

The Economic Role of Metal Mining in Minnesota: Past, Present, and Future

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EXECUTIVE SUMMARY

New Metal Mining for Minnesota: Economic Boom or Set-Back to Diversification and Sustainability?

Rising metal prices have triggered a revitalization of Minnesota's taconite mining and processing industry. Some of the taconite mills have upgraded their operations; others have plans to do so. In addition, an integrated steel mill has been proposed that would combine iron ore mining, concentration, iron metal production, and the production of rolled steel. High copper and nickel prices have also led to two proposals to begin mining and processing the state's extensive copper ore deposits.

Metal mining and processing jobs are among the highest paid blue-collar jobs available in Minnesota and the nation. The metal industry also requires other highly skilled personnel, creating high-paid technical and professional jobs in relatively small towns or rural areas. These are attractive economic benefits of metal mining.

Metal mining and processing also have negative aspects. They disturb the land in ways that often prevent real reclamation, leaving behind a degraded natural landscape. They often create water pollution problems such as acid drainage, continuing indefinitely into the future, requiring perpetual treatment and containment. Metal mining earnings and jobs tend to be very volatile, leading to community instability and long-term decline. These are real economic costs associated with metal mining.

This report will look closely at the economic characteristics of Minnesota's metal mining industry. Understanding the impact of metal mining and processing on local and regional economies lays the basis for an evaluation of the net dollar benefits created. These can then be compared to the environmental and social costs to evaluate the overall economic rationality of the proposed mineral developments.

Hard Lessons from Minnesota's Metal Mining Boom and Bust Past

The metal mining industry is prone to both "booms" and "busts" as well as to a long-term decline in the labor required to produce any given volume of metal ore. That is clear in Minnesota's iron industry. The first graph below shows the declines in employment between 1965 and 1972 and then the mini-boom between 1972 and 1979. The mini-boom was followed by a dramatic

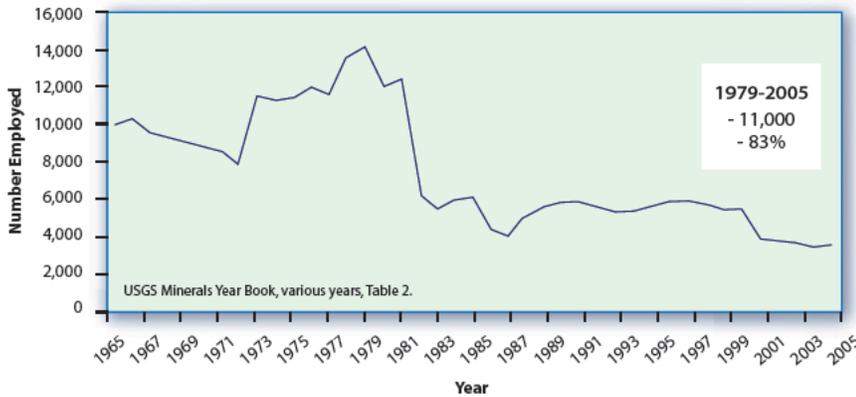
collapse in iron mining and processing during most of the 1980s. Very modest recovery in the 1990s was followed by ongoing declines in the 2000s. Eighty-three percent of the iron jobs that existed in 1979 had vanished by 2005. Similarly, the second graph shows the collapse of national employment in copper mining between 1972 and 2002 when 80 percent of the nation's copper mining jobs disappeared. If Minnesota had developed its copper ores previously, the Iron Range would have been even more decimated.

Employment in metal mining has been volatile and declining for several reasons. First, metal ores and raw metals compete on a worldwide scale. As national and international economies

go through recessions and expansions, the demand for, and price of, metals and metal ores fluctuate. When metal prices are high, lower grade deposits are brought on line, adding to the supply and moderating price increases. As demand and prices fluctuate, so do production, employment, and payroll. As poorer nations struggle to boost employment via mine development, cheaper sources of supply displace American sources. In addition, technological change in metal mining and processing steadily displaces labor with more powerful equipment and new electro-chemical processes. The same or higher production is possible with a smaller and smaller workforce.

Mining inevitably depletes economically viable ores, forcing mines to be abandoned. Usually the very process of mining, concentrating, and refining the metal ores creates relatively permanent environmental damage: huge open pits, massive waste piles, extensive settling ponds, heavy metal pollution, acid mine drainage, etc. These reduce the attractiveness of mined-over areas to new residents and businesses, making it difficult for mining areas to diversify their economies.

Employment in Minnesota Iron Ore Industry: 1965-2005



Employment in US Copper Mining



Metal Mining Is a Surprisingly Small Source of Jobs and Income

Despite massive losses of jobs in iron mining and processing in Minnesota in general and on the Iron Range in particular, the non-iron sectors of the economy have continued to expand, diversifying the overall economy and creating new sources of jobs and income. As a result, average incomes increased 30 to 40 percent over and above inflation since the collapse of metal industry jobs began in 1978. As real earnings from the iron industry fell by 65 to 75 percent in Itasca and Lake Counties, real earnings from the rest of the economy increased 65 to 75 percent. In St. Louis County, dominated by the Duluth metropolitan area, a 63 percent decline in real earnings in the iron industry was accompanied by a 21 percent expansion in real earnings outside of the industry.

After periods of relatively high unemployment rates on the Iron Range, the region has been approaching full employment with unemployment rates in the four to five percent range and shortages of skilled workers are being reported.

As a result of declines in the iron industry and expansion of the rest of the economy, the relative importance of the iron industry as a source of income and jobs declined dramatically. By 2005, earnings in metal mining were the source of only two-tenths of one percent of total Minnesota personal income. In Itasca County the dependence on iron mining has declined from 23 to 4 percent and in St. Louis County, from 13 to 5 percent. Lake County has the largest reliance on iron ore processing, and its dependence declined from 43 percent to 13 percent.

The metal mining and processing projects proposed for the Iron Range will have a relatively modest impact on residents for several reasons. First, both the temporary construction workforce and the new workers are likely to have to come from outside the Iron Range because the region is approaching full employment and the aging existing industry work force will also have to be replaced.

Second, the number of jobs directly associated with each of the proposed metal mining and processing projects is relatively small compared to the 11,000 job losses that the industry has suffered over the last 25 years. The largest of the proposals, the Minnesota Steel Project in Itasca County, would employ 700 workers once it was operating at full capacity. If all of the jobs were filled by residents of Itasca County this would represent a 3 percent increase in employment. But the facility would be near the St. Louis County border and within commuting distance from Hibbing. As a result, the jobs are likely to be shared with much larger St. Louis County. Even when “multiplier” impacts are taken into account, the total employment impact is estimated to be an eight and a half percent increase in Itasca County employment (although, again, most of these jobs would have to be filled by in-migrants or commuters).

Similarly, PolyMet Corporation’s proposed NorthMet Project in the Hoyt Lakes area of St. Louis County would hire 470 workers when operating at full capacity. This would add four-tenths of one percent to St. Louis County employment. Even with the multiplier impacts, producing a total of 1,000 jobs, the impact would be less than one percent of total employment, representing only about three months of the earnings growth seen in recent years.

Quality of Life Drives the Economic Vitality of the Iron Range Counties



If iron mining and processing is the “economic base” of the Iron Range, the declines in employment and earnings over the last 25 years should have forced a decline in the rest of the economy. However, after an adjustment period, the St. Louis, Itasca, and Lake County economies expanded significantly. Clearly there were other sources of economic vitality.

One of those forces was simply the impact of residential choice. Although the economic base view of the local economy suggests that people always have to move to where jobs are, the fact is that business firms often have to move to where workers are readily available and to where customers are located. This is clear in the rapid growth in medical and health services jobs in the Iron Range. It is also clear in the significant increase in retirement-related income flowing into Iron Range communities. These two new sources of income were many times larger than the loss of iron industry payroll.

The ability of an area to hold and attract residents is an important part of any region's economic base. Statistical studies have shown the attractiveness of the social environment (small cities, good schools and public service, low crime rates) and natural environment (scenic beauty, wildlife, outdoor recreation, clean air and water) attract people and economic activity. Such amenity-supported economic vitality is a powerful force in many areas of the nation including St. Louis, Itasca, and Lake Counties.

The reality of amenity-supported economic development underlines the economic importance of protecting quality of the social and natural environment. Environmental quality is not just a matter of "prettiness" or aesthetic preferences; it is a central part of any region's economic base and its potential for economic vitality.

In general, sustainable communities do not rely on the export of just one or a few products. Nor is economic development built around "more of the same." The natural landscape is not just a warehouse from which to extract commercially valuable commodities. That natural landscape is also the source of valuable environmental services that make a location an attractive place to live, work, and do business.

Alternative Economic Values Associated with Northeastern Minnesota's Natural Landscapes – Building a Sustainable Future

Metal mining offers a variety of benefits such as injecting income into local economies, stimulating economic expansion, and providing payments to governments in the form of royalties and taxes that help fund public services. However, at the same time metal mining imposes significant costs such as irreparable degradation of natural landscapes, water pollution that continues long after mining ends, and disruption of communities due to the volatile nature of the industry, leading employment to fluctuate widely.

Mining companies weigh the costs and benefits of developing a particular mineral deposit when deciding whether to proceed with mining at a particular time. In the 1970s copper mining companies considered developing the copper deposits in Minnesota's Iron Range. After weighing the costs, benefits, and risks, they decided to not develop them. A business does not develop a mineral resource if its costs exceed the benefits.

Minnesota has to make the same calculation about proposals for the expansion of metal mining and processing, but from a *public interest* point of view: Do the public benefits and costs justify approving any particular proposal? When total costs exceed expected benefits, economic rationality would call for the mining project to be rejected.

Minnesota *knows* that there are significant costs associated with metal mining and processing. The Iron Range and the North Shore of Lake Superior have already suffered significant environmental damage from past iron mining and processing. The Iron Range has also been through the pain of repeated booms and busts, ghost towns, strikes, and mining disasters.

The challenge represented by new metal mining proposals is that it is a landscape-intensive activity that has had significant negative impacts on the natural environment. That means it has the potential to damage one part of the local economic base, environmental quality, while developing another, the mineral deposit. To the extent the environmental damage could be significant and permanent while the mineral development is relatively temporary, significant public economic policy issues are raised: Is there a net gain or loss to the local economic base as a result of developing the mineral deposit? Can the development of the mineral deposit be modified in such a way as to reduce the threat to other current and future economic values and activities? The environmental record of metal mining clearly indicates that these questions have to be explored

carefully and critically. This is not “merely” a matter of aesthetics or the impractical preservation of “prettiness.” It goes to the heart of the future economic vitality and sustainability of the north-eastern Minnesota economy. That is the reason that rational public regulation of metal mining should be an important part of Minnesota’s economic development policy.

Minnesota will have to decide if it wants to ride the mining roller coaster again and then wrestle with an even greater level of environmental damage that may foreclose more sustainable economic development options.



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Introduction: A New Mineral Development Boom in Northeastern Minnesota?

Not many years ago, the primary concern of many residents of Minnesota's Iron Range was that the mining that supported the original European-American settlement of these "northwoods" was spiraling downward to an end. In 2001 the LTV-Erie operations that had been the source of about 16 percent of Minnesota's taconite production shut down. In 2003 two large taconite operations, the Eveleth Taconite Company (EVTAC) and National, that were the source of about 26 percent of production changed ownership. Over the ten year period 1996-2005, the employment in Minnesota iron ore production reported by the United States Geological Survey (USGS) declined by 2,400 or 43 percent. The iron mining industry that the USGS reported employed 14,000 workers in 1979 employed only about 3,000 in 2005.

In 2004 Marvin G. Lamppa, one of the leading historians of Minnesota's Iron Range, seemed to be expecting the imminent demise of mining:¹

...However, in the midst of all this turmoil, a growing global steel market sharply diminished the demand for the region's iron, raising new issues over...the future of northeast Minnesota's communities. Coping with the unpredictable fluctuation of mining economy and forces of change, over which there seemed to be no control, became an accepted part of life for the generations who made Iron Country their home. They, like people in other single industry regions – Massachusetts' textile towns, the coal belt towns of West Virginia and Pennsylvania, Michigan iron mining districts – came to know the hurt and anguish of mine and plant closing, loss of jobs, loss of pensions and insurance, strikes, accidents and death. They confronted turmoil and intimidation, experienced poverty and prosperity, and through it all they endured.

Just three years later in 2007 the talk is not of the demise of mining in northeast Minnesota but of a potential new mining-related boom built around the development of the region's copper ores, a resurgent interest in processing taconite iron ore, and the additional energy infrastructure that would be needed to support that expansion of the metal industry.

The renewed interest was tied to an explosive growth in the price of metal commodities that is usually attributed to the burgeoning economies of China and India. Iron products such as direct reduced iron, pig iron, and scrap iron have tripled in price since 2001. Copper prices quintupled between 2002 and 2006, rising from about \$0.75 cents per pound to about \$3.80 per pound in mid-2006. During 2007 copper prices fluctuated significantly, but they remain far above the 1980-2003 average of \$0.94 per pound. The value of nickel, which is found in significant amounts with Minnesota's copper, also rose almost tenfold (\$2.50 to \$25 per pound) between May 2002 and May 2007.

As a result of these metal price increases, several new metal mining and processing facilities have been proposed in northeast Minnesota as well as upgrades of existing mining and processing facilities. Minnesota Steel Industries has proposed a direct reduction iron (DRI) facility that may ultimately include a steel mill near Nashwauk in Itasca County. A similar project, Mesabi Nugget, was proposed near Hoyt Lakes, but failed to arrange the financing and is currently on indefinite hold. PolyMet Mining has proposed Minnesota's first copper and nickel mining and processing facility, NorthMet, near Hoyt Lakes, making use of the former LTV industrial site and facilities. Franconia Minerals is exploring the feasibility of another copper-nickel mine and refining facility

¹ *Minnesota's Iron Country: Rich Ore, Rich Lives*, Lake Superior Port Cities, Inc., Duluth, MN, 2004, p. 245.

in the Babbitt area. Two mine sites, one under Birch Lake and the other, the Maturi deposit just to the east in Lake County, would be served by a common processing plant.

Iron mining upgrades, including developing new mines to supply existing facilities as well as expanded processing facilities for existing mines, have been proposed at the North Shore Mining taconite processing facility on Lake Superior and the Mittal Minorca mine near the town of Virginia. An upgrade has already been carried out at the Minntac facility at Mountain Iron. Finally, Excelsior Energy has proposed to build a twin electric generating station using integrated coal gasification technology. This Mesaba Project would be located northeast of Grand Rapids and is intended to serve the expanding metal industry in the region.

