

Rural Mines Increase Productivity, Decrease Employment

Mining is one of the most productive, capital-intensive rural industries and its various sectors are geographically concentrated. Mining employment in recent years has declined sharply from a peak in 1981.

During the 19th century, mining was a pioneering industry that followed explorers and fur traders into the West. Like the frontier society of which it was a part, mining was also a rambunctious industry that experienced extravagant bouts of “boom and bust.” Less extreme cycles of expansion and contraction have continued in the 20th century. The accompanying graph shows the industry’s roller-coaster trajectory as it responded to the “energy crisis” of the 1970’s by doubling nonmetro employment and then to the oil and metals glut of the 1980’s by shrinking that work force back to the 1969 level. Since the 1980’s, nearly every State has become less dependent on the energy industries. The Federal Reserve Bank of Dallas predicts that this trend will continue throughout the 1990’s but at a slower rate.

The mining industry is generally divided into four main groups—(1) coal; (2) metals; (3) nonfuel nonmetallic minerals; and (4) oil and gas. Wages in all four groups are above the national average. Thus, unless replaced by other types of well-paid jobs, a drop in mining employment results in an overall decline of high-wage jobs in rural America.

Coal—the Most Rural of the Mining Industries

The U.S. coal industry is concentrated in three main geographical regions—Appalachia, the West (including Texas), and the central and lower Midwest. Five States—Wyoming, Kentucky, West Virginia, Pennsylvania, and Texas—account for 64 percent of total national production. With 81 percent of its workers living in nonmetro counties (1992 data), coal is also the most rural-oriented of the major mining industries.

Electric utilities are the primary consumers of coal. Their consumption grew from a 17 percent share of production in 1949 to an 88 percent share in 1994. On the other hand, consumption by all other economic sectors in 1994 was lower than it had been in 1949. The largest declines took place in the transportation sector, where railroads switched to petroleum, and in the residential and commercial sector. In 1994, only 1 percent of U.S. coal was consumed in these sectors.

In 1994, the average prices of bituminous, lignite, and anthracite coal were less than half of what they had been in 1975. The decline in coal prices resulted from gains in productivity, the expanded use of longwall mining in underground mines, and the increased use of cheaper western coal. Overall production, however, is now more than 50 percent greater than it was in 1975. Since World War II, coal has been the major U.S. energy export. Coal exports peaked at 113 million short tons in 1981 and from 1982 to 1994 fluctuated between 71 million and 106 million short tons. In 1994, Japan (10 million short tons), Canada (9.2 million short tons), and Italy (7.5 million short tons) accounted for 38 percent of U.S. coal exports of 71.4 million short tons.

Coal Production Shifting West

U.S. coal production, which had averaged nearly 1 billion tons per year during 1989-92, dropped to 945 million tons in 1993. A United Mine Workers strike and a decline in exports account for most of the decrease in 1993. Coal production in the West in 1993 rose 7 percent above the 1992 level to 369 million short tons, with Wyoming accounting for 86 percent of that increase. Eighty-six percent of Wyoming’s production was concentrated in Campbell County, which accounted for nearly 20 percent of the U.S. total. The increase in Wyoming coal production was the result of greater demand for low-sulfur coal from the Powder River Basin. Much of the additional coal output from Wyoming was shipped to electric utilities in Texas and the Midwest, particularly in Illinois, displacing indigenous high-sulfur coal. Because of these changes in coal production in 1993, the western region’s share of the U.S. coal output rose from 35 percent in 1992 to 39 percent in 1993. Appalachia’s production share dropped to 43 percent from 46 percent in 1992

while the Midwest's share fell from 20 to 18 percent. This continues a trend begun in the early 1980's, when Appalachia claimed half of the Nation's coal production. One result of the westward shift in production has been a greater utilization of lands leased from the Federal Government and Indian Tribes. In 1993, over 30 percent of coal output as measured in sales volume came from Federal and Indian lands. Within the next few years, the West will begin to dominate national production since two-thirds of the recoverable coal reserves are located west of the Mississippi River and 93 percent of these reserves are at surface mines, which have an average recovery rate of 91 percent compared with 56 percent for underground mines. For instance, Wyoming has 69.5 billion short tons of proven coal reserves. About 16.5 billion short tons is "compliance coal," meeting the Clean Air Act mandate of 1.2 pounds of sulfur dioxide per million British thermal units. At current production rates, Wyoming miners can produce "compliance coal" from surface operations for another 75 years.

