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# FRBSF WEEKLY LETTER

Number 93-20, May 21, 1993

## Western Metal Mining

Mining has played an important historical role in attracting immigrants and establishing businesses in many of the states that make up the Twelfth Federal District. And this area continues to contribute the largest share of the nation's totals in a variety of different metals. For example, according to data reported for 1990 to the U.S. Bureau of Mines, nearly three-quarters of the nation's copper production is in Arizona and Utah; over 80 percent of U.S. gold production is in Nevada, California, and Utah; and over two-thirds of the nation's silver is produced in the District states.

The District's metal mining industry has changed significantly in the last 20 years. This *Letter* focuses on activity in the intermountain states of the District: Arizona, Idaho, Nevada, and Utah. Aggregate metal mining employment in these states has declined by 17 percent since 1973, but this modest decline averages a sharp increase in Nevada's mining activity with an equally steep decline in Arizona's metal mining. Implications of these trends are discussed in this *Letter*.

### Mining's importance

Metal mining provides one of the base industries for the intermountain states in the District. However, it accounts for a relatively small share of direct employment in most states. In February 1993, metal mining's share of total nonagricultural employment in the four states ranged from 0.3 percent in Idaho to 2.0 percent in Nevada. In levels, employment ranged from 1,300 in Idaho to 12,600 in Arizona.

While not a major source of employment, the industries are important because of their multiplier effects on the rest of the economy. (Accounting for multiplier effects gives a more complete sense of the importance of metal mining.) An average industry has a total employment multiplier (which takes into account direct employment at the mine, induced effects on other industries that must process the material, and indirect effects on other

industries resulting from higher income and spending from that sector) close to 2.

Results from the U.S. Forestry Department's regional modeling system (IMPLAN) suggests that mining multipliers in these states are considerably higher. The model provides employment multipliers for several major minerals at the state level using data from 1990 and the 1987 U.S. input-output table. Results from this model suggest that copper mining has a relatively high multiplier in Utah (4.9) and Arizona (6.6), gold mining had total employment multipliers of around 3 in Arizona, Nevada, and Utah, while silver mining had employment multipliers of 2.5 to 2.8 in Arizona, Idaho, and Nevada. (Differences in multipliers across states for a given mineral reflect the relative presence in that state of processing facilities and industries that use the mineral as inputs to final production of goods and services.) Total metal mining had multipliers of 2.8 in Nevada, 3.2 in Idaho, 4.0 in Utah, and 5.2 in Arizona. These estimates of multiplier effects suggest that metal mining's total contribution to state employment would be 1.0 percent in Idaho, 1.6 percent in Utah, 4.1 percent in Arizona, and 5.0 percent in Nevada.

### Trends

While remaining an important base industry in these states, metal mining employment has been falling in most areas. As shown in the Figure, metal mining employment has declined in Arizona, Idaho, and Utah, while rising in Nevada. As a share of total employment, metal mining employment fell from 2.3 percent of total employment in the four state region in 1973 to 0.8 percent in early 1993. The major changes have been in Nevada, where employment rose by 9,400 jobs, and Arizona, where employment fell by 10,400 jobs.

Several factors have been important in determining these trends. First, labor productivity has

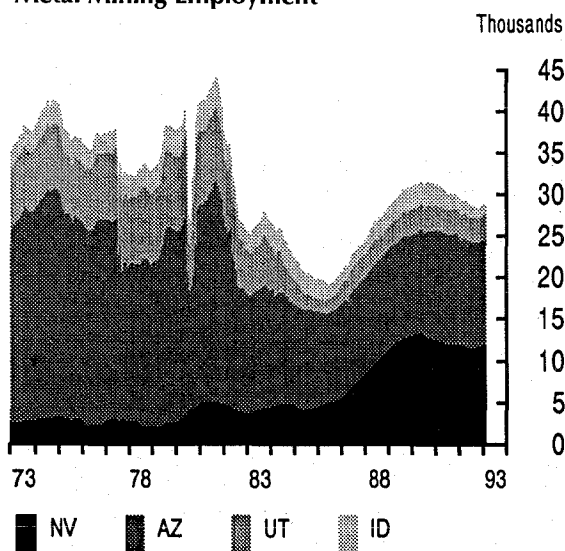
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## THE WESTERN ECONOMY

*The Western Economy* is a quarterly review of economic conditions in the Twelfth Federal Reserve District. It is published in the *Weekly Letter* on the third Friday of February, May, August and November.