The proponents of these metal mining developments project that each would directly provide several hundred jobs once they were operating and a thousand or more temporary construction jobs during the initial construction of each of the facilities. They further assert that those direct impacts would then cause ripple or multiplier effects throughout the regional economy, creating many more jobs. Proponents expect the cumulative impacts of such a revitalized metal industry to return prosperity to Minnesota's Iron Range, depressed over the last three decades by the substantial job losses in the taconite industry.

Modern metal mining exploits relatively low grade ores mined from open pits and produces a considerable amount of waste material. Large industrial facilities are then needed to concen-

trate or refine the ore. These processes also tend to be energy intensive, creating demands for electricity, natural gas, and petroleum products. All of these activities can have substantial environmental impacts. Historically mining and the heavy industry associated with it have been the source of some of the nation's more serious and permanent environmental impacts. The mining of sulfide metal ore, for instance, has been the source on ongoing acid mine drainage [photo at left] that continues to pollute surface and ground water long after the mining ceases or requires continuous water treatment indefinitely into the future.



Photo courtesy of Pennsylvania Department of Environmental Protection

Mineral extraction at any particular location ultimately exhausts the economic supply being mined and has to shut down. Modern mining techniques have significantly reduced the duration of mining any given site. Volatile commodity prices and international competition can also

lead to the closing of mines. Minnesota's iron mining communities have a long history of coping with this endemic instability associated with mining. That community disruption also represents a social cost of mining.

Such environmental and social impacts represent real costs that should be taken into account when evaluating the socioeconomics of the proposed expansion of Minnesota's metal industries. Just as high production costs relative to the value of the metal being produced may lead a mining company to choose not to develop an ore body or to shut down a mine after it has operated for some time, high environmental costs may also lead the public or public agencies acting in their name to appropriately reject a proposed mineral development as "uneconomic" when all costs, both public and private, are taken into account.

This report will look closely at the economic characteristics of Minnesota's metal mining industry, in the past, currently, and in the future. Understanding in some detail the impact of metal mining and processing on local and regional economies lays the basis for an evaluation of the net dollar benefits created. These can then be compared to the environmental and social costs to evaluate the overall economic rationality of the proposed mineral developments. This report will not evaluate those environmental and social costs nor carry out the overall evaluation of the social rationality of the various proposed projects. The objective of the report is more limited: to critically evaluate

the market-based values created by metal mining and processing. That is an important first step on the way to an overall evaluation of social rationality of any particular mining project.

Lessons from Mining in Minnesota's Past

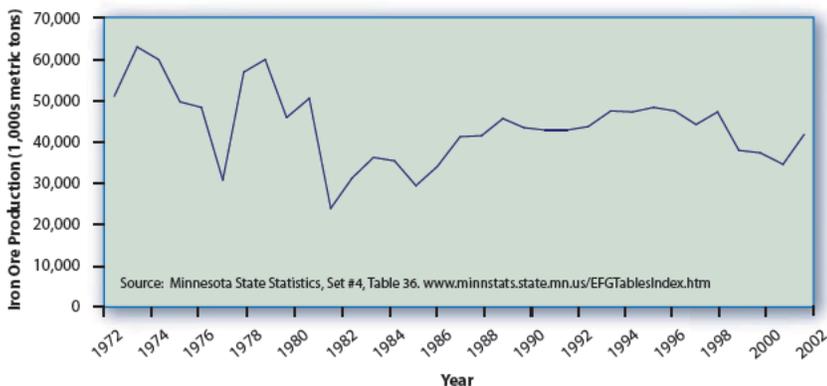
As Minnesota contemplates renewed interest in mining, metal processing, and expansion of the energy infrastructure to serve a resurgent metal industry, it is worth reflecting on the impact of metal mining on Minnesota's northern communities and environment over the last 140 years. Although it is often asserted that contemporary mining is a high tech operation that avoids all of the problems associated with past mining, metal mining in Minnesota over the last decade or two has pretty well reflected the patterns of the previous century of mining.

Mineral extraction pursues the "gift of nature" buried in the earth's crust. Often this is presented as the pursuit of concentrated wealth of such high value that mine development trumps all other values associated with the land. That was clear in early gold mining that followed veins of nearly pure metal or "panned" gold nuggets and dust from stream beds. The same can be true of non-precious metals. The early iron ores mined in Minnesota were of such high quality that no benefaction was necessary before they were shipped to steel mills. Modern mining, however, often pursues ores far less rich requiring the removal of considerable waste rock and then the concentration of the ores before shipping. Contemporary mechanical and chemical techniques can make very low grade ores profitable to mine.

The high pay associated with most contemporary mineral extraction activities tends to reinforce the view that mining is pursuing concentrated wealth. But early Minnesota mines were operated largely by unskilled recent immigrants who worked long dangerous days at very low wages.² The high wages now associated with mining evolved over time as the result of organized labor's struggles and management's adoption, not coincidentally, of increasingly sophisticated, capital-intensive, equipment, boosting significantly the skill levels required of workers. The adoption of those capital and energy intensive technologies also, ultimately, dramatically reduced the required mining workforce.

The Volatility of Mining Employment and Income

Figure 1
Minnesota Iron Ore Production: 1972-2004



The history of metal mining in Minnesota (as well as the rest of the nation) over the last century and a half has been characterized by both booms and busts. Between 1974-1977 production fell ten percent but regained those losses in 1978-1979 only to face a 25 percent decline in 1980, falling to a 50 percent decline by 1982. As recently as 2000-2003 production tumbled 27 percent. See Figure 1. This volatility in production is typical of mineral extraction activities, including iron ore mining. There are several reasons for this disruptive volatility.

² In 1910 nearly 80 percent of all people residing in the iron fields were born in a foreign country. In 1907 only 300 of the 10,000 Oliver Iron Mining Company employees could speak English fluently. Marvin G. Lamppa, *Minnesota's Iron Country: Rich ore, Rich Lives*, pp. 197 and 205, Lake Superior Port Cities Inc, Duluth, MN, 2004.

Sensitivity to Normal Business Cycles

The demand for iron ore flows directly from the steel industry. Steel, like copper and other non-precious metals, is a basic material input to manufacturing and construction activities. When the overall economy is expanding, the demand for such inputs rises. When the economy slips into a recession or depression, the demand for steel or copper collapses quickly. This was clear in the early history of iron ore development in Minnesota's Mesabi Range when the financial Panic of 1893 led to massive layoffs and the abandonment of some of the new mining towns as well as the restructuring of the Minnesota mining industry around Rockefeller and Carnegie financial interests. Throughout the 20th century national business cycles had an amplified impact on the metal industries. The back-to-back recessions in the early 1980s led to dramatic declines in iron production as did the economic slowdown in the early 2000s. The downturn in the American housing market in 2006-2007 also appears to be having a negative impact on copper prices today.

Globalization and Competition

Iron ore serves a worldwide steel industry. Ores and concentrates are shipped long distances as are the pig iron, iron pellets, and steel produced from those ores. As a result, iron mines directly

and indirectly compete with each other as do steel producers. The American steel industry suffered significantly as imported steel displaced domestic production in the 1980s as the American steel market was integrated into the world economy. Imported pig iron and iron pellets have also displaced domestic iron ore products in American steel mills during the 1990s and 2000s. As a result of this globalized steel industry, it is not just the level of demand within the American economy that matters to American iron ore producers. When worldwide economic activity slows down, the demand for steel

and iron ore tumbles dramatically. When, as in recent years, worldwide demand is burgeoning, steel and iron ore prices rise and production expands.

As iron ore prices fluctuate with national and international demand for steel, the profitability of iron mines can change dramatically, leading economically marginal mining operations to close at least temporarily. Similarly, when iron ore prices are high, new supplies and mines come on line, increasing the supply and tempering price increases and ultimately pushing those prices back down. See Figure 2.³

Figure 3 provides a close up of the dramatic changes in iron raw materials that have triggered the current interest in expanded iron ore mining, processing, and steel production in Minnesota. The price of recycled scrap iron along with those of DRI and pig iron tripled between 2001 and 2004 and then reached a new high in early 2007. But this was not a smooth movement upward. The

³ For most of the 20th century, iron ore prices were not market determined prices. Steel companies owned iron ore mines and the price attached to the iron ore was an administered price set by the parent company for internal use. Given that the demand for iron ore is tied directly to the demand for steel, the administered price probably primarily reflected the market value of the steel.

Figure 2
Real Price of Iron Ore (1998 dollars)

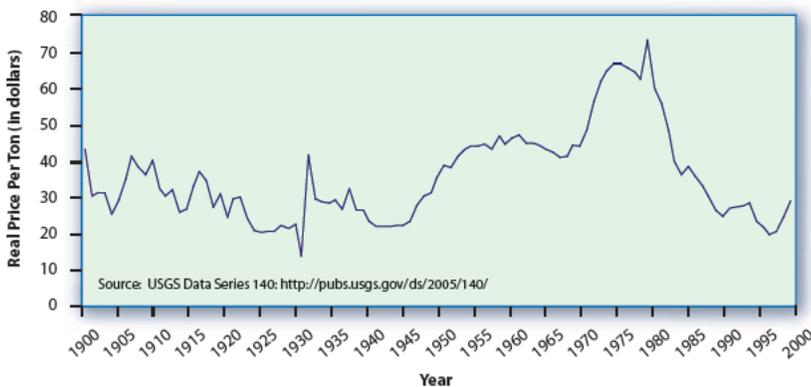


Figure 3
US Recycled Iron Prices 2001-2007: American Metal Market Chicago

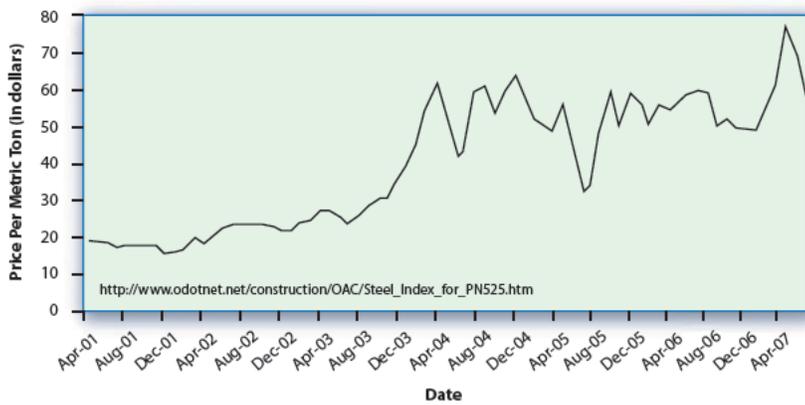
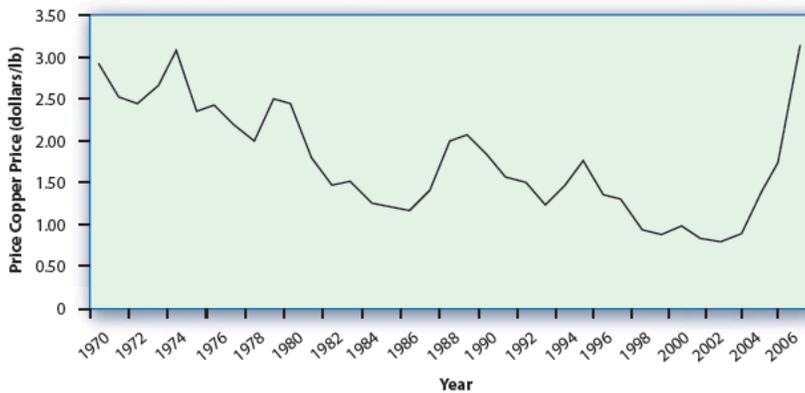


Figure 4
Real Copper Prices: 1970-2007



evaluating the current high market prices for many metals including iron and copper. Even if the expansion of the Chinese and Indian economies is sustained and there is no reduction in demand elsewhere in the world, something that has not been true in the past, the high prices triggered by increased demand for raw materials will stimulate the development of other sources of supply. Iron, copper, and nickel prices will tend to move back down to reflect the incremental costs of those new supplies.

Over the last quarter century, we have been through several cycles of high commodity prices followed by low commodity prices with the accompanying opening and closing of mines, refineries, and smelters. Consider copper prices. In the 1970s a doubling of copper prices appeared to make the development of Minnesota's copper ore deposits inevitable. Considerable state resources were expended trying to plan for that copper development in northeastern Minnesota.⁴ But copper prices tumbled in the first half of the 1980s and copper mines nationwide shut down rather than new mines, such as those proposed in Minnesota, opening up. Copper prices recovered, rising to peaks in 1990 and 1995, but Minnesota's deposits were still not developed. Beginning in 2003 copper prices rose dramatically. See Figure 4.

⁴ A three -year *Minnesota Regional Copper-Nickel Study* was commissioned that produced 180 reports, data files, and other research documents at a cost of \$3.5 million. (Environmental Quality Board, September 20, 1979).

price of iron raw materials has remained very volatile making business decisions based on that price risky.

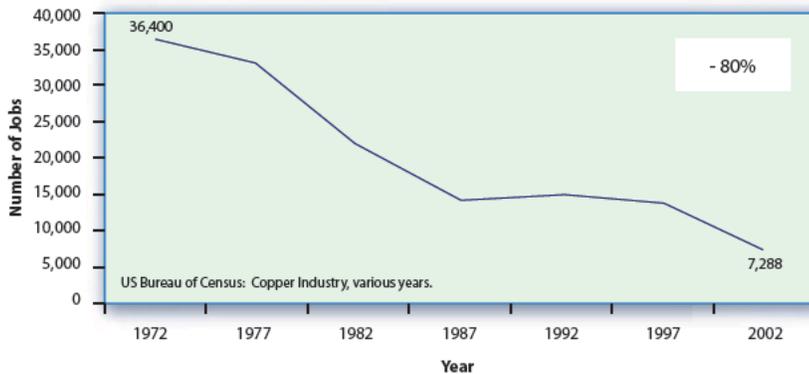
It is not only iron prices that have shown this instability in the 2000s as metal prices, overall, have risen. The same was true of copper and nickel prices. Copper prices quintupled between 2002 and 2006. The price of nickel, a metal ore found with Minnesota's copper ore, has also increased many-fold during the 2000s, rising rapidly, falling dramatically, and rising steeply again.

Sudden increases in metal prices followed by declines are typical of world metal prices. In the short term, as demand rises, only existing inventories of metal can be drawn on. That limited short term supply assures rapid price increases if the surge in demand is large. But those higher prices provide an incentive to expand production at existing mines and to bring abandoned or new mines on line. In addition the high prices encourage consumers to use less of the metal or turn to substitutes, dampening the existing demand.