Mining employment and wages

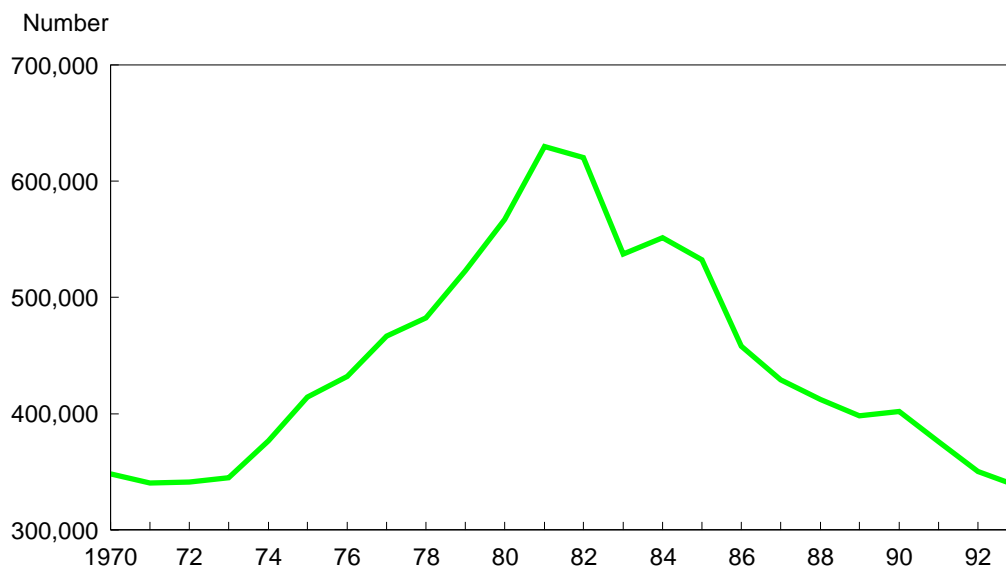
Mining employment and wages have fallen but wages remain above national average

Item	U.S. employment		1995 average earnings
	1992	1995	
	Thousands		Dollars per hour
Metal mining	52.7	50.7	16.67
Coal mining	126.3	107.1	18.88
Oil and gas	352.3	316.7	14.48
Nonmetallic minerals	101.3	103.8	13.32
Total mining	632.6	578.3	15.28 ¹
Total private employment	89,958.8	96,963.6	11.40

¹Weighted average.
Source: Bureau of Labor Statistics.

Nonmetro mining employment

Mining employment peaked in 1981, and has fallen steadily since then



Source: Bureau of Economic Analysis.

Amendments to the Clean Air Act (CAA) requiring lower sulfur dioxide emission limits by 1995 and 2000 have resulted in research and development to meet these new requirements. Such research will benefit mines in Appalachia whose coal generally has a higher sulfur content than those in the West. Coal-burning utilities are being evaluated for compliance with the CAA, and those not meeting standards must switch to lower sulfur coal or "scrub" coal with a gas desulfurization system. The use of scrubbing systems would allow for continued use of more Appalachian coal and increase demand for lime and limestone.

An Older, Smaller, More Productive Workforce

The number of U.S. coal mines dropped 10 percent from 2,748 to 2,475 between 1992 and 1993. This is slightly less than half the number of coal mines that existed in 1984. Virtually all of the decline from 1992 to 1993 resulted from the loss of mines in Appalachia. The closing of mines is in part responsible for a pronounced "greying" of the work force. In 1986, the average age of miners was 39 years but by 1992 it had increased significantly to 45 years. Perhaps another reason for the aging of the work force has been that significantly fewer miners are now needed to produce a relatively constant amount of coal. During 1984-1993, productivity at U.S. coal mines increased at an average annual rate of 6.6 percent. During that same period total coal mining employment declined from 177,848 to 101,322.