# FRBSF

## Metal Mining Employment



risen in many metals industries. For example, copper production accounts for over 90 percent of Arizona's metal mining employment. Between 1973 and 1990, employment in that sector declined by 46 percent. During that same time period, however, Arizona's copper output rose 16 percent. These increases in productivity can be traced to new mining processes that involve more automation and capital equipment.

Second, large deposits of gold and silver have been discovered in Nevada. As shown in the Figure, Nevada's metal mining employment was relatively small in the 1973–1984 period, and the state's copper industry virtually disappeared in 1986. Gold and silver discoveries were recorded throughout the state, though, and according to the Bureau of Mines, exploration efforts were reported in every county in Nevada during the mid- to late-1980s, with 10 to 15 new mines opening each year. By 1990, exploration efforts concentrated on the northern part of the state, but annual production of gold rose from 1 million troy ounces in 1984 to 5.8 million troy ounces in 1990, while silver production rose from 6.5 to over 25 million troy ounces.

### Prices

In recent years, declines in metals prices also have affected mining employment in the four intermountain states in the District. For example, since reaching its most recent peak in 1988, nominal gold prices have fallen 29 percent, silver prices have declined 46 percent, and copper prices have fallen 18 percent.

Price declines have been attributed to several factors. For copper, production has risen in Chile as well as in the U.S., while growth in consumption in the U.S. has slowed (in part reflecting the shift from copper wires to fiber optics for communications and electricity). Gold and silver prices have fallen for similar reasons, and in addition because world-wide inflation has subsided. Since gold and silver often are viewed as inflation hedges, decreased concern about inflation has lowered the demand for holding those assets. Moreover, opening trade opportunities with Russia is bringing that country's large stock of mineral wealth into the marketplace.

Price changes have some impact on employment and production trends in most of the states. To test for the effect of prices, simple lagged adjustment models of metal mining employment were run for each of the four states, with gold, silver, and copper prices (adjusted for inflation) used as explanatory variables. In general, the results suggest that a given 10 percent decrease in the inflation-adjusted price of gold, silver, or copper would lead to a decline in long-term employment of between 5 and 7 percent, with half of the effect of a given price change on employment taking between nine and fifteen months.

Not surprisingly, copper prices were important in explaining metal mining employment in Arizona and Utah, while silver prices were important in explaining metal mining employment in Idaho and Utah. In Nevada, recent activity has been dominated by the gold and silver discoveries, and changes in employment have shown little statistical relationship to changes in gold and silver prices.

### Implications

Increased international trade has boosted available supplies of minerals, which has put downward pressure on mineral prices. Low prices and further automation are expected to reduce employment further in metal mining as well as in industries that are linked to mining. While future discoveries may temporarily reverse this trend in some regions, the long-term adjustment to a less mining-intensive employment base in these states is likely to continue.

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**DISTRICT INDICATORS**  
(Seasonally Adjusted)