The tendency of supply to expand and demand to moderate when market price rises is important to keep in mind when

When copper prices are looked at in inflation adjusted terms, the current high copper prices reflect a return to the price levels that triggered the interest in developing Minnesota's copper deposits in the mid-1970s. But the dramatic declines in real copper prices after the peak in 1974 should be kept in mind. High prices today are not a good prediction of prices next year or five or ten years from now. Planning on stable or rising commodity prices and committing public resources on the basis of those high prices is very risky. Commodity prices are inherently volatile.

Figure 5
Employment in US Copper Mining



That long-run volatility and decline in copper prices led to a collapse in copper ore mining and processing jobs in the 1970s and 1980s, with 80 percent of U.S. copper mining jobs being lost. See Figure 5.

If Minnesota had developed its copper resources during the early 1970s when copper prices were high, Minnesota's northeast mining communities would have been even more disrupted by the simultaneous collapse of both the copper and the iron industries. That copper development would not have brought prosperity to the region.

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Long Term Downward Trends in the Economic Vitality of Mining Towns

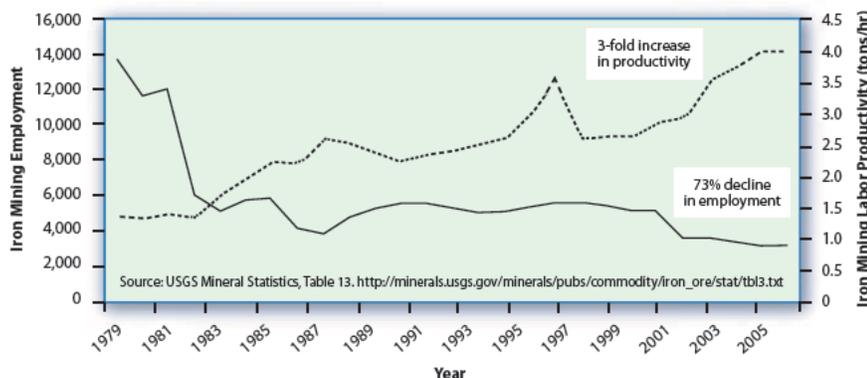
Technological Change in Mining

Technological change in the mining industries, including iron mining, has also had a significant impact on communities adjacent to mines. As one of the oldest "industrial" activities, mining has had a long period to develop increasingly sophisticated mining techniques. Early "pick and shovel" work quickly gave way to the increased use of mechanized equipment. That equipment then became more and more gargantuan in size. Technological change substituted capital and energy in the form of mechanized equipment for labor, displacing increasing numbers of miners even when overall production was expanding. Between 1979 and 2005, labor productivity in Minnesota iron mines tripled. Since levels of production did not triple, but declined modestly (see Figure 1), employment declined by 73 percent. Even if production had remained constant, employment would have declined by 67 percent. See Figure 6. This pattern of significant declines in employment despite stable or increasing levels of production can also be found in almost every mining sector from copper to coal. For adjacent communities that do not have diversified economies and rely heavily on mining, this pattern of labor-displacing technological change means regular layoffs and relatively high unemployment rates, even when high levels of production are maintained.

Even when overall production was expanding. Between 1979 and 2005, labor productivity in Minnesota iron mines tripled. Since levels of production did not triple, but declined modestly (see Figure 1), employment declined by 73 percent. Even if production had remained constant, employment would have declined by 67 percent. See Figure 6. This pattern of significant declines in employment despite stable or increasing levels of production can also be found in almost every mining sector from copper to coal. For adjacent communities that do not have diversified economies and rely

heavily on mining, this pattern of labor-displacing technological change means regular layoffs and relatively high unemployment rates, even when high levels of production are maintained.

Figure 6
Minnesota Iron Mining Employment and Iron Mining Labor Productivity



Depletion of High Quality Ores

Mining removes nonrenewable resources, focusing first on the higher quality, lower cost ores. All mines, ultimately, deplete those economically feasible ore deposits as costs rise and ore quality declines and the mines shut down. That is the source of the “ghost towns” that historically have been associated with mining. Minnesota’s iron mining history reflects the same pattern: As mines opened, communities of thousands developed adjacent to the mine, only to be abandoned as the mine depleted its high grade ores and shut down. Other communities were consumed by the expanding open pits or had to relocate. As iron ore has been mined in northern Minnesota for a century and a quarter, some mining communities have come and gone while others have dramatically expanded and contracted as mining techniques, facilities, and locations have shifted geographically.⁵ Mining has rarely provided stability for adjacent communities. Miners and their families have often adjusted to mining’s geographic instability by choosing not to live adjacent to mining operations and commuting long distances to work in the mines. This can help protect the value of their housing investment when a mine lays off workers or shuts down. It also, however, means that the local economic impact of the mining operation is reduced as a large part of the payroll and spending from that payroll “leaks out” of the adjacent communities.

Environmental Degradation as an Economic Issue

Mining is land intensive. Especially as lower grade ores are pursued through open pit mining, large amounts of land have to be disturbed to gain access to the ores and large amounts of waste material are generated in the mining, concentrating, and refining processes. Returning the land to its original condition is almost impossible and even effectively reclaiming it so that natural processes can heal the disturbances can be difficult, costly, and ultimately unsuccessful.

This is not just an “environmental” problem. As will be discussed in more detail below, it is also an economic problem. Population and the economic activity associated with it have become increasingly “footloose” during the last half-century as people and businesses have pursued what they perceive to be higher quality living environments. That attractiveness of a place, including its social, cultural, and natural environmental characteristics has become an important source of local economic vitality. The environmental degradation associated with mining can undermine that potential source of economic vitality. That is not inevitable. Many past mining towns around the nation have made the transition to a new economic base once mining ended and the environmental damage was contained. It is, however, important to keep in mind that environmental degradation has important economic ramifications for the future economic vitality of a region.



To summarize the economic lessons from Minnesota’s mining past, metal mining provides some of the highest paid blue-collar and technical-professional jobs available outside of large urban areas. But metal mining also has some important economic drawbacks. Metal mining is a volatile industry that can have a disruptive impact on adjacent communities. National and international demand and metal prices fluctuate with business conditions. In response existing mines close or new mines open to bring supply back in balance with demand. In addition, ongoing labor-displacing technological change has a long run depressing impact on communities as fewer and fewer workers are

⁵ Marvin G. Lamma, *Minnesota’s Iron Country: Rich ore, Rich Lives*, pp. 197 and 205, Lake Superior Port Cities Inc, Duluth, MN, 2004, pp. 126-140.

needed to support any given mine capacity. Labor management conflicts in the past have also led to periodic strikes or lock-outs, disrupting mining payrolls. Ultimately, mineral deposits at any particular location are “played out” as the lower cost ores are extracted and rising extraction costs lead the remaining deposits to be abandoned as the mine closes. Finally, most modern metal mining involves massive and deep open pit operations that have considerable environmental impacts. The degradation of the natural landscape, water quality, fish and other wildlife populations, etc. can also discourage in-migration and new, diversifying economic activity.

The Economies of Minnesota’s Iron Counties

The enthusiasm that many residents of northeastern Minnesota have expressed for the many proposals to open new mines and new processing facilities, and refurbish and upgrade older mineral processing facilities is no doubt tied to the traumatic downsizing of the iron mining and processing industry in that region during the late 1970s and renewed closures in the 2000s. Between 1978 and 2005, about 11,000 iron mining and iron ore processing jobs were lost, almost 80 percent of the iron jobs that existed in 1978.⁶ St. Louis County by itself lost 9,000 iron mining and processing jobs during that period. Itasca and Lake Counties had a smaller number of iron workers but they also had much smaller economies in which the iron industry was directly responsible for 24 percent of all jobs in Itasca County and 35 percent of all jobs in Lake County in 1972. Losing about two-thirds of those iron industry jobs in the late 1970s and early 1980s

was a significant shock to the local economies. See Figure 7.

Note that in Figure 7 the state total is for iron ore mining alone while the individual county data includes *all* mining jobs including sand and gravel pits, rock quarries, and oil and gas extraction. Only about two-thirds of Minnesota mining jobs are associated with iron mining.

This dramatic downsizing of the iron ore industry had a significant disruptive impact on Minnesota’s iron field

communities. Between 1980 and 1988 the population of St. Louis County declined by 25,000 and that of both Itasca and Lake Counties by 2,400. In percentage terms these represented losses of 11, 6, and 19 percent of the population, respectively. After 1988 the population in these three counties stabilized but saw very little growth. See Figure 8.

⁶ The processing of metal ore to concentrate the metal component before shipping it to users is considered part of the mining operation (“benefaction”) in economic statistics. Thus “mining” jobs include not only the miners who extract the ore from the earth but also those who work in the taconite mills boosting the iron content percentage before shipping the ore to steel plants. On the other hand, some jobs directly related to iron ore mining and processing are not included in the total. For instance, the rail transportation of taconite ore or taconite pellets to Lake Superior docks and the iron ore ships themselves are listed as transportation jobs, not as mining jobs. Also, the opening or expansion of any mine or processing facility requires substantial construction activity that is listed under construction rather than mining. As a result, the mining jobs we report here tend to understate the full economic impact of mining and processing iron ore. All mining, of course, is not iron ore mining. Only about 60 to 70 percent of Minnesota mining is iron ore mining. In that sense, use of “mining” data to quantify iron mining impacts tends to exaggerate the importance of iron operations alone.

Figure 7
Changes in Employment in Minnesota’s Iron Counties

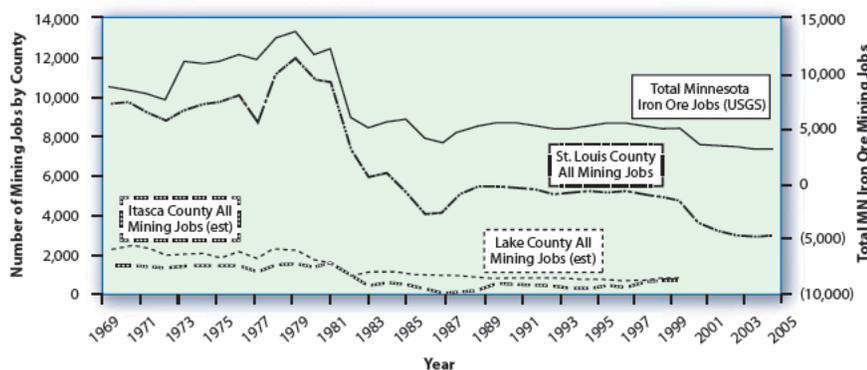


Figure 8
Changes in Population in Three Minnesota Iron Counties

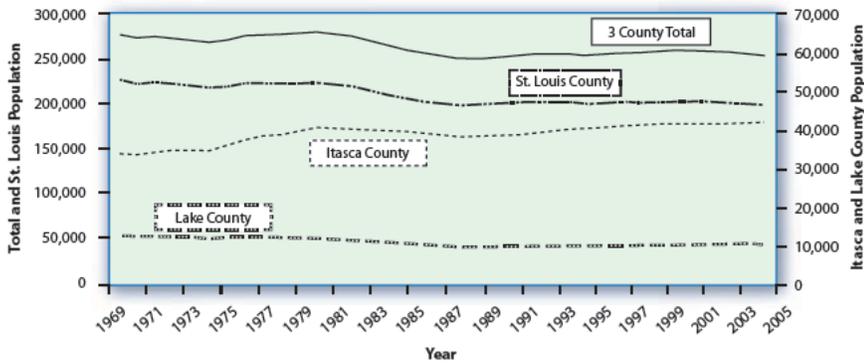
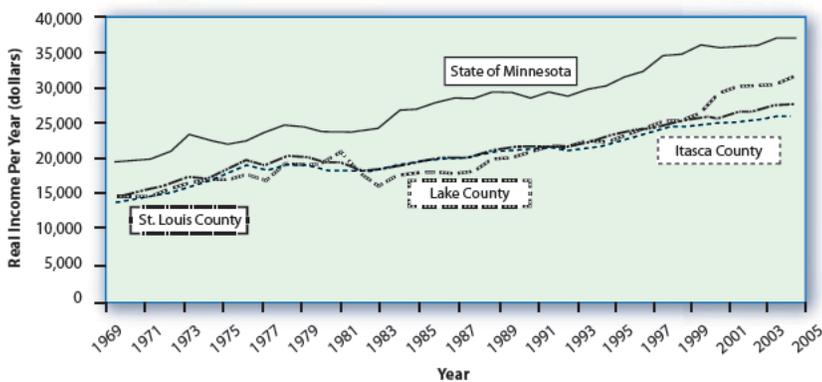


Figure 9
Growth in Real Capita Income: Iron Counties and State of Minnesota



The out-migration of previous residents after the decline in economic opportunity represented by the loss of so many iron industry jobs was rapid enough to keep the average incomes of remaining residents from falling in real terms. Actually, real per capita income steadily increased in the iron counties of Minnesota despite the declines in iron industry employment. See Figure 9. Real per capita incomes in the iron counties closely tracked that of the state as a whole. The correlation coefficients between the state average income and those of these three iron counties were 93 to 98 percent between 1969 and 2005.

However, as is clear from Figure 9, about a 25 percent gap has existed for at least 36 years between these iron counties and the state. This gap is largely explained by the higher income associated with the densely settled Minneapolis/St. Paul metropolitan area where 61 percent of the Minnesota population lives. More densely settled areas tend to have higher levels of productivity and pay. They also tend to have higher costs of living primarily

due to higher land costs. Per capita income in the greater Minneapolis urban area is 13 percent above the statewide average. Across the nation, the less densely settled an area is, the lower is its per capita income. That pattern is found in Minnesota, too. Whether those lower per capita incomes represent lower levels of economic well being is not clear. The higher cost of living and the existence of urban disamenities (congestion, pollution, crime levels, etc.) tend to offset some or all of the higher money income levels found in larger urban areas.⁷

The ongoing improvement in average real incomes in these iron counties despite the massive loss of high paid jobs in the iron industry was impressive. If we look more closely at how real per capita income changed as mining jobs at first grew and then collapsed during the 1970s, some of the negative impacts of the job losses that we would expect are evident. As employment in the iron industry grew in the 1970s, per capita income in the iron counties rose relative to the state average, reducing the gap some what. As iron industry employment tumbled in the 1980s, per capita income declined relative to the state average but then rose back to earlier levels and continued to improve at about the rate that average incomes were improving statewide. As a result, the percentage gap relative to the state average, about 25 percent, was about the same in 2005 as in 1969 even though iron industry employment was only one-third what it had been in 1969. See Figure 10.

