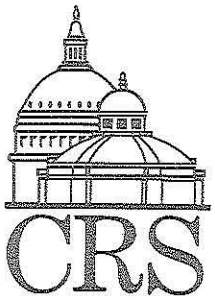
94-540 E

CRS Report for Congress

Hardrock Mining, the 1872 Law, and the U.S. Economy

Bernard A. Gelb
Specialist in Industry Economics
Economics Division

July 1, 1994



Congressional Research Service • The Library of Congress

HARDROCK MINING, THE 1872 LAW, AND THE U.S. ECONOMY

SUMMARY

Enacted to promote mineral resource development and the settlement of the Western United States, the General Mining Law of 1872 as amended provides easy private access to hardrock mineral resources on Federal lands. Partly as a result, mineral and economic development in the West has been substantial.

A cost of the significant benefits realized as a result of the 1872 Law, however, is a different, less economically efficient, allocation of resources than would be in place without the 1872 Law. In the view of many, this includes insufficient attention to environmental values. Critics also say that the Law is outdated, and that the Government (as custodian of the land for the citizens) gets very little return for making the land and mineral resources available.

Impetus to "reform" the 1872 Law has led to the passage of significantly different bills by the House and Senate, in the 103rd Congress, that directly and indirectly would raise the cost of existing and prospective hardrock mining on Federal lands. It appears that designers of change in the law are striving for, or are acceding to, an increase in the explicit price charged by the Government for access to Federal lands. Royalties and maintenance, or holding, fees are the chief means selected toward that end. Generally accepted economic principles hold that each should be part of an overall system of payments for use of the land, sharing of risk, and removal of resources.

The bills passed by the respective chambers would impose much different degrees of added cost and Federal control of access, with the difference stemming mainly from a greater royalty charge and greater environmentally-related restrictions in the House bill. Both bills, however, would change the economics of hardrock mining on Federal lands by raising the cost of existing and prospective operations. Such mining would become less attractive than without the changes. Consequently, U.S. firms probably would tend to mine more on non-Federal lands and abroad. In the short run, profitability would tend to suffer as a result of higher costs; but it would tend to return to its prior level in the long run, other things being equal.

The hardrock mining industry constitutes a small portion of the U.S. economy in terms of value of output and persons employed. But, because a large portion of the industry's activity takes place on Federal lands, and other industries' output directly and indirectly goes into the delivery to final use of a dollar of hardrock minerals, there is concern that measures that impose added costs on mining operations would make some mines uneconomic, resulting in lower production, fewer jobs, and reduced economic activity. To the extent that present hardrock mining activity would be cut back and/or its duration shortened at a number of locations, employment would be reduced and some communities could lose their main source of income. The economic costs and other disruptions of such local impacts could be severe.

CONTENTS

HARDROCK MINING, THE 1872 LAW, AND THE U.S. ECONOMY

Environmental concerns, a new Administration's initiative, and a search for revenues to help reduce the Federal budget deficit combined in 1993 to give impetus to "reform" of the General Mining Law of 1872 — leading to the passage of a bill in each chamber of the 103rd Congress. Enacted to promote mineral resource development and the settlement of the western United States, the 1872 law provides easy private access to hardrock mineral resources on open Federal lands. Mining industry interests, once strongly opposed to changes that would raise the cost to mining companies of access to and removal of minerals from Federal lands, now appear willing to accept a modest move in that direction.

The respective bills would impose substantially different degrees of added cost and Federal control of access to minerals on Federal lands — differences that will have to be resolved by a Conference Committee. After describing the industry, the provisions of the law governing hardrock mining on Federal lands, and the House and Senate bills, this report presents and analyzes some of the economic issues and likely economic effects of the major proposed changes.[1]

THE U.S. HARDROCK MINING INDUSTRY

To miners, hardrock minerals are those metals and nonmetals that are found in hard formations in the earth. They include metals such as copper, gold, lead, and zinc, and nonmetals such as barite and fluorspar. However, as will be described, "hardrock" has a particular definition in the law governing mining on Federal lands. ("Federal lands" will be further defined, as well.)

THE INDUSTRY AS A WHOLE

Although minerals are the major material inputs in most of the industrial, commercial, and consumer equipment and structures produced by the U.S. economy, and the United States still is self-sufficient in many metallic and nonfuel nonmetallic minerals,[2] the industry that extracts and initially processes these materials, constitutes a very small portion of the U.S. economy in terms

---

[1] See also *Mining Law Reform: The Impact of a Royalty*, CRS Report 94-438 ENR, May 12 1994, by Marc Humphries.

[2] There are a number of important exceptions, such as chromium, manganese, and platinum-group metals. But, because this country is endowed with little or no known resources of these minerals, few if any of these exceptions come into play in the debate over change in the 1872 Mining Law.

of value of output and persons employed. This is because only a small part of the entire transformation from ore to finished product takes place in mines and mills,[3] and hardrock mines and mills tend to be highly mechanized.

Thus, gross product originating (GPO) in hardrock mining averaged an estimated $9.7 billion in 1990 and 1991 (latest data available), less than 0.2 percent of Gross Domestic Product in those years. Industry employment in 1993 was an estimated 105,000, less than 0.1 percent of total civilian employment. About 60 percent of gross product and about 50 percent of employment in hardrock mining is accounted for by mines and mills producing metals.[4]

Copper, gold, iron ore, and crushed rock account for about three fifths of the value of hardrock mining output (measured by value of shipments) and about three fourths of hardrock mining employment. Gold mining has expanded very rapidly during the last decade and a half and, by itself, now accounts for about one sixth of hardrock mining employment.[5] Almost two-thirds of U.S. mine production of gold takes place in Nevada.[6]

Workers in hardrock mining earn considerably more than workers in most other industries, partly reflecting mine workers' ability to operate the large-scale and extensively-used heavy equipment. In 1993, the average weekly pay of metal mining and of nonmetal mining production workers was about 75 percent and 55 percent, respectively, higher than the average for all industries.

Because nonfuel minerals are used largely as material inputs in equipment and structures, whose purchase usually is postponable and, therefore, cyclical, the (derived) demand for hardrock minerals and the industry producing them also are cyclical.

---

[3] Mines perform the extraction; and mills perform initial processing — mainly concentrating or "beneficiating" the ore. These mills, which usually are at or near the mine, are regarded as part of the mining operation.

[4] An industry's gross product originating is its contribution to the value of the goods or services it sells. Hardrock mining GPO and employment have been estimated because hardrock mining does not coincide fully with the classification scheme used to gather industry data, notably in the case of nonmetals. The estimate of gross product is based upon data in the *Survey of Current Business*, Bureau of Economic Analysis, U.S. Department of Commerce, November 1993. The employment estimates here and below are based upon data in *Employment and Wages Annual Averages, 1992*, October 1993, and *Employment and Earnings*, March 1994, Bureau of