	93Q1	92Q4	92Q3	92Q2	92Q1	91Q4	91Q3	91Q2	% Change From:	
									92Q4	92Q1
<b>AGRICULTURE</b>										
U.S. crop prices, 1985=100	108.4	109.2	107.9	108.1	109.6	110.7	114.6	115.8	-0.72	-1.15
District crop prices, 1985=100	107.8	112.8	110.4	101.6	114.9	107.9	120.7	128.6	-4.46	-6.20
Farm cash receipts, million \$	2,508.3	2,740.7	2,563.2	2,468.1	2,535.6	2,655.9	2,528.0	2,717.6	-8.48	-1.08
Cattle-on-feed, 1985=100	90.1	91.1	91.3	86.8	86.0	81.1	84.3	91.9	-1.13	4.76
Cattle prices, California, \$/Cwt.	62.4	58.4	60.1	58.4	59.1	62.1	62.6	66.4	6.85	5.58
<b>FORESTRY</b>										
Lumber production, millions board feet	1,300.0	1,409.6	1,369.2	1,282.3	1,413.7	1,370.5	1,418.8	1,466.3	-7.77	-8.04
Northwest lumber inventory, millions board feet	2,020.9	2,086.1	2,196.6	2,278.6	2,197.7	2,310.9	2,393.9	2,305.4	-3.12	-8.04
U.S. lumber prices, 1986=100	245.1	162.9	147.9	153.1	156.8	137.9	131.6	137.6	50.41	56.30
<b>ENERGY</b>										
Spot price of oil, \$/barrel	19.8	20.6	21.7	21.1	18.9	21.8	21.6	20.8	-3.79	4.82
U.S. rig count	862.2	854.7	860.9	871.9	867.3	906.8	926.1	939.8	0.88	-0.59
District rig count	50.2	63.9	60.8	65.9	54.6	63.2	74.5	80.4	21.48	-8.06
Fuel mining employment, 1985=100	60.3	67.6	68.3	70.3	70.3	70.2	72.6	73.4	-10.72	-14.22
U.S. seismic crew count	77.5	73.7	71.7	80.7	80.2	89.9	98.9	109.4	5.03	-3.36
<b>MINING</b>										
Mineral prices, 1986=100	99.5	99.2	105.3	107.0	105.9	104.1	104.5	108.8	0.29	-6.07
Metal mining employment, 1985=100	176.4	177.5	178.9	180.1	182.6	180.6	184.1	186.1	-0.61	-3.39
<b>CONSTRUCTION</b>										
Nonresidential awards, 1985=100	98.8	97.2	94.6	102.4	111.0	103.2	94.5	104.0	1.63	-10.95
Residential permits	18,624	21,147	19,538	18,922	19,564	19,749	18,488	19,757	-11.93	-4.80
Western housing starts, thousands	19.2	21.2	26.3	26.7	21.9	19.5	24.1	25.5	-9.45	-12.47
Construction employment, thousands	862.2	854.7	860.9	871.9	867.3	906.8	926.1	939.8	0.88	-0.59
<b>MANUFACTURING</b>										
Wages, California, \$/hour	12.2	12.3	12.3	12.2	12.1	12.1	11.9	11.8	-0.57	0.99
Employment, thousands	2,804.4	2,798.5	2,835.8	2,872.6	2,894.4	2,954.9	2,980.3	3,007.6	0.21	-3.11
Durables, 1985=100	86.8	89.3	90.5	92.1	93.4	94.0	95.2	96.4	-2.80	-7.02
Construction durables, 1985=100	90.4	91.8	91.1	93.7	94.8	93.5	95.0	95.6	-1.48	-4.60
Aerospace, 1985=100	89.4	93.3	96.8	100.0	103.7	106.1	107.4	109.5	-4.15	-13.84
Electronics, 1985=100	80.9	85.4	85.9	87.1	87.8	88.9	90.5	92.0	-5.26	-7.79
Semiconductor orders, mil. \$, not s.a.	2,010.1	1,932.8	1,712.0	1,543.1	1,438.8	1,378.5	1,272.4	1,299.1	4.00	39.70
Whls/retail trade employment, thousands	4,685.2	4,652.2	4,665.1	4,686.1	4,680.2	4,694.2	4,705.9	4,721.7	0.71	0.11
Retail sales, Pacific District, mil. \$	N/A	26,119	25,774	25,675	25,997	25,044	25,411	25,304	N/A	N/A
Services employment, thousands	5,565.2	5,530.0	5,505.1	5,495.5	5,455.7	5,477.5	5,465.0	5,444.1	0.64	2.01
Health care, 1985=100	135.3	134.2	133.6	132.8	132.0	131.0	130.0	128.9	0.79	2.45
Business services, 1985=100	115.4	113.5	112.7	113.0	112.9	112.1	112.4	113.0	1.68	2.25
Hotel, 1985=100	129.9	131.2	130.9	131.8	132.4	132.6	131.7	132.2	-1.02	-1.92
Recreation, 1985=100	142.2	141.2	140.9	139.4	139.0	139.7	139.0	140.1	0.73	2.29
Finance, insurance, and real estate empl., thousands	1,226.3	1,222.0	1,223.4	1,227.4	1,224.7	1,241.9	1,244.1	1,246.7	0.35	0.13
<b>GOVERNMENT EMPLOYMENT, THOUSANDS</b>										
Federal government	603.1	612.2	610.8	608.1	615.7	612.6	614.5	611.3	-1.50	-2.05
State and local	2,928.6	2,929.5	2,945.6	2,920.3	2,914.4	2,889.5	2,888.8	2,869.0	-0.03	0.49

Data are weighted aggregates of available 12th District data constructed by FRBSF staff from public and industry sources.