Despite the westward shift in production and the "greying" of the work force, coal still has considerable socioeconomic importance in Appalachia. For instance, in 1992 an average of 91 short tons of coal was produced for every person in West Virginia, higher than any other State except Wyoming, compared with a national average of 4 tons per person. However, a comparison of size, employment, and the number of mines gives a more accurate picture of the socioeconomic impact of coal in West Virginia. West Virginia is approximately a fourth the geographic size of Wyoming, but it employs 24,000 people in the coal industry or about four times as many as in Wyoming. In 1992, Wyoming had 32 mining operations versus 1,600 in West Virginia. Also, in West Virginia, about 600 other facilities such as preparation plants, stockpiles, loading areas, refuse disposal areas, and haulageways support these mining operations.

Metal and Nonmetal Nonfuel Minerals

Federal mining policy has been a much-debated subject recently. In 1872, Congress passed the Mining Act permitting prospectors to acquire fee simple title to Public Domain land for \$2.50 per acre upon demonstrating the existence of profitable deposits of metaliferous ore. That act undoubtedly stimulated the western mining industry, but for over a century secretaries of the Interior and various commissions have criticized it for unnecessarily allowing the alienation of public property. In recent decades, environmentalists have attacked it for its supposed adverse effect on land and water quality. Beginning in the 1970's, chairpersons of various interior and natural resource committees in Congress have attempted to move to a leasing system similar to that governing coal, oil, and gas on public lands but each time were thwarted by the industry's considerable political persuasiveness. In 1995, leaders in the U.S. House of Representatives proposed increasing the sale price of mineralized land to reflect the market value of "surface" resources only. In addition, a small royalty payment would be assessed on the output of new patented claims. Environmentalists and their congressional supporters consider these changes to be insufficient. The Mining Act of 1872 will probably be amended in the near future but the extent of change is still in doubt.

During the early 1980's, western mining industries (especially copper) suffered a severe downturn. They rebounded later in the decade, led by a surge of gold mining in Nevada where improved processing methods allowed the recovery of gold from deposits previously considered unprofitable. Nevertheless, because of foreign competition, environmental controls, the exhaustion of profitable deposits, and the development of more efficient ways to use metals, the long-term trend line for the U.S. metals industry points downward.

The nonfuel minerals industry is concentrated in a few States, although the degree of concentration is less than in other mining industries. Ten States accounted for 54.5 percent of nonfuel mineral production in the United States in 1992. Nonfuel mineral industries are less rural-oriented than coal. Sixty-two percent of the work force of metals industries lived in rural counties, while 44 percent of the work force of other nonfuel minerals industries have rural residences. Much of the stone, gravel, cement, and clays are mined in States with low proportions of rural counties.

The Ten Leading Nonfuel Mineral-Producing States

Arizona (9.89 percent of U.S. nonfuel mineral production)—Arizona remained the 1992 national leader in nonfuel mineral production, a position it first assumed in 1989. Arizona produced 65 percent of the Nation's copper. Its total of 1.15 million metric tons (\$2.73 billion) constituted 86 percent of the State's total nonfuel mineral value. Arizona remained an important gold producer and was nationally significant in terms of several byproducts of copper production - lead, molybdenum, rhenium, silver, and sulfuric acid. According to a study prepared by the Western Economic Analysis Center, the Arizona copper industry contributed \$6.56 billion, directly and indirectly, to the 1992 State economy, up sharply from \$5.65 billion in 1991. In 1992, 1.6 million Arizonans worked in the nonagricultural sector and 12,600 of those were in mineral mining (0.8 percent). This was down from 14,900 in 1991, which reflects a general trend toward greater productivity in the mineral industry.

Nevada (8.09 percent)—Mined gold made up 87 percent of Nevada's total nonfuel mineral production in 1992. Nevada produced 60 percent of all the Nation's gold and accounted for approximately 9 percent of the world's output. Silver, almost all as a byproduct from gold production, accounted for an additional 3 percent of Nevada's nonfuel mineral production and placed it first among silver-producing States. Relatively low prices, uncertainties regarding access to Federal lands, and more restrictive State and Federal regulations resulted in a substantial decline in exploration activity since the peak in 1988. In December 1992, 12,900 workers were employed in the Nevada mining industry, a 0.8-percent decrease from 1991 and an 8-percent decline since the 1990 peak of 15,000.

