calculated as the difference between the percentage of total respondents reporting increases and the percentage reporting decreases.

the district. Results from earlier surveys show the midyear downturn was preceded by a gradual slowing in manufacturing activity.

The results of the July 1995 survey are shown in Table 2. The results suggest the district's manufacturing sector contracted in July. The negative diffusion index for production reflects widespread declines in factory output among respondents. The diffusion indexes were negative for most other month-ago indicators of manufacturing activity, with the clearest signals of contraction coming from shipments, new orders, and order backlogs. Comparisons of July activity with year-ago activity, however, suggest the district's manufacturing sector remained ahead of its year-earlier pace. Expectations about future activity suggest most respondents consider the downturn temporary. The survey results also show widespread increases in materials prices but stable finished-product prices.

The July survey results reflect a gradual deterioration in manufacturing activity in the Tenth District over the first half of 1995. Diffusion indexes from the testing phase of the survey—October 1994, and January, April, and July 1995—are shown in Table 3. Indexes for month-ago comparisons for each of these test surveys suggest a slowdown in district manufacturing activity in the months leading up to the July 1995 contraction. The slowing trend is also evidenced by a general decline in the indexes for year-ago activity and expectations during the first

half of 1995. The results in Table 3 show that increases in raw materials prices became less widespread over the year but were consistently more widespread than increases in finished goods prices.

COMPARISONS WITH OTHER MANUFACTURING INFORMATION

Are the results of the Tenth District survey consistent with other sources of manufacturing information that may be less timely or less specific to the region? Prior to the new survey, observers often formed impressions about district manufacturing conditions based on employment data and information on the nation's manufacturing sector. Over the past four quarters, that impression would have been the same as the one formed by looking at the Tenth District survey results.

The monthly changes in factory employment and the diffusion index for employment from the survey tell similar stories (Chart 3). Both indicators of labor market conditions in manufacturing improved slightly in January 1995, before falling sharply during the first half of the year.⁶

Measures of manufacturing activity in the nation and the Tenth District also tell similar stories. Chart 4 shows the diffusion index for production from the Tenth District survey and the corresponding index from the NAPM survey. Both indexes showed increases in production becoming gradually less

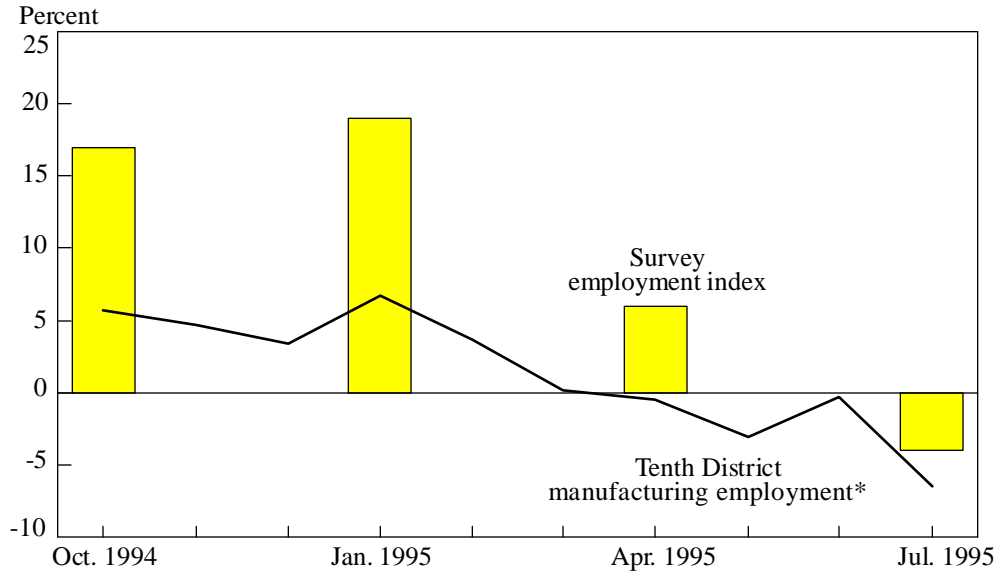
widespread from October 1994 to April 1995. In July 1995, both indexes turned negative, suggesting a contraction in factory production in the region and the nation. The level of the Tenth District index was consistently below the level of the NAPM index, indicating that increases in production were less widespread (or decreases were more widespread) among the respondents to the Tenth District survey than among respondents to the NAPM survey.⁷

SUMMARY

The new Survey of Manufacturers conducted by the Federal Reserve Bank of Kansas City provides new information about manufacturing in the Tenth District. While manufacturing is an important influence on the region's economy, little up-to-date information has been available to chart its performance. The survey, conducted during the first month of each quarter, records changes in several indicators of manufacturing activity, including production and shipments. Moreover, the survey identifies changes in prices of raw materials and finished products. In addition to providing a snapshot of manufacturing activity each quarter, the survey's accumulated results help trace longer run trends in manufacturing performance. Experience with the survey shows that its results correspond with other information about the manufacturing sector. However, the survey results are more timely than employment data and, unlike the NAPM survey, are specific to the Tenth District.