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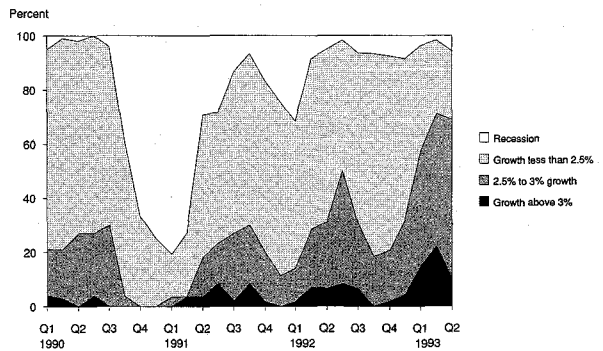
# Research Department Federal Reserve Bank of San Francisco

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## PERSONAL INCOME Annualized Percent Growth Rates

	92Q4	92Q3	92Q2	92Q1	91Q4	Annual Growth		
						1992	1991	1990
Alaska	7.6	0.8	1.2	10.8	6.1	5.0	4.1	6.9
Arizona	6.6	3.4	6.1	7.1	6.1	5.8	4.2	5.7
California	5.1	4.1	4.4	4.8	1.1	4.6	1.7	7.3
Hawaii	39.8	-24.3	3.2	10.7	2.1	4.9	2.3	11.2
Idaho	20.2	3.7	8.4	1.5	14.8	8.2	4.7	8.2
Nevada	8.0	6.9	2.6	8.6	4.4	6.5	4.3	10.6
Oregon	7.8	6.5	4.5	6.6	5.8	6.3	4.6	6.7
Utah	8.4	7.1	4.5	10.8	6.8	7.7	5.9	8.1
Washington	13.3	5.0	4.4	8.7	8.3	7.8	5.8	9.1
12th District	7.4	3.6	4.5	5.9	3.0	5.3	2.7	7.6
U.S.	8.3	2.9	4.4	6.5	5.7	5.5	3.5	6.2

## Twelfth District Business Sentiment\* GDP



## NON-AGRICULTURAL EMPLOYMENT Annualized Percent Growth Rates

	93Q1	92Q4	92Q3	92Q2	92Q1	Annual Growth		
						1993*	1992	1991
Alaska	7.9	2.0	-0.7	-2.7	5.9	7.9	1.1	1.3
Arizona	1.5	0.4	5.0	4.3	0.1	1.5	2.4	0.6
California	0.2	-3.0	-2.3	-0.4	-5.6	0.2	-2.9	-2.9
Hawaii	0.0	-2.8	-3.2	0.2	1.7	0.0	-1.1	1.2
Idaho	3.5	2.7	3.7	4.2	5.8	3.5	4.1	3.8
Nevada	4.4	5.0	4.5	2.2	2.5	4.4	3.5	-0.2
Oregon	3.9	2.0	0.1	2.8	1.6	3.9	1.6	0.1
Utah	6.5	3.1	3.8	2.8	4.0	6.5	3.4	2.3
Washington	2.4	3.4	-0.2	0.7	3.1	2.4	1.7	1.2
12th District	1.4	-1.1	-0.8	0.5	-2.7	1.4	-1.0	-1.5
U.S.	1.6	0.5	0.3	1.1	-0.2	1.6	0.4	-1.0

\* Year-to-date

## UNEMPLOYMENT RATES Average Quarterly Data

	93Q1	92Q4	92Q3	92Q2	92Q1	Annual Average		
						1993*	1992	1991
Alaska	8.0	8.9	9.5	9.2	9.2	8.0	9.2	8.6
Arizona	7.6	7.4	7.0	7.3	8.1	7.6	7.4	5.6
California	9.6	9.9	9.4	8.7	8.4	9.6	9.1	7.6
Hawaii	4.5	4.8	4.6	4.1	3.5	4.5	4.3	2.7
Idaho	6.6	6.5	6.4	6.2	6.3	6.6	6.3	6.1
Nevada	6.7	6.5	7.2	6.1	6.5	6.7	6.6	5.6
Oregon	8.1	7.5	6.9	6.6	8.3	8.1	7.3	6.0
Utah	4.1	5.4	5.0	4.6	4.8	4.1	4.9	4.9
Washington	7.6	7.8	6.9	6.9	7.2	7.6	7.2	6.4
12th District	8.6	8.9	8.4	7.9	7.9	8.6	8.3	6.9
U.S.	7.0	7.3	7.6	7.5	7.2	7.0	7.4	6.8

\* Year-to-date