California (7.33 percent)—The 1992 value of minerals was down 7.5 percent from 1991. California was the sole producer of boron and tungsten and led all States in the production of asbestos, Portland cement, diatomite, calcined gypsum, rare-earth concentrates, and construction sand and gravel. It was second in natural calcium chloride, gold, magnesium compounds, pumice, industrial sand and gravel, and soda ash. Construction sand and gravel, Portland cement, gold, and boron, in order of value, were the four principal mineral commodities. Industrial minerals were about 82 percent of the value of California's nonfuel mineral production. Continuing declines in industrial minerals prices, due in part to a continued weak construction market in the State, caused the drop in value from 1991. In December 1992, the California mining industry employed 7,900 workers, down about 7 percent from the previous year. Of these, 2,200 were metal mining jobs and 5,700 were nonmetallic mineral mining jobs.

Michigan (4.96 percent)—Michigan's 1992 nonfuel mineral production was valued at \$1.6 billion, a 6 percent increase over 1991's amount. In order of value, Michigan's leading mineral commodities were iron ore, Portland cement, sand and gravel, and crushed stone. Industrial minerals constituted about 60 percent of the State's nonfuel mineral value. Although statewide unemployment declined from 9.2 percent to 8.8 percent, in the Upper Peninsula where mining is important the rate rose from 10.4 percent to 10.8 percent. About 9,000 persons were employed in mining throughout the State, the same figure as in 1991. In the Upper Peninsula 3,400 worked in the industry, also reflecting little change from the 1991 figure.

Florida (4.50 percent)—In 1992, Florida's nonfuel mineral value was \$1.439 billion, an increase over the 1991 figure of \$1.396 billion. An increase in sales was reported for the major industrial minerals produced in the State - cement, phosphate rock, construction sand and gravel, and stone. For most of the 20th century, phosphate rock has been the leading mineral mined in Florida. More than 95 percent of Florida's phosphate rock production is used by

Oil and Gas

During the last 25 years there have been three oil “price shocks” with lasting effects. Employment in the oil and gas industry has risen and fallen with these price changes. U.S. oil production peaked in 1970, and since that year the U.S. has been importing a greater percentage of the oil it consumes. However, the ratio of energy consumption to gross domestic product (GDP) has been falling over time, reducing concern about U.S. dependence on foreign energy suppliers. According to the forecast of the Federal

the fertilizer industry, and the phosphate industry produces approximately 80 percent of U.S. fertilizer needs and 30 percent of worldwide demand. Historically, sales of fertilizer and phosphoric acid have exceeded 50 percent of the State's mineral value. The annual rise or fall in the value of the State's minerals has been controlled by both fertilizer and phosphoric acid demand and sales to the domestic and world's phosphate fertilizer market. The break-up of the Soviet Union temporarily disrupted an important foreign phosphate market.

Minnesota (4.26 percent)—Minnesota's 1992 mineral production was valued at about 1.4 billion, a \$75-million increase over the amount reported in 1991. In order of value, Minnesota's three leading mineral commodities were iron ore, construction sand and gravel, and crushed stone, all of which increased in value in 1992. Minnesota continued to lead the Nation in iron ore production. The industry underwent considerable change in 1992. Lower demand for iron ore, foreign competition, and competition from steel mills that produce steel from scrap (minimills) caused companies to lower production, reduce employment, and even temporarily shut down operations at most of the State's seven taconite iron ore operations. Employment in Minnesota's mining industry averaged 7,621 in 1992, a decline of about 3.2 percent from 1991. The monthly average number of workers employed in the metal mining sector was 6,017 in 1992, a drop of 274 from the figure reported in 1990. Industry's moves to lower taconite production costs caused most of the job lost in the State's mining industry.

Utah (4.21 percent)—Utah's mineral value increased from \$1.18 billion in 1991 to \$1.35 billion in 1992. Production and value of beryllium, copper, gold, magnesium, molybdenum, and silver all increased from 1991 levels. Utah was one of only three mercury-producing States. The State ranked second in copper and magnesium metal; third in gold, iron ore, and molybdenum, and sixth in silver production. Mining employment constituted approximately 1 percent of the State's total work force. Utah's economy performed well in 1992 and mining production increased but the State's mining employment declined slightly from 8,596 in 1991 to 8,487—another example of the national trend towards greater mine productivity and declining employment.