Chart 3

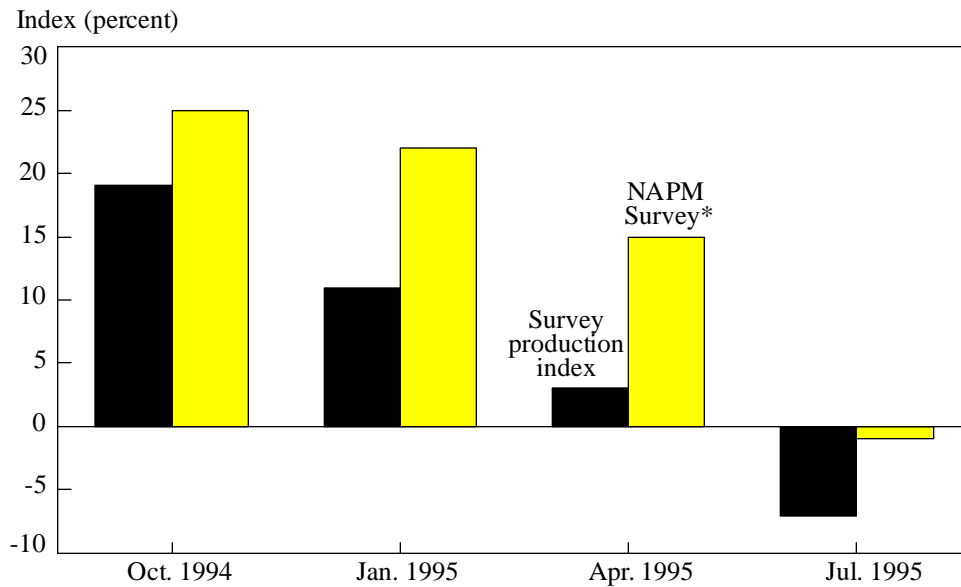
TENTH DISTRICT MANUFACTURING SURVEY EMPLOYMENT INDEX VS. LABOR MARKET DATA



* Annualized change from previous month.

Chart 4

PRODUCTION INDEXES, TENTH DISTRICT SURVEY VS. NAPM SURVEY



* The "net index" reported by the National Association of Purchasing Management (NAPM) corresponds to the Kansas City Federal Reserve's diffusion index. Indexes for the NAPM are for selected months corresponding to the Kansas City Federal Reserve's quarterly survey.

ENDNOTES

¹ While the panel includes only plants located in the district, the plants can be owned by companies outside the district. Companies headquartered in the district but with all production facilities located elsewhere are excluded from the panel.

The survey panel is monitored to ensure consistent participation by respondents. All plants that do not respond to the survey are contacted by telephone and mail. If a plant does not participate for three consecutive quarters, it is dropped from the panel. About once a year, the plants dropped from the panel are replaced. New participants are chosen that represent the same states and industries as the plants that left the panel.

² The region covered by the survey is the Tenth Federal Reserve District: Colorado, Kansas, Nebraska, Oklahoma, Wyoming, western Missouri, and northern New Mexico.

³ No attempt was made to mirror the size characteristics of the district's manufacturing sector because accurate information about the size of each plant was unavailable. Instead, data on employment and annual sales were collected from plants at the time they agreed to participate in the survey. Data from the U.S. Department of Commerce (1992 *County Business Patterns*) show the employment distribution among plants in the survey panel roughly matches the distribution for all manufacturing establishments with one exception. The panel has a much smaller proportion of very small plants (fewer than 50 employees) than the manufacturing sector as a whole. Only a few very small plants were included in the panel because they are difficult to identify and because they tend to make the panel less stable over time due to a higher rate of business failures among this group.

⁴ Respondents are not asked to take seasonal fluctuations into

account. As a result, the survey information should be treated as seasonally unadjusted.

⁵ Diffusion indexes are also used to summarize the survey information collected by the National Association of Purchasing Management (NAPM). The NAPM indexes are calculated differently than the indexes used by the Kansas City Federal Reserve and other Federal Reserve Banks. The NAPM indexes are calculated by adding one-half of the percentage of respondents reporting no change in a given indicator to the percentage of respondents reporting an increase in the indicator. The resulting indexes range from 0 to 100. Values above 50 signal expansion. The greater the reading above 50 the greater the extent of expansion. In contrast, any reading below 50 percent signals contraction. While the scale of the NAPM indexes is different from the scale of the Kansas City Federal Reserve indexes, both sets of indexes have the same relative movement and convey the same information.

⁶ The employment index or labor market data may not always be a reliable guide to overall manufacturing activity. Productivity improvements made in recent years allow many manufacturers to make adjustments to production without the wide swings in employment once commonplace in the manufacturing sector.

⁷ The Tenth District sample may bear a different relationship to the population of manufacturing establishments in the district than the NAPM sample to the population of manufacturing establishments in the nation. Therefore, the levels of the indexes cannot be used to determine the performance of the region's manufacturing sector relative to the nation for any single month.

REFERENCES

Bell, John, and Theodore Crone. 1986. "Charting the Course of the Economy: What Can Local Manufacturers Tell Us?" Federal Reserve Bank of Philadelphia, *Business Review*, July/August.

Chmura, Christine. 1987/88. "New Survey Monitors District Manufacturing Activity," Federal Reserve Bank of Richmond,

Cross Sections, Winter.

National Association of Purchasing Management. Various issues. *NAPM Report on Business*.

Rodgers, R. Mark. 1992. "Tracking Manufacturing: The Survey of Southeastern Manufacturing Conditions," Federal Reserve Bank of Atlanta, *Economic Review*, October.