⁷ See Jennifer Roback, 1982, "Wages, Rents, and the Quality of Life," *Journal of Political Economy*, 90(6):1257-78; Sherwin Rosen, 1987, "The Theory of Equalizing Differences," Chapter 12, Volume 1, pp 641-692, in *The Handbook of Labor Economics*, O. Ashenfelter and R. Layard, eds., New York: Elsevier; and T.M. Power and R.N. Barrett, 2001, *Post-Cowboy Economics: Pay and Prosperity in the New American West*, Chapter 5, "Is the West Really Poor," Washington DC: Island Press.

Figure 10
Per Capita Income in Minnesota's Iron Counties Relative to the State of Minnesota and Employment in Iron Ore Mining and Processing

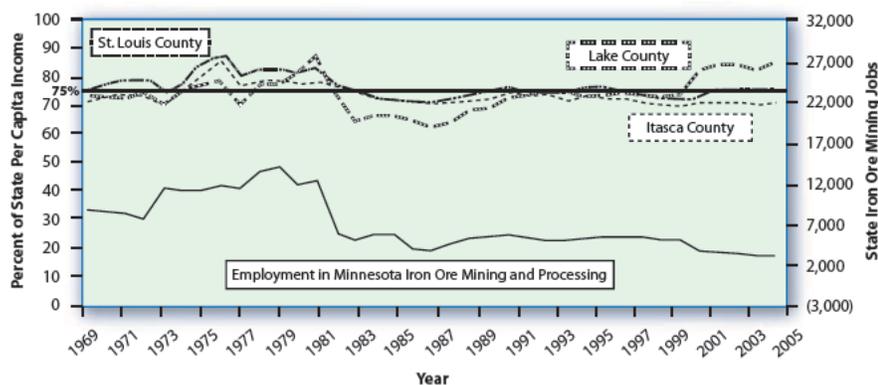


Figure 11
Real Income from Mining and the Rest of the Economy: St. Louis County, MN

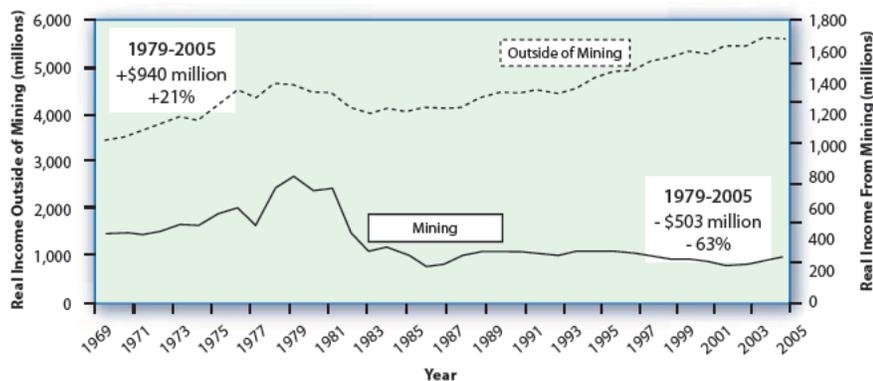
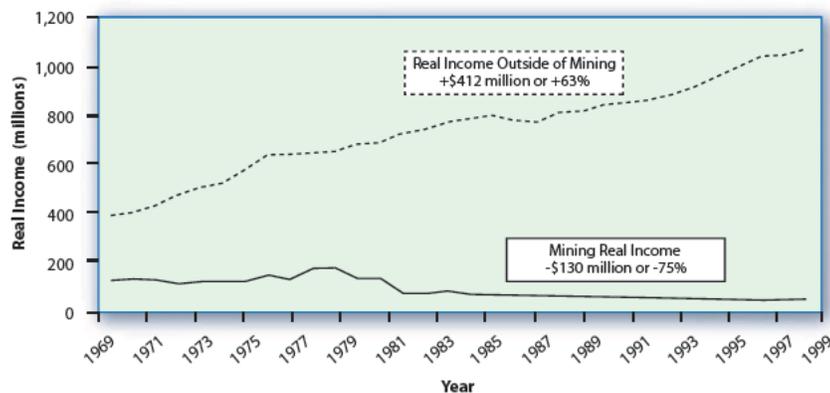


Figure 12
Real Income from Mining and the Rest of the Economy: Itasca County, MN



of iron industry jobs were lost. With those 820 jobs went a \$71 million payroll. The non-iron sectors, however, added 3,200 jobs with a payroll of \$113 million. See Figure 13.

After the 1980s, during which most of the downsizing of the iron industry took place, all three counties had substantial growth in both jobs and aggregate real income. Between 1990 and 2005, the rate of job growth in Itasca and Lake Counties, for instance, was faster than job growth in

At least when judged using the most common measure of local economic well being, real per capita income, these three iron counties' economies showed considerable resilience, bouncing back from the loss of the iron industry jobs and payroll to maintain ongoing improvements in economic well being.

That resilience can be seen if we separate these county economies into mining and non-mining sectors. As mining jobs and payroll dropped precipitously, jobs and real earnings outside to the mining sectors initially dipped too as less income circulated in the local economy, but then the non-mining sectors returned to a steady growth trend. For instance, when mining jobs in St. Louis County declined 76 percent, eliminating 9,000 mining jobs, the real payroll from mining dropped \$503 million dollars. But in the other sectors of the economy, 25,000 jobs were added with a payroll of \$940 million. See Figure 11.

St. Louis County might be seen as an exception because it has a large urban center, Duluth-Superior, relatively far removed geographically from the iron mining areas to the north. But both Lake and Itasca Counties show the same pattern. In Itasca County, two-thirds of the iron industry jobs were lost, eliminating 75 percent of the iron industry payroll. A total of 1,500 iron industry jobs with a payroll of \$130 million were lost. But Itasca County's non-mining economy managed to continue to expand, adding 12,000 jobs outside of the iron industry with a payroll of \$412 million. See Figure 12.

In Lake County where iron ore is processed into taconite pellets, 60 percent

Figure 13
**Real Income from Mining and the Rest of the Economy:
 Lake County, MN**

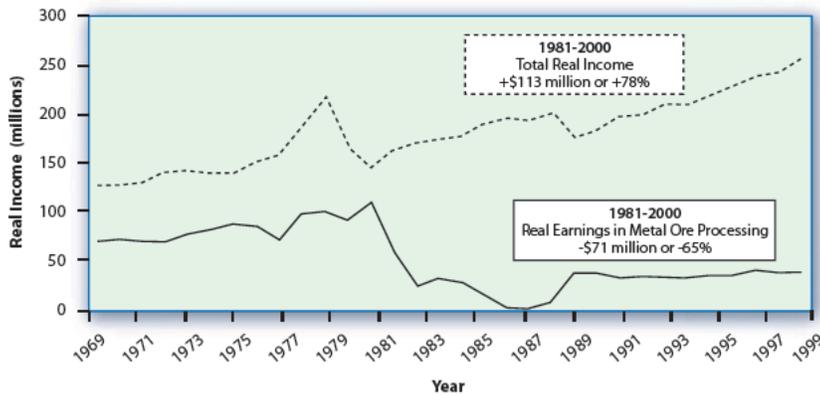


Figure 14
**The Relative Importance of Mining as a Source of Income
 in Three Iron Counties and the State of Minnesota**

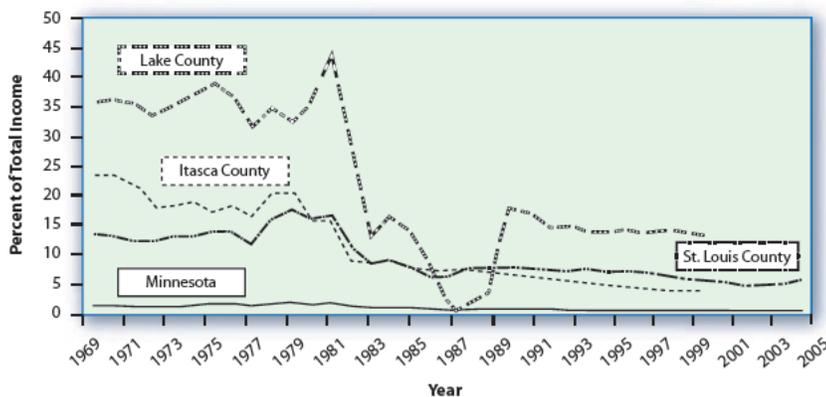
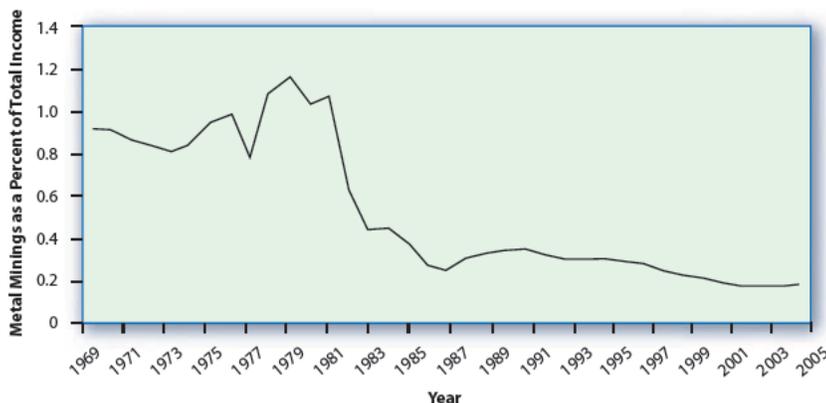


Figure 15
Metal Mining as a Source of Personal Income in Minnesota



income received by citizens of the state. If metal mining payrolls in Minnesota were to expand five fold so that Minnesota became the most specialized state in metal mining in the nation, Minnesota would have a metal mining payroll larger than the other top seven metal mining states combined: Nevada, Arizona, Utah, Colorado, Montana, and Alaska. Clearly that would be an

the state as a whole. The rate of growth of aggregate real income in Lake County during that period was faster than for the state as a whole. Real income in Itasca and St. Louis Counties also grew relatively rapidly but then slowed beginning in 2000.

Since 1978 the relative importance of the iron industry in these three counties and the state of Minnesota as a direct source of jobs and income has declined dramatically. The county with the highest dependence on iron industry jobs is Lake County where 13 percent of the income received by residents still directly comes from jobs in the iron industry. But that is less than a third of the dependence that existed in 1981 when 43 percent of Lake County personal income originated directly from the iron industry. In Itasca County the direct reliance on the iron industry for income has declined from 23 percent to less than four percent. In St. Louis County the industry used to be the direct source of about 13 percent of income, but now is the source of about five percent. For the State of Minnesota as a whole metal mining was the source of 1.2 percent of total income in 1979 and now is the source of only 0.2 percent, two out of every thousands dollars received by citizens. See Figure 14. The decline in the relative importance of mining activities is not just due to the decline in the iron industry. It is also tied to the ongoing expansion of the rest of the economy despite the declines in iron industry.

Because the line in Figure 14 showing the relative importance of metal mining in Minnesota is so close to zero, it is hard to read. For that reason it is shown separately in Figure 15.

Clearly metal mining does not contribute in a major way to the overall Minnesota economy. In 2005 it was directly the source of two-tenths of one percent of the personal

unlikely metal mining boom in Minnesota. But even with that size boom, metal mining would still contribute only one percent of total personal income in Minnesota.⁸

As discussed above, even in the iron counties of northeast Minnesota, iron ore mining and processing no longer dominate the local economies. In all three counties, the non-mining sectors showed considerable vitality, allowing ongoing expansion despite the loss of the mining jobs and payroll. The ongoing expansion of new economic opportunities in these three counties has led to a decline in unemployment and a reported shortage of skilled workers.

The unemployment rate in Lake County, for instance, has been at or below the national rate since the late 1990s and in 2006 stood at four percent, close to “full employment.” The unemployment rate in St. Louis County has largely tracked the national rate since the mid-1990s. In 2006 it stood at five percent compared to the national average of 4.6 percent. The unemployment rate in Itasca county has fallen from 11.7 percent in 1994 to 5.9 percent in 2006, but has remained significantly above the national average for almost two decades. But even in Itasca County there is evidence of tight labor markets when it comes to skilled workers. The Draft Environmental Impact Statement for the Minnesota Steel Project in Itasca County issued in February of 2007 by the Minnesota Department of Natural Resources cited a shortage of skilled workers across the Iron Range region and reported that mining companies were recruiting workers from areas outside of the Range (pp. 6-58). Newspaper stories in 2007 reported labor shortages across northern Minnesota. Minnesota Power Company was reported as having difficulty finding the skilled workers needed for the refurbishing of the electric generating facilities at the Boswell Energy Center at Cohasset in Itasca County. Minnesota Power expected to draw their workforce from the Dakotas, Canada, and northern Midwestern states.⁹ Clearly these iron counties are not reservoirs of large numbers of unemployed skilled workers waiting for mining or construction jobs. The ongoing expansion of their non-mining economies has largely absorbed the unemployed and under-employed.

Housing market information also suggests that these counties have adjusted to the population declines associated with the downsizing of the iron industry. Housing studies of St. Louis County, the City of Hibbing in St. Louis County, and Grand Rapids in Itasca County report relatively low vacancy rates, rising housing values, and ongoing new construction.¹⁰ What once had been seasonal “cabins” are being converted to year around residences to provide housing for permanent residents. There is not a surplus of housing available for potential new residents.

Despite the massive loss of mining jobs and payrolls, the economies of Itasca, St. Louis, and Lake Counties are not in a state of collapse. They have shown considerable economic vitality despite the losses in iron ore mining and processing. These economies have been diversifying, absorbing the unemployed, and enjoying ongoing growth in average real income. We will discuss the sources of this ongoing economic vitality in the next section.

⁸ These calculations are based on data from the year 2000, the last year for which metal mining earnings were reported by state in the Regional Economic Information System. Beginning in 2001 only oil and gas activities were reported separately within the mining category.

⁹ Grand Rapids *Herald-Review*, April 9, 2007.

¹⁰ 2003 State of Housing, St. Louis County Planning Department, Duluth, MN; Maxfield Research Incorporated Minneapolis, Housing Market Analysis and Demand Estimates for Grand Rapids (2003) and Housing Market Analysis and Demand Estimates for Hibbing, Minnesota (2005).

Projected Impacts of New Metal Industry Developments in Minnesota

In order to provide an indication of the quantitative impact of new metal industry developments in northeastern Minnesota, we will focus on one proposed development in each of St. Louis, Itasca, and Lake Counties. Projects for which economic and/or environmental impact statements have already been prepared were chosen because those documents tend to provide detailed information on the character of the project and its socioeconomic impacts. The projects that will be reviewed are the PolyMet Mining Corporation's proposed NorthMet Project to mine copper ores near Hoyt Lakes in St. Louis County, the Minnesota Steel Project to build a Direct Reduction Iron and steel making facility near Nashwauk in Itasca County, and several taconite processing plants proposed for upgrade in Lake, St. Louis, and Itasca Counties.

Measuring Local Economic Impacts

Defining the "Local" Area

The impacts of a new business opening or an existing business closing are transmitted to the surrounding geographic area by the expenditure patterns of the business and the residential, commuting, and spending patterns of the workers. Businesses buy some of their inputs from local businesses, but because small towns are unlikely to be able to provide most of the basic inputs of a modern industrial operation, most of those purchases are likely to be made from firms located far away from the mining and processing operation. Similarly, profits, dividends, and interest earned on the mining venture will flow to stockholders and lenders. Those expenditures "leak" out of the local economy.

The primary impact of a mining operation is likely to be felt through its payroll as its workers spend their income. If the workers live in communities adjacent to the mine and do most of their shopping in those adjacent communities, much of that payroll will circulate in the adjacent communities. But with mine, manufacturing, and construction workers this often is not the case. Workers are willing to commute considerable distance to such well paid jobs and seek to protect their investment in their homes by not buying a home in a mining or mill town where a shutdown could severely reduce the value of the home. This leads much of the payroll to "leak" out of the adjacent communities.



In addition, small towns often do not have a full range of retail and service opportunities for families. As a result, even residents of those towns often commute to regional trade centers for many of their more expensive purchases and for entertainment. This, too, leads to the income received by workers to "leak" out of the adjacent communities.

The mobility of workers and the existence of a hierarchy of different types of trade centers ensures that the impact associated with a new mine and processing facility will be dispersed over a relatively wide geographic area. The affected economic area is not just the adjacent community. The people working in the mine or mill may well not live in that community. Those who live in that community may not work in the mine or mill. Those who live in small communities may well not spend most of their income in that community but shop elsewhere. Those who shop in the small communities may not live in those communities. They may be convenience shoppers from the surrounding countryside.

For all of these reasons, a small town or city cannot be studied as an "economy." Instead the larger geographic area in which that town or city is embedded that includes most of the commuting to

work and to shop has to be used. Often that area has to be larger than just one county because the larger trade centers may be located outside of a largely rural county. Lake County, for instance, has no major trade centers. Its largest towns (Two Harbors at 3,500 and Silver Bay at 1,900 residents) are along the shores of Lake Superior, relatively isolated from the interior of the county. Residents in the northern part of Lake County are likely to use Ely with a population of 3,800 in St. Louis County as a trade center. In the eastern and southern part of the county, a large number of Lake County workers commute to work in the Duluth area of St. Louis County. Itasca County's largest town, Grand Rapids, has a population of only 8,200. Across the county border in St. Louis County, the City of Hibbing has over twice as many people. Dominating all of the cities in the three-county area is the greater Duluth metropolitan area with 275,000 people. Since a significant portion of the economic impact of new metal mining developments in northeast Minnesota is likely to be felt in St. Louis County because of its larger population and trade centers, the economic impact area has to include it. The economic impact analysis cannot simply focus on the small cities or towns closest to the proposed development.

How to Measure Economic Impacts

There are many different ways to describe the quantitative importance of any particular economic activity. For instance, the total volume of ore produced, the total sales value of that ore, the total value actually added by an ore processing facility, the total pay received by workers, or the total number of jobs.

The economic impacts that matter the most to local residents are impacts on jobs and incomes. Yet local economic impacts are often measured in quite different terms that produce a bigger number but tell us little about how that economic activity contributed to the well being of local residents. For instance, local economic impacts are often measured in terms of changes in the total dollar volume of business or by the overall level of local spending. Because all local businesses import from outside the local economy substantial amounts of what they sell, much of the dollar volume of sales does not flow to local residents but, instead, quickly leaves the local economy to support incomes and jobs in distant manufacturing and trade centers. The volume of that spending tells us nothing about local jobs and incomes. That is why the national economy is almost never described in those terms.

Similarly, depending on how sophisticated the local economy is, dollars spent in one business move to other local businesses that supply goods and services to local businesses. Counting all of those transactions can lead to double or triple counting of the value that is actually being produced locally and the income that residents earn. That too is why specific economic accounting rules were adopted for evaluating the overall performance of the national and state economies that prohibit such misleading double counting. Measuring economic activity in terms of the total value added by economic activity within the local economy (gross state product) avoids both of these problems. But even with that measure the impact on residents can be exaggerated because often a significant part of that value added, for instance the royalties and profits received by those who own the mineral rights, mine, and processing facilities, do not stay in the local area but flow away to the stockholders of the mining companies, most of whom do not live in the local area. There are appropriate uses for data on gross state product, but measuring local economic impacts is not one of them.

The apparent relative importance of industries can change dramatically depending on which economic measure is used. If we look at the top ten industries in St. Louis counties as judged by the number of employees, mining ranks seventh. If we rank industries by the value of the output produced, mining ranks first. Electric utilities would be ranked 34th on the basis employees but

The Impact on the Economic Measure on Industrial Relative Importance in St. Louis County, MN

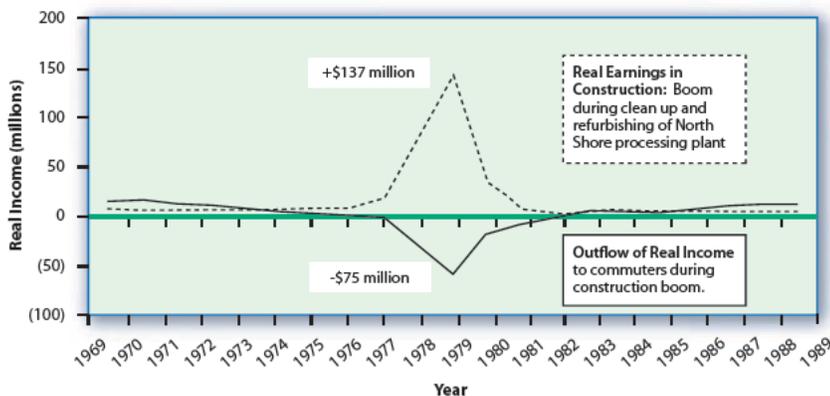
Industry	Rank on the Basis of:	
	Number of Jobs	Value of Output
Iron Ore Mining	7	1
Hospitals	4	2
Doctors' Offices	5	3
Electricity Supply	34	4
State and Local Government, Non-Education	1	5
Insurance Agents	18	6
Wholesale Trade	8	7
State and Local Government, Education	3	8
Food Services and Drinking Places	2	9
Other State and Local Government Enterprises	30	10

Source: "Economic Impacts of PolyMet's NorthMet Project and Other Industrial Projects of Minnesota's East Range Communities," UMD Labovitz School of Business and Economics, December 2005, a study prepared for Short Elliot Hendrickson, Inc. Table A10.

or the refurbishing of older ones require considerable initial construction work before the facility can actually begin producing. Often a very large construction force is needed for a good part of a year or more. Then a much smaller workforce is needed to operate the facility. To most residents, the temporary construction jobs, which often are filled by commuting or in-migrating skilled workers, are not as valuable as the permanent operations jobs. The construction boom can actually be disruptive to a community because of the large number of temporary residents or commuters. A six- or nine-month construction job should not be treated as of the same importance as a 10- or 25-year operations job.

The role of temporary construction workers who commute in to an area from relatively distant locations in draining off much of the construction payroll can be seen in the upgrade of the North Shore taconite facilities in Lake County in 1979. Construction payrolls rose to \$143 million in a county where earnings in all industries had previously been less than \$200 million

Figure 16
Construction Boom and the Outflow of Income to Commuters:
Lake County, MN



fourth on the basis of value of output. See the table at left. Note the high importance of medical service and state and local government under either ranking approach.

In the local economic impact discussion below, we will focus on the direct jobs and income (payroll) received by workers once the new facilities are operating as the most relevant measures of local impact.

Short-Term Construction Versus Long-Term Operations Jobs

New mines or a new processing facilities require considerable initial construction work before the facility can actually begin producing. Often a very large construction force is needed for a good part of a year or more. Then a much smaller workforce is needed to operate the facility. To most residents, the temporary construction jobs, which often are filled by commuting or in-migrating skilled workers, are not as valuable as the permanent operations jobs. The construction boom can actually be disruptive to a community because of the large number of temporary residents or commuters. A six- or nine-month construction job should not be treated as of the same importance as a 10- or 25-year operations job.

The role of temporary construction workers who commute in to an area from relatively distant locations in draining off much of the construction payroll can be seen in the upgrade of the North Shore taconite facilities in Lake County in 1979. Construction payrolls rose to \$143 million in a county where earnings in all industries had previously been less than \$200 million (2005 dollars). Of the \$137 million increase in construction payroll in Lake County, more than half, \$75 million, leaked out as many of those construction workers returned home outside of Lake County, largely to St. Louis County, each night. See Figure 16.

Multiplier or Ripple Effects

A new economic activity is likely to have impacts beyond the number of people actually hired and the size of its own payroll. The new business is likely to purchase at least some of its supplies locally, putting people to work in those businesses too. These are labeled "indirect"

effects. When workers are paid and they spend their income within the local economy, that spending also puts people to work in local businesses. These types of effects are labeled "induced" effects. A "multiplier" is often applied to the direct jobs and direct income earned to incorporate these indirect and induced effects. As the description of these "multiplier" effects makes clear, their size will depend on the extent to which the new business actually makes purchases locally

and on the extent to which workers live in adjacent communities and spend their pay there. If the firm's links to the local economy are weak or the workers commute some distance to their new jobs, these multiplier impacts may be quite weak.

Short-Term Impacts versus Economic Development

Economic impact analysis is built around a relatively mechanical view of the local economy. The economy is assumed to be largely in equilibrium when a large new business opens up or an existing large business shuts down, dramatically changing the local demand for workers. Economic impact analysis then traces out the direct, indirect, and induced impacts of this change on the assumption that nothing else happens within the local economy to help offset these impacts. Jobs are created or lost; new residents move in or existing ones move out. The ongoing dynamism of a real operating economy is largely ignored as employment and payroll are calculated to permanently rise or permanently fall. In the Iron Range, for instance, the past loss of mining jobs is depicted as creating a permanent hole in the local economy that is never healed.

But, as we have seen, economies evolve and new source of economic activity develop creating their own jobs and payroll. It is important to keep in mind that economic impact analysis is not a theory of economic development nor prediction of what will actually happen within the economy. Rather economic impact analysis answers a counter-factual question: If a shock of a certain size were to hit the local economy and nothing else were to change, what would be the impact on jobs and income? One of the attractions of a market economy is that it is neither mechanical nor static. Instead it tends to redeploy all valuable resources in productive ways as it flexibly adapts to a constantly changing set of economic forces. The decline in unemployment rates in the decade following the downsizing of the iron industry and the diversification and expansion of the economy outside of the iron industry are signs of that local economic adaptability. Because local economic impact analysis ignores that economic dynamism, it tends to exaggerate both the positive impacts of a new large business and the negative impacts of an existing business closing.

The PolyMet Mining Corporation's NorthMet Project

The PolyMet Mining Corporation proposes to develop sulfide copper ore deposits north and east of Hoyt Lakes and use the previous LTV-Erie taconite mill site to process the copper ore. This proposed copper development has been labeled the NorthMet Project. The processing facilities will grind and concentrate the ore and then use electro-chemical processes to extract the copper metal and produce precipitates of nickel, cobalt, palladium, platinum, and gold to be processed elsewhere.

The Bureau of Business and Economic Research at the University of Minnesota at Duluth was commissioned by PolyMet to carry out an economic impact analysis of the NorthMet Project.¹¹ It concluded that after full operation in 2009, this copper mining and processing facility would employ 472 workers in St. Louis County producing copper and other metal products worth \$167 million per year. Another 233 workers would be employed by firms providing supplies to the copper facility and, when workers spent their paychecks, another 353 jobs would be created. That would be a total of over a thousand jobs created by NorthMet, direct, indirect, and induced.

The economic impact study does not say what the payroll would be associated with the copper mining and processing jobs. The value of the metal products produced has to cover more than

¹¹"Economic Impacts of PolyMet's NorthMet Project and Other Industrial Projects of Minnesota's East Range Communities," UMD Labovitz School of Business and Economics, December 2005, a study prepared for Short Elliott Hendrickson Inc.

the workforce and the cost of the investment in exploration and development of the mine and processing facilities, the equipment and fuel used, the royalties or other payments to those who own the mineral rights, interest on loans, and profit for investors. Therefore, the value of the ore is not a good measure of local economic impact.

The UMD economic impact study estimated that 45 percent of the value of the output would go to cover equipment and supplies, leaving \$92.5 million in “value added” or value created by the mining activities themselves to cover the costs associated with the investment in the mine, mineral rights, corporate overhead, profits, taxes, and payroll. The 2002 Census of Copper and Nickel Ore Mining indicates only about 25 percent of the value added by copper ore mining and processing goes to workers as wages. If, for the NorthMet mine 30 percent of value added goes to wages, that would represent a payroll of about \$28 million associated with the copper workers themselves.¹² The indirect and induced jobs would add another \$19 million in payroll for a total of \$47 million added to St. Louis County money income.



The 472 direct jobs represent a four-tenths of one percent increase in employment in St. Louis County. With the indirect and induced jobs included the total job gain is just over a thousand. That would represent a nine-tenths of one percent increase in employment. The impacts of the payroll relative to the total money income being received by St. Louis County residents are of similar small magnitude. The payroll associated with just the miners would raise total personal income by four-tenths of one percent and the total increase in county payroll including indirect and induced effects would be about eight-tenths of one percent. Over the last ten years, total real personal income has been increasing at about \$81 million per year in St. Louis County. The \$47 million boost in payroll as a result of this mine would represent about seven months of that level of typical past county economic growth.

The opening of the copper mine and the building of the processing mill will also, of course, require a large number of construction workers for about a year. The economic impact analysis estimates that 451 temporary construction jobs would be created. If those construction workers are paid the same wages as existing construction workers in St. Louis County, the payroll would be about \$20 million. If the estimated indirect and induced jobs are added to this, the total jobs associated with the construction phase would be about 750. Because the indirect and induced jobs would be created by a temporary pulse in construction spending, it is not clear how reliable these job numbers are. Businesses may have enough slack in their operations and the hours their workers are working to absorb such temporary pulses in spending without adding permanent new employees. In any case, such temporary jobs should not be equated with long term permanent jobs.

The UMD economic impact study also looked at the impact of the NorthMet Project on state and local taxes after it was up and fully running. State and local tax impacts were reported together, not separately. The estimated combined impact on tax revenues was \$14.5 million. Only the impact on local taxes would be focused on the local communities and St. Louis County where the NorthMet mine and mill would be located. The ultimate impact of the increased state taxes on particular local communities would be less certain.

¹²To make the UMD economic impact modeling results plausible in terms of pay per mining job, a higher percentage of value added has to be assigned to wages. An alternative approach to estimating the wages and salaries would be to use the employment figures and assign typical St. Louis County mining, construction, etc. wages to those jobs. Both approaches were used here. The IMPLAN modeling that UMD carried out provides the wages and salaries data. It just was not provided in the reports.

The total budget for St. Louis County in 2006 was \$282 million. Only \$109 million of this was funded by taxes. Another \$71 million of revenue came from fees and \$79 million in revenues came from the state and federal government. If a quarter of the \$14.5 million state and local government impact of NorthMet were to flow to the St. Louis County government alone, that would add about one percent to county government revenues. But St. Louis County government is just one unit of local government within the county borders. There are also city and town governments, school districts, special improvement districts, etc. The 2002 Census of Governments indicates that when all of these units of local government are aggregated, total local government revenues within St. Louis County totaled \$957 million. If half of the state and local tax revenue impact of NorthMet went to this aggregation of local governments, that would boost aggregated local government revenues across St. Louis County by eight-tenths of one percent.

In discussing the likely impact of new metal projects on tax revenues, it should be kept in mind that taxes, in the aggregate, pay for the public services on which residents and businesses rely. Increased economic activity and population impose additional costs on local and state governments for services such as police protection and schools. Knowing that tax revenues will rise a certain amount tells us nothing about what happens to the balance between revenues and the cost of services. The fiscal balance faced by local governments could improve or deteriorate depending on how the increased costs of serving the new businesses and population compare to the increased tax revenues.

In the exhaustive, multi-volume, 1979 Minnesota Regional Copper-Nickel Study of the impacts of developing Minnesota's copper resources, detailed modeling of the impact of copper development on the fiscal balance of local governments concluded that the new tax revenues would not come close to covering the costs of providing the additional services to residents and businesses. As the chapter dealing with "Community Government Service Cost and Revenue Projections" stated:¹³

Most important to the eight cities and seven school districts of the [copper development] Study Area is the indication that local government revenue generated by copper-nickel development are estimated to be insufficient to match the estimated expenditures which must be made to meet the demands of development-related population...in only one case among the 60 analyzed was annual revenue great enough to cover the total estimated annual costs development.

The demographics of the general population has changed significantly since 1979, the costs associated with meeting the needs of the new population associated with a contemporary "copper boom" may have changed, and state tax and revenue sharing laws may also have changed enough to undermine this earlier conclusion. However, the fiscal imbalance projected for local governments the last time Minnesota considered developing its copper ore deposits serves as a warning that it is not enough to show that tax revenues will rise. It must also be shown that tax revenues will rise faster than the demand for and cost of public services.

The Upgrade of Taconite Mines and Mills

There have been proposals or actual upgrades at all six of Minnesota's taconite mining and processing facilities. This includes facilities at Eveleth, Hibbing, Virginia, and Mt. Iron in St. Louis County. Upgrades at Keewatin in Itasca County and Silver Bay in Lake County were also included in the modeling carried out by the Bureau of Business and Economic Research of the University

¹³ Minnesota Environmental Quality Board. Volume 5, Chapter 13, author: Mark Donaldson, December 1979, p. 3.

of Minnesota-Duluth. The expansion of these mining operations was modeled as a single project, combining the effects of all six expansions within the iron ore mining and processing sector.¹⁴ The impact of the expansion on taconite pellet production would be modest, about a four percent increase relative to 2004 levels. Employment at the taconite mills would rise by about six percent.

When the expansions of the taconite plants are completed in 2008, direct employment is projected to rise by 183. If these workers are paid the average mining wage in 2004 in St. Louis County, the payroll would be \$11.1 million.¹⁵ To these have to be added the indirect and induced “multiplier” effects that the UMD economic impact modeling estimates to add another 231 jobs for a total of 414. Another \$8 million in wages would be associated with those jobs for a total payroll increase of about \$19 million. This would represent about a three-tenths of one percent increase in jobs and total income in St. Louis County. The \$19 million increase in income would represent about three months of the sort of growth St. Louis County has seen over the last ten years.



Photo by Bob Kelleher, Minnesota Public Radio/news.mpr.org

If a taconite mill upgrade of this size were located in Lake or Itasca County, its direct impact would be relatively much more substantial because of the smaller size of those two economies. But the indirect and induced impacts would be substantially smaller than those discussed above since much more of the impact would take place outside of either of those two smaller counties, primarily in St. Louis County. In addition, it needs to be recalled that these were upgrades at several different

taconite mills, not at one mill in one county. If, however, we exaggerate the potential impact and consider a single taconite mill upgrade in either of these smaller counties, the direct impact would be about three percent in Lake County and slightly less than one percent in Itasca County in terms of both employment and income. If, in fact, only a third or less of this impact were likely to be experienced in Lake or Itasca County, the impact would be less than one percent.

The UMD economic impact study also estimated the impact of these taconite mill upgrades on state and local government tax revenues. Only the aggregate of these two tax impacts was reported. It totaled \$4.75 million. Only the impact on local taxes would be focused on the communities and counties in which the developments took place, but for taconite ore mining and processing, Minnesota tax law assures that most of the tax revenues flow to local governments and organizations. The 2002 Census of Governments indicates that the total revenue received by local governments within the three counties, Lake, Itasca, and St. Louis, totaled \$1.2 billion. Clearly the part of the \$4.75 million that went to local governments would not have a significant impact on local government resources, a few tenths of one percent. At the other extreme, if half of this state and local government aggregate went entirely to Lake County local governments, it would boost local government revenues four percent.

The Minnesota Steel Project

Minnesota Steel Industries has proposed to reactivate the former Butler taconite mine and mill in eastern Itasca County and use it to supply an integrated steel mill. The integrated facility would mine the taconite ore, crush and concentrate it, form it into pellets to feed a direct-reduction iron plant. The iron produced would then feed electric arc furnaces to produce steel that would then

¹⁴ Op. cit. pp. 27-29.

¹⁵ This would be 75 percent of the UMD estimated value added vs. the 25 or 30 percent that the Census of Iron Ore Mining indicates was reported by Minnesota taconite facilities. Either the new workers are expected to start at pay levels well below the existing average or the numbers within the UMD economic impact analysis are inconsistent.

move through a hot rolling mill. This will require a \$1.6 billion investment over six years. When the integrated, mine to steel, plant is completed and operating at full capacity it will employ 700 workers. At peak construction 2,000 construction workers will be on the site.

The University of Minnesota-Duluth has carried out an economic impact analysis of the likely impact of building and operating such an integrated steel plant.¹⁶ It has estimated both the total value of output of the facility and the value added at the facility (value of output less cost of inputs). As discussed above, neither of those give us a good measure of the impact on local residents since much of the value of output and value added does not flow to local residents. Economic census data can be used to determine what part of value added in an iron mine and mill and steel mill is wages and salaries paid to workers. Alternatively, the pay being received by current workers in taconite mills and construction in the Iron Range can be used to estimate a payroll for the new workers. Both approaches suggest a payroll for the integrated steel operation of \$47 million per year. Applying the multipliers estimated by the economic impact analysis to incorporate the indirect and induced effects increases the 700 direct jobs to 2,010 and increases the payroll impact to \$98 million.

The direct jobs and payroll would add three and four percent, respectively, to jobs and income in Itasca County. With the multiplier impacts included, jobs and income would increase by about eight and a half percent.

The construction phase would, of course, also add temporary jobs with about 2,000 construction workers on site for two years and another 1,200 for three more years. At its peak, the construction jobs would directly add about eight and a half percent to Itasca County employment and the boost total income by \$81 million or seven percent. If the estimated multiplier impacts are included, 3,200 jobs and \$122 million in payroll would be added to the county economy during the construction phase. That would be a fourteen percent temporary increase in jobs and a ten percent temporary increase in income in Itasca County.

The economic impact analysis, recognizing that Itasca County might be too small a county to fully capture all of the impacts associated with the Minnesota Steel project, also estimated impacts using the combination of Itasca and St. Louis Counties. By including the much larger adjacent county that also has the largest trade center in the region, more of the impacts of the project could be captured. At the same time, including St. Louis County would tend to dilute the measured impact because it would be spread over a much larger metropolitan county. A comparison of the results of the impact analysis using just Itasca and the combination of Itasca and St. Louis Counties indicates that about 239 additional jobs would be created in St. Louis County with a payroll of about \$16 million. During the construction phase, 451 additional temporary jobs would be created with a \$20 million payroll in St. Louis County. Within that large county these impacts would be only one- to three-tenths of one percent of total jobs and income.

Summary of the Local Economic Impacts of an Expanded Metal Industry in Northeast Minnesota

A variety of metal mining and processing projects have been proposed for northeastern Minnesota. Some modest ones have already been carried out. Others have already been abandoned. It is difficult to project which ones will actually proceed and, of those that do, which

¹⁶ The Economic Impact of Constructing and Operating Minnesota Steel Industries LLC in Itasca County, Minnesota, April 2006, Labovitz School of Business and Economics, Bureau of Business and Economic Research, prepared for the Itasca Development Corporation.

will succeed in the long term. Each of the larger projects (new copper mines, new iron or steel mills) would directly add 500 to 800 jobs and a payroll of \$30 to \$50 million per year. If the projected multiplier impacts are reliable, the total impact could be 1,000 to 2,400 additional jobs and \$50 to \$115 million in additional wages.

These are large impacts but the three-county regional economy is also large. St. Louis, Itasca, and Lake Counties have a combined employment of 152,000 and a combined total personal income of \$6.2 billion. The direct impacts of one of these larger facilities would add only a fraction of one percent (one half to seven-tenths percent) to current jobs and income. Even including the multiplier impacts, the additional jobs and income would represent an addition of between one and one half and two percent to the existing economy. Of course, in the smaller counties the impacts would be much larger but could be realized only by the in-migration or commuting of workers from outside those counties given the current low unemployment rates and relative lack of skilled workers. In that setting it is less clear how the current residents would gain from that job creation since most of the benefits would go to those currently living outside the region.

The Economic Future of Northeast Minnesota

Metal Mining as a “Basic Industry” That Energizes the Northeastern Minnesota Economy

As discussed earlier, iron ore mining and processing directly provides only about two-tenths of one percent of Minnesota income and one-tenth of one percent of total state jobs. In Itasca and St. Louis Counties mining is directly the source of four to five percent of jobs and income. Despite this relatively tiny statewide contribution and modest local contribution of metal mining to the prosperity of communities, some state citizens and leaders believe that metal mining holds a special place within the Minnesota and Iron Range economies that makes it much more important than these numbers suggest. This belief in the importance of metal mining is partially tied to the historical role that industry played in the European settlement of northeastern Minnesota. But economic history is not usually a good guide to the economic present or future. Trying to explain current day Pittsburgh, Chicago, Denver, or Portland, for instance, in terms of steel, meat packing, ranching, or timber, respectively, would not be very useful.

Another reason that metal mining is assumed to play a special role in the economy, far in excess of its quantitative size, is the prevalence of metals in almost all of the goods we use, especially in the manufacturing sectors of the economy. Without metals, it is hard to imagine an industrial or, even, a high-tech society. But that is also true of food, air, water, energy sources, education, science, technology, vitamins, antibiotics, and innumerable other things. Knowing that something is necessary for economic activity tells us nothing about how important it is to produce more of it. Food and metals may be necessary, but it is quite possible to over-produce them, driving the value of additional production so low that it is not economically rational to increase production.

Still another reason that some believe that metal mining is special and more important than the direct employment and income numbers suggest is that metal mining, like timber, agricultural, and manufacturing activities, brings income into the Minnesota economy from the outside through its export of products to the rest of the world. Industries that “inject” income into the local economy are often depicted as the engines that drive the rest of the economy. They are special because, it is believed, without them, only primitive subsistence economic activity could take place locally. Industries like metal mining are said to provide the money that circulates in the local economy, allowing people to make purchases at local businesses and pay taxes to support local public services. Without that money, it is believed, there would be no local businesses or local public services, only a dispersed population living off the land, largely in poverty.

Because this latter view of metal mining and other natural resource industries is so prevalent in economic discussions of Minnesota’s Iron Range, it is important to look more closely and critically at that particular way in which metal mining is believed to be special and central to the future of this region.

Basic Industry

Economic activities that bring income in from the outside are often called “basic” economic activities because they are seen as the source of the income that then makes possible the locally oriented economic activities. Basic economic activity is seen as causing or facilitating locally oriented economic activity. In that sense basic economic activity is believed to have a local economic impact that is larger than just the number of jobs or the size of the payroll associated with it. There are said to be “spin-off” or “ripple” or “multiplier” impacts associated with basic economic activities that amplify their ultimate impacts on the local economy.

Testing the Economic Base Approach to Explaining Economic Changes

The more popular version of the “economic base” approach to explaining changes in the local economy focuses on certain industries that are assumed to make up the state or local area’s economic base. Traditional export activities aimed at national and world markets and the infrastructure supporting them are usually identified as the “economic base”; land-based activities such as mining, timber harvest and agriculture and the manufacturing associated with them fall into this category. Most other manufacturing would, too. Transportation, energy utilities, and heavy construction supporting these industries are likely to be treated as part of the export base as well. It is this group of industries that are assumed to drive the rest of the Minnesota and Iron Range economies. Although this popular view of the economy has intuitive appeal, it does not do a very good job of explaining changes that have been taking place in the Iron Range economies over the last two decades.

The economic base view of the Iron Range economies predicts that as a result of the decline in employment and earnings in iron ore mining and processing and the industries supporting it (railroads, construction, etc.) beginning in the late 1970s, employment and income in non-mining

sectors should also have declined as the money previously earned in these sectors no longer circulated in the local economies. But this did not happen.

As real earnings in iron ore mining and processing, transportation, and construction declined in, for instance St. Louis County, earnings in the rest of the economy, including services, trade, finance, government, expanded steadily. See Figure 17.

In St. Louis County between 1983 and 2000, aggregate real income increased \$1.3 billion or 33 percent. But the services’ sectors increased 104 percent,

providing \$587 million or about half of the total increase in real income. The expansion of health service alone added \$334 million. Non-employment income increased by \$380 million including \$288 million in dividends, rent, and interest and \$91 million in federal transfer payments

Figure 17

**Sources of Real Income in St. Louis County, MN:
Goods, Transportation and Public Utilities v. Rest of Economy**

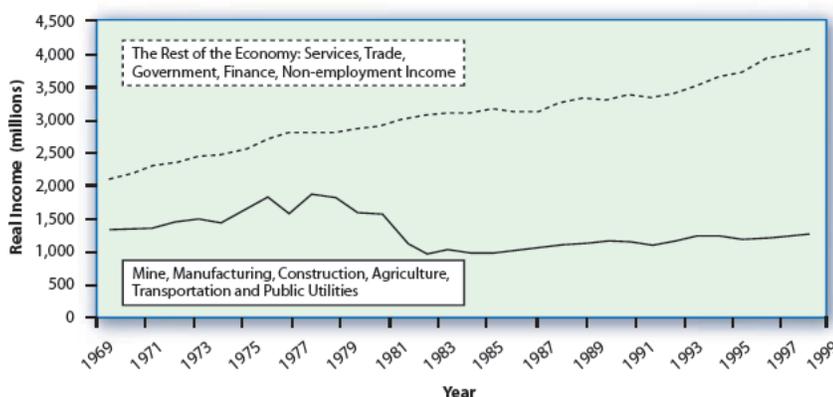


Figure 18
Sources of Real Income in Itasca County, MN:
Goods, Transportation and Public Utilities v. Rest of Economy

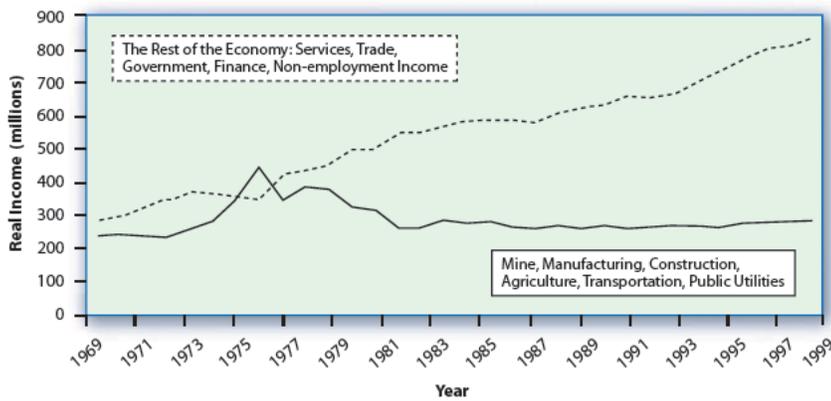
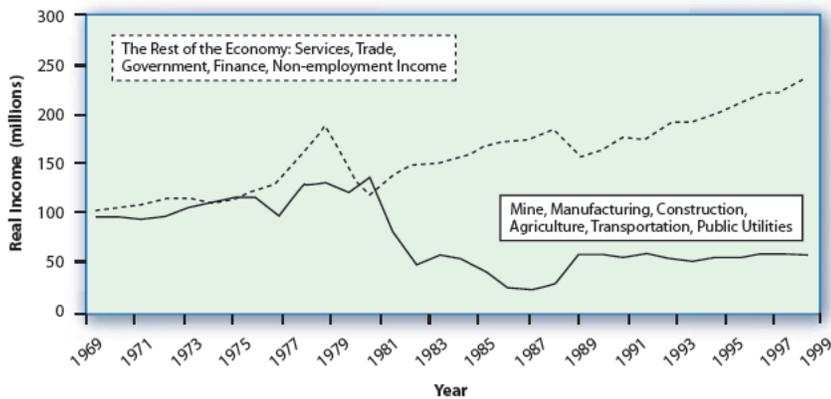


Figure 19
Sources of Economic Vitality in Lake County, MN:
Goods, Transportation and Public Utilities v. Rest of Economy



almost all new jobs and income lay outside of those industries that are usually assumed to make up the local economic base. In addition, as the traditional local economic base has contracted, the rest of the economy has not. In fact it has continued to grow rather than joining the economic base in decline. That indicates that there are sources of economic vitality that lie outside of the traditional “economic base.”

Gains and Losses in Real Income: Three Iron Counties

County Time Period	St. Louis County 1983-2000	Itasca County 1979-2000	Lake County 1981-2000	3 Counties
Real Income Losses (\$ millions)				
In-Commuting	-\$148			not additive
Metal Mining	-\$34	-\$128	-\$71*	-\$233
Fabricated Metal Products	-\$17			-\$17
Railroads	-\$21	-\$2	-\$12	-\$35
Food Processing	-\$16			-\$16
Agriculture	-\$2	-\$7		-\$9
Total Real Income Losses	-\$238	-\$137	-\$83	-\$458
Real Income Gains (\$ millions)				
Medical, Health, Social Services	\$516	\$65	\$8	\$589
Dividends, Interest, Rent	\$207	\$123	\$36	\$366
Government	\$180	\$45	\$13	\$238
Construction	\$100	\$17	\$2	\$119
Federal Transfers: Social Security, Medicare, Etc.	\$260	\$148	\$34	\$442
Finance	\$265	\$10	\$3	\$278
Total Real Income Gains	\$1,528	\$408	\$88	\$2,024

Source: US Department of Commerce, Bureau of Economic Analysis, Regional Economic Information System.
*1981-2000

including Social Security and Medicare reimbursement. Almost all of the growth in St. Louis County real income came from these sources. The goods-producing sectors – manufacturing, mining, construction, and agriculture – along with transportation and public utilities in the aggregate were the source of no net expansion in real income. The sources of economic vitality largely lay elsewhere.

This dominance of services-producing economic activities in supporting local economic vitality, despite the declines in the “economic base,” was not due to the fact that St. Louis County is a metropolitan area. The same pattern is found in Itasca and Lake Counties. See Figures 18 and 19.

The limited role that land-based economic activities including mining, forest products, and agriculture, as well as manufacturing, and the infrastructure that supports them, have played in supporting local economic development is important to note. These iron counties have been able to maintain considerable economic vitality primarily through the diversification of the economy away from traditional natural resource activities as well as manufacturing. The source of

The industries in which these income losses and gains took place are shown in the table at left. It is important to note that the shift in employment that took place cannot be accurately characterized as a loss of high-paid natural resource jobs and their replacement with low paid “tourist” or “burger-flipping” jobs. Among the industries with the largest gains in employment and real income were medical services, construction, government, and finance. In addition, investment and retirement income expanded significantly, injecting income

into the local economy from sources other than employment.

Part of the reason that this popular view of the economic base is not very good at predicting changes in the local economy is that the economic base is often not accurately defined. For instance, federal Social Security and Medicare reimbursement payments and other retirement income are usually ignored. Investment income (rent, interest, dividends, etc.) received by individuals and spent in the Iron Range should also be accounted for. However, even when the economic base is carefully specified and includes all of these, it is often the case that the rest of the economy moves independently of the economic base for reasons that will be discussed below. The “economic base,” including metal mining, does not have the predictable and reliable impact advocates of this particular theoretical view of the local economy suggest.

Moving Beyond the Economic Base View of the Local Economy: Amenity-Supported Local Economic Vitality

Within the context of the economic base view of the local economy, local economic health is determined by the health and profitability of those export-oriented businesses with which the local community is blessed. In that context, any government regulations that might reduce that profitability can be depicted as threatening local economic health. That way of looking at the economy is the source of the assertion that environmental regulation damages the economy. From this perspective, enforcing water quality standards or imposing reclamation requirements on metal mines can be depicted as threatening local jobs and income. This dichotomy between environmental protection and economic well-being, however, is a false one, largely created by the incomplete nature of the way the economic base approach encourages us to think about the local economy.

Discussions of the Iron Range economies are almost exclusively carried out in the context of that economic base view of the state and local economies. In that view business firms are assumed to locate in a particular area because of certain site-specific resources such as iron or copper ore, timber, farm products, etc. These business firms create jobs to which the workforce responds. Workers and their families move to where the jobs happen to be located. The distribution of these export oriented natural resource firms explains why people live where they do. Or so this incomplete view of the local economy assumes.

To many this is just hard-nosed economic realism: “That’s the way the economy is.”

But this approach implicitly makes two assumptions that, when stated, appear very questionable. The first is that people do not care where they live. They simply move to where the economy demands. The second is that business firms do not care either about where workers live or would like to live or where the markets for those business firms’ products are located. The location of the population determines both of these, but firms are assumed to ignore both and choose their location on some other basis. Neither of these assumptions can be defended on either theoretical or factual grounds. Abandoning them introduces residential location choice as an important economic force in determining the location of economic activity and seriously undermines the economic base approach.

During the second half of the twentieth century, changes in the economy have made residential location choices increasingly important in the determination of the location of economic activity. These changes have made both people and businesses more “footloose.” Those changes include the following:

- Improvements in transportation and communications that have drastically reduced the costs associated with geographic distance from economic centers. These changes include improved

highway systems, the extension of regular airline service to small cities, the development of modern telecommunications networks and technology, the development of national and international television networks that reach the most isolated locations, and the emergence of competing next-day courier service. These changes significantly reduce the sense of isolation from the national economy and culture associated with locations far removed from the nation's largest metropolitan areas.

- Changes in what the economy produces have also had an important impact on the location of economic activity. With the shift from the dominance of extractive and heavy industry to light manufacturing and services, the relative importance of transportation costs has declined as the value to weight ratio has risen dramatically. Transportation costs no longer tie economic activity as tightly to particular locations.¹⁷

These two changes explain the ongoing diversification of the Iron Range economies that was documented in the table above. One dramatic change the table demonstrated was the growth in the medical services industries. But other professional service industries (finance) and retail trade infrastructure have also expanded. This allowed the ongoing expansion of the locally oriented sectors despite the declines in the export oriented sectors documented in Figures 17, 18, and 19 above. Businesses and economic activity have been moving to where people are located in order to deliver their goods and services.

As a result of these changes and the relative mobility of economic activity, it is less costly for citizens to act on their preferences for certain types of living environments. Similarly, it has made it more feasible for economic activity to follow the population as it makes residential location decisions. The result is that economic activity increasingly follows people rather than people passively following businesses. Consider the shift of economic activity from center cities to suburbs: First people fled those centers of employment and commercial activity and commuted back for work and shopping. Later the manufacturing base followed the population to the suburbs, as did the shopping centers. Similar things can be said about the move to the Sunbelt or the current resettlement of the Mountain West.

Population Change in Non-Metro Counties by Type of County, 1990-2000

County Type	Population Change	Net Migration
Retirement	28.4%	25.9%
Federal Lands	22.3%	16.4%
Recreation	20.2%	16.9%
Commuting	15.2%	12.0%
Services	14.6%	11.7%
Government	11.5%	5.2%
Non-Specialized	10.9%	8.4%
Total Non-Metro	10.3%	6.9%
Manufacturing	9.5%	6.1%
Poverty	9.1%	4.4%
Transfer Payments	8.5%	6.5%
Farming	6.6%	3.9%
Mining	2.3%	-1.5%

An analysis of population growth in non-metropolitan counties during the 1990s clearly indicates the role that residential choice has been playing in determining local economic vitality. If non-metropolitan counties are sorted on the basis of the various economic categories the Bureau of Economic Analysis of the U.S. Department of Commerce has developed, the importance of local attractiveness is clear. The fastest growing non-metro counties are retirement counties, counties dominated by the presence of federal lands, and recreation counties. See the table at left.¹⁸ Counties with traditional export-oriented economic bases (manufacturing, farming, and mining) had the greatest difficulty retaining their existing populations and attracting new residents.

¹⁷ Mills, Edwin S., and Gary Chodes. 1988. "Non Extractive Employment Outside Metropolitan Areas," *National Rural Studies Committee: A Proceedings*. Hood River, Oregon. May 24-25, 1988. Corvallis, OR: Western Rural Development Center, Oregon State University. Edited by Emery Castle and Barbara Baldwin, pp. 29-36. Mills, Edwin S. 1987. *The Determinants of Small Area Growth*. Lecture Series 1. Corvallis, OR: Oregon State University, Graduate Faculty of Economics.

¹⁸ Table 3 in "Nonmetro Recreation Counties: Their Identification and Rapid Growth," Kenneth M. Johnson and Clavin L. Beale, *Rural America* 17(4):12-19, 2002.

Since the mid-1950s economists have emphasized the importance of residential location decisions as a powerful economic force. They focused on the role of local environmental “amenities” such as climate and natural landscapes in the settlement of the desert southwest (including Southern California and Arizona), Florida, and the Pacific Northwest.¹⁹ Tiebout (1955) underlined the fact that people “shop around” for the social amenities produced by different levels of local government taxation and different public spending patterns.²⁰ Borts and Stein (1964) argued that in a mobile, open economy, it would be an area’s ability to attract and hold a labor force without bidding labor costs up that would determine the geographic distribution of economic activity.²¹ These economic forces tied to local amenities continue to operate in important ways today, helping to explain the above average economic performances of the Southeast, the Pacific Northwest, and the Mountain West states over the last decade.²²

Conventional regional economic analysis now regularly takes into account the role of social and natural amenities in explaining migration patterns and regional development patterns. The US Department of Agriculture, for instance, which long has used farm, manufacturing, and mining to classify the major economic characteristic of non-metropolitan counties in harmony with the simple economic-base approach, has expanded its economic classification to include “amenity” counties. This became necessary in the 1980s when a group of non-metropolitan counties showed ongoing growth despite the economic difficulties most non-metropolitan counties were having. The common denominator in these counties was their attractive landscape and climatic features that attracted recreationists, retirees, and other new residents. This impact of amenities has accelerated in the 1990s.²³ Similarly, most migration modeling now takes into account the role of local amenities along with employment and income opportunities and cost of living.²⁴

Of course, most areas are not “amenity” magnets that draw national attention. That, however, does not mean that the attractiveness of a particular area to current and potential residents is unimportant. Most small towns and rural areas in the West, for instance, have gained population and the new economic activity that supports it during the 1990s, not just those with destination resorts or those that have attracted high tech firms.²⁵ The characteristics of a local area that allow it to attract and hold people are an important part of the area’s economic base. If this is not recognized, that part of the economic base may be irreversibly damaged.

¹⁹ Ullman, Edward, 1954, “Amenities As a Factor in Regional Growth,” *Geographic Review*, 44(1):119-132.

²⁰ Tiebout, Charles, 1956, “A Pure Theory of Local Expenditures,” *Journal of Political Economy*, 64(2):160-164.

²¹ Borts, G.H., and J.L. Stein, 1964, *Economic Growth in a Free Market*, New York: Columbia University Press.

²² Thomas M. Power and Richard Barrett, *Post Cowboy Economics: Pay and Prosperity in the New American West*, Island Press, forthcoming, Spring 2000; Power, Thomas M., 1995, editor, “Economic Well-Being and Environmental Protection in the Pacific Northwest: A Consensus Report by Pacific Northwest Economists,” Department of Economics, University of Montana, Missoula, MT, December.

²³ U.S. Department of Agriculture (USDA), 1996, Economic Research Service, *Rural Conditions and Trends*, 7(3):40-44, p. 9. See also Deavers, K., 1989, “The Reversal of the Rural Renaissance,” *Entrepreneurial Economy Review*, 3-5; Beale, C.L. and G.V. Fuguitt, 1990, “Decade of Pessimistic Nonmetro Population Trends Ends on Optimistic Note,” *Rural Development Perspectives*, 6(3):14-18; Peggy J. Cook and Karen L. Mizer, *The Revised ERS County Typology: An Overview*, Rural Development Research Report Number 89, Economic Research Service, USDA, 1994; Johnson, Kenneth M., and Calvin L. Beale, “Nonmetropolitan Recreational Counties: Identification and Fiscal Concerns,” *Demographic Change and Fiscal Stress Project*, Loyola University, Chicago, January, 1995.

²⁴ Greenwood, Michael J., G.L. Hunt, D.S. Rickman, and G.I. Treyz, 1991, “Migration, Regional Equilibrium, and the Estimation of Compensating Differentials,” *Journal of Regional Science*, 26(2):223-234. Berger, M.C. and G. C. Blomquist, 1992, “Mobility and Destination in Migration Decisions: The Roles of Earnings, Quality of Life, and Housing Prices,” *Journal of Housing Economics* 2: 37-59.

²⁵ See the special issue of *Rural Development Perspectives* on the rural West, 14(2), August 1999, USDA, Economic Research Service.

When we recognize the importance of social and natural amenities to local economic vitality, a quite different picture of the forces driving the local economy emerge. The ability of an area to attract and hold residents is central to its economic vitality. In that context, those locally specific qualities that make a particular area an attractive place to live, work, and do business are not just of aesthetic interest, they are part of the local area's economic base. High quality living environments attract and hold people and businesses. That in turn triggers a series of dynamic changes that support ongoing local economic vitality. The quality of the social and natural environments have profound economic implications.

The local economic development case for protecting natural landscapes can be summarized very directly: people care where they live. They care about the qualities of the natural and social environments that make up their living environment, and they act on those preferences. They are willing to make sacrifices to obtain access to these natural amenities. High quality natural environments draw people and businesses to areas even when economic opportunities are otherwise quite limited. As a result, economic activity shifts towards those preferred living environments.

Because this aspect of community economic development shifts the emphasis away from exclusive focus upon natural resource industries, it might be interpreted as suggesting that natural resources do not matter as much to these communities any longer. But the primary message is quite different. It is that the role of natural resources in the local economy is not diminishing but changing from extraction and export to non-consumptive and environmental. Communities' economic health continues to depend on the surrounding natural landscapes, but in a fundamentally different way. Our natural landscapes are no longer primarily warehouses from which to extract commercially valuable resources nor a playground where commercial companies can entertain temporary visitors. They are now the source of flows of increasingly valuable environmental services: clear water and air, cultural and historical preservation, recreational opportunities, wildlife, scenic beauty, biodiversity, environmental stabilization, etc. Those environmental services provided by protected landscapes make the communities embedded in them attractive places to live, work, and do business. This supports and enhances local economic vitality and well-being.

Extractive industry, including metal mining, by itself has generated ghost towns in the past. When it was only the employment opportunities in mining or logging or agriculture that drew people to an area, the ultimate decline in employment opportunities in those sectors meant

there was nothing else to hold people in the area. As a result, those communities lost population or were abandoned. Minnesota's Iron Range, like the Upper Peninsula and a good deal of the Mountain West, have their mining ghost towns. The northern tier of the nation also has many examples of logging ghost towns. The Great Plains has hundreds of agricultural ghost towns. High quality living environments, on the other hand, prevent ghost towns by holding and attracting economic activity. Because of this, it is vitally important from an economic point of view to treat environmental regulation as part of a region's or state's economic development strategy rather than allowing economic development strategy to constantly undermine efforts to protect the social and natural environments. An economic development policy focused on the rear-view mirror, seeking to revive the industries that were important sources of jobs and income in the

past by sacrificing additional elements of the natural environment in the present and future, may actually be undermining the economic future of a region.



Amenity-Supported Economic Development in the Region Surrounding the Iron Range

Minnesota and northern Wisconsin provide many examples of amenity-supported economic development. What some have labeled suburban or exurban “sprawl” is actually a type of “counter-urbanization” in which urban residents choose to shift their residence to rural areas. The 2000 Census provides data on people who had moved in the previous five years and from where they moved. That allows the identification of people who had lived in large urban (metropolitan) areas but then moved to rural areas. A map of rural areas that have gained significant numbers of such previous urban residents shows that the upper midwestern north woods have seen lots of this type of in-migration. Northern Minnesota, from the greater Minneapolis region north, and northern Wisconsin have concentrations of such areas. Itasca, Lake, and northern St. Louis Counties do, too. Many of these same rural areas also have increased new home construction.²⁶

The Pine Barrens of northwestern Wisconsin has seen ongoing residential development. With 1,400 lakes and thousands of acres of forests and public lands it has drawn seasonal visitors for most of the twentieth century. Now, however, in addition to the seasonal use, there is a growing permanent population, growing at a rate twice the Wisconsin state average. Located within a two-hour drive of the greater Minneapolis metropolitan region, the Pine Barrens have become a highly desirable setting for retirement and ex-urban residences. But the same sort of exurban development is taking place along a broad front within Minnesota to the north of Minneapolis and to the north of Duluth.

St. Louis County’s planners have noted the increase in population, new housing, and property values around its own large lakes.²⁷ It is not just areas like the Island-Boulder-Fish Lake area within commuting distance of Duluth that have seen this growth. Far to the north the same type of lake-based development is taking place around Vermillion and Trout Lakes (Tower area), Burntside-Shagaw Lake (Ely area), Birch and Bear Island Lakes (Babbit area), Hoyt Lakes, and Pelican Lake (Orr area). Not only are new building permits concentrated in these lake areas but what had been seasonal housing has been systematically converted into year-around residents, significantly reducing the stock of seasonal homes.

This type of rural residential development is not without its own problems. Almost all types of economic development, because they bring change, have social, economic, and environmental impacts. The point is not to uncritically praise the wave of rural residential development that is sweeping across a good part of the Northwoods from the Lower Peninsula of Michigan to Northern Minnesota. The point is simply to emphasize the fact that there is an alternative set of economic forces operating in the region that involves people pursuing what they perceive to be higher quality living situations, rural and small urban residential growth, and the shifting of economic activity to support that new residential settlement. Jobs are following people. The attractiveness of an area is an important economic characteristic that will determine what areas gain and what areas lose population. The rural Great Plains represents a large area that thus far has lost population as a result of this set of economic forces. Damage to the landscape and waters of northeastern Minnesota could close off this source of economic vitality and leave the region entirely dependent on volatile international metal markets.

²⁶ Roger B. Hammer and Richelle L. Winkler, “Housing Affordability and Population Change in the Upper Midwestern North Woods,” Chapter 14 in *Population Change and Rural Society*, edited by William A. Kandel and David L. Brown. Springer: Dordrecht, Netherlands. Figures 14.1 and 14.2.

²⁷ State of Housing: Housing Facts and Figures 2003, St. Louis County Planning Department, Duluth, MN. Also State of the County: A Statistical Portrait of St. Louis County 2001, St. Louis County Planning Department, Duluth, MN.

Looking towards Minnesota's Economic Future

Over the last century, the Iron Range has focused on extracting one part of nature's bounty, the extensive iron ore deposits. In the process it has turned a significant part of the Iron Range into an industrial landscape of open pits, sprawling tailings piles, settling ponds, and aging industrial facilities. This is not a new situation. The leading historian of the Iron Range describes the early twentieth century Mesabi country in the following way:

Within a decade [of 1892] more than 30 million tons of ore had been removed and the Mesabi was a 60 mile expanse of stumps, rubble, gaping open pits and rude mining camps and towns. By the end of the second decade, camps had been turned into towns, towns into cities and the giant mining frontier appeared all but closed. The era of explorers, prospectors and entrepreneurs seemed to be waning.²⁸

Thirty years later, things were no better. As historian Dana Miller describes it: "This area was known as the cut over area in the '30s, because the logging was pretty much done, and everything had been cut; clear-cut pretty much to the Canadian border... In the '30s, it was a real desolate looking place. There are very few places on earth that have been pitted and scarred like the Iron Range."²⁹

The residents of the Iron Range have experienced firsthand the instability of an economy built around metal mining. While the hard and dangerous work of Minnesota's iron ore miners produced incredible wealth for this nation, providing most of the iron ore around which the industrialization of America was based, those miners, their families and communities also experienced something else. As Iron Range historian Marvin Lamppa said in closing his history text:

...However, in the midst of all this turmoil, a growing global steel market sharply diminished the demand for the region's iron, raising new issues over...the future of northeast Minnesota's communities. Coping with the unpredictable fluctuation of mining economy and forces of change, over which there seemed to be no control, became an accepted part of life for the generations who made Iron Country their home. They, like people in other single industry regions – Massachusetts' textile towns, the coal belt towns of West Virginia and Pennsylvania, Michigan iron mining districts – came to know the hurt and anguish of mine and plant closing, loss of jobs, loss of pensions and insurance, strikes, accidents and death. They confronted turmoil and intimidation, experienced poverty and prosperity, and through it all they endured.³⁰

Northeastern Minnesota will have to decide if it wants to ride the metal mining roller coaster again and then wrestle with an even greater level of environmental damage that may foreclose more sustainable economic development options. The reality of the type of economy metal mining actually supports and the long-term environmental damage always associated with metal mining have to be weighed against the high wage jobs at least temporarily created largely for in-migrating or commuting skilled workers.

In general, sustainable communities do not rely on the export of just one or a few products. Nor is economic development built around "more of the same." Over-specialization on the export

²⁸ **Minnesota's Iron Country: Rich Ore, Rich Lives**, Marvin G. Lamppa, Lake Superior Port Cities, Inc., Duluth, MN, 2004, p. 143.

²⁹ The History of the IRRB, Bob Kelleher, Minnesota Public Radio, 12/06/1999, http://news.minnesota.publicradio.org/features/199912/06_newsroom_irrb-m/history.shtml

³⁰ *Ibid.* p. 245.

of unprocessed natural resources is largely the characteristic of an under-developed “colonial” economy. As discussed above, it exposes the economy to several serious problems that discourage sustained development: fluctuations in international commodity prices cause fluctuations in export earnings; international competition leads to over-productions and downward pressure on prices and export earnings; ongoing technological change steadily reduces the employment opportunities associated with the mineral extraction.

To moderate or buffer these problems, natural resource economies have to supplement their economies with other types of economic activities. This calls for diversification of the economy both by developing new value-added exports and through import substitution. A new economy has to develop along side the old.

Those who have grown up with metal mining in the Iron Range and are steeped in its long history will doubt whether northeastern Minnesota communities can successfully compete for economic activity that is not tied to extracting its natural resources. Some of those who insist that the Iron Range has to continue to focus primarily on its traditional natural resource industries do so because they see natural resources as a “sure thing” and any “new” economy as speculative and unlikely given northeastern Minnesota’s remoteness and harsh climate.

However, as discussed above, advances in transportation and communications and changes in what it is that the economy produces have dramatically reduced the costs associated with geographic isolation. As more economic activity has become relatively “footloose,” a different set of local characteristics, other than the presence of extractable natural resources, becomes important in determining the location of economic activity: the quality of the local labor force, the quality of the public infrastructure, including schools, parks, and libraries, and the quality of the social and natural environments. In the jargon of economics these factors can be labeled human, social, and natural capital. Those areas across the nation that have been successful at attracting significant amounts of new economic activity over the last decade were not those that continued to specialize in natural resource extraction. In fact such areas lagged all other community economic categories. It was areas that were perceived to have the human, public, and environmental resources that made them attractive locations for new or expanding businesses that prospered.³¹



High quality natural amenities contribute in a dynamic way to the location of economic activity. Areas that have been able to retain and attract a high quality labor force are attractive because of those human resources. Areas that do not have that labor force but have attractive characteristics that allow the recruitment of the necessary skilled workforce without paying inflated wages also have an advantage.

The ongoing growth in employment and real income despite the shrinkage in the iron industry makes clear that northeastern Minnesota *can* compete for the location of new economic activity. The Lake Country of northeastern Minnesota, including the areas adjacent to the Boundary Waters Canoe Area, is already serving as a magnet for new residents and the economic activities that support them.

³¹ For supporting evidence from the Western states see: “Amenities Increasingly Draw People to the Rural West,” Gundars Rudzitis, and “Jobs Follow People in the Rural Rocky Mountain West,” Alexander C. Vias, *Rural Development Perspectives*, 14(2), August 1999. For the Great Plains see “Net Migration in the Great Plains Increasingly Linked to Natural Amenities and Suburbanization,” John B. Cromartie, *Rural Development Perspectives*, 13(1), June 1998. For the South see “Migrants in the Rural South Choose Urban and Natural Amenities, John B. Cromartie, *Rural Development Perspectives*, 14(4), February 2001.

The challenge represented by metal mining is that it is a landscape-intensive activity that almost always has had significant negative impacts on the natural environment. That means that it has the potential to damage one part of the local economic base, environmental quality, while developing another, the mineral deposit. To the extent that the environmental damage could be significant and permanent while the mineral development, in contrast, is relatively temporary, significant public economic policy issues are raised: Is there a net gain or loss to the local economic base as a result of developing the mineral deposit? Can the development of the mineral deposit be modified in such a way as to reduce the threat to other current and future economic values and activities? The environmental record of metal mining, including that of many relatively recently closed mines, clearly indicates that these questions have to be explored carefully and critically. This is not “merely” a matter of aesthetics or the impractical preservation of “prettiness.” It goes to the heart of the future economic vitality and sustainability of the northeastern Minnesota economy. That is the reason that rational public regulation of metal mining should be an important part of Minnesota’s economic development policy.

About the Author

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