Georgia (4.21 percent)—Georgia experienced a 3.1-percent increase in mineral value, going from \$1.31 billion in 1991 to \$1.35 billion in 1992. The State's two leading mineral commodities, clays and crushed stone, accounted for more than 90 percent of the total value produced. Georgia continued to be the largest State producer of several types of clays and also in the quantity of granite and barite production. Mining employment declined from 7,700 in 1991 to 7,500 in 1992, a drop of 2.6 percent.

Texas (4.07 percent)—Texas has been the Nation's leading oil and gas producer since the 1920's and has also been an important producer of Portland cement, crushed stone, magnesium metal, and construction sand and gravel. It led the Nation in the production of magnesium metal, common clay, and zeolites and was second in the production of Portland cement, salt, sodium sulfate, and talc. Jobs in the metals and coal subcategory averaged about 9,000 in 1992, down 500 from 1991. This compares to 161,600 oil and gas jobs, down from 175,600 in 1991.

Wyoming (2.97 percent)—Unlike coal production which is concentrated in one county, 19 of Wyoming's 23 counties contributed to the 1992 nonfuel mineral value of \$951 million, up 2 percent from 1991. Wyoming continued to be the Nation's leading producer of bentonite clays and soda ash, and the second largest producer of total clays and Grade-A helium. The minerals industry in Wyoming continued to be the single largest contributor to the value of that State's economy, according to the Wyoming Department of Commerce. It accounted for 8.5 percent of total nonagricultural employment in 1992. In that year nonfuel mining employment was 4,000, a drop from 4,400 the previous year.

Reserve Bank of Dallas, oil prices are unlikely to experience sharp sustained changes during the next decade. Gas prices will move parallel to oil prices but will remain below oil prices for equivalent amounts of energy.

Oil and gas are the least rural of the mining industries, with only 36 percent of their work force located in rural counties. Oil and gas operations sometimes occupy only a few acres of land and usually require less land disturbance than coal and metal mining operations. Thus, they can often fit compatibly into metro environments. Secondly, crude oil and natural gas can more easily be transported to urban processing plants than coal or metal ores. Thirdly, a significant amount of production comes from off-shore wells. For instance, in 1994 gross withdrawals of natural gas from wells totaled 24 trillion cubic feet. Texas, Louisiana, and Oklahoma accounted for 61 percent of total U.S. production. Most of the withdrawals came from onshore wells and State offshore wells, but 5.2 trillion cubic feet (22 percent of the total) were Federal offshore withdrawals.

In 1992, Congress passed the Energy Policy Act (EPACT), which affects virtually all sectors of the energy industry with a range of research-and-development provisions, conservation and fuel requirements, tax incentives, Federal mandates, and regulatory changes. The oil and gas sectors are affected both directly and indirectly. Independent oil and gas producers are helped by changes to the alternative minimum tax system, which took effect at the beginning of 1993. These changes may increase the profitability of their operations and could encourage substantial additional investment. Independent producers account for significant percentages of crude oil and natural gas reserves and for about three-fourths of annual well completions.

Producers of natural gas may also be favorably affected by broad changes EPACT made to the 1935 Public Utility Holding Company Act. These amendments establish a new class of independent power producers (IPP's), who will now have access to utility-owned transmission lines. The IPP's will be able to sell their power directly to utilities. IPP's tend to favor gas power plants because of lower initial costs.

The production of U.S. natural gas rose each year from 16.62 trillion cubic feet in 1987 to 18.41 trillion cubic feet in 1993. Future expansion will be due to a number of factors, including stronger economic growth and increasing gas-fired generating capacity. Increase in demand is supported by a growth in interstate pipeline capacity. Increased demand by electric utilities and by the industrial sector account for virtually all of the increase in natural gas demand. Residential and commercial demand is predicted to remain largely unchanged.

During the same period domestic crude oil production declined in every year but one from 8.349 million barrels per day to 6.870 million barrels per day. The continuing decrease in production reflects low levels of domestic exploration and development during the past several years as a result of prices that are substantially lower in real terms than in most years since 1974. Also, opportunities abroad have been better recently. *[Dennis Roth, 202-501- 8321, droth@econ.ag.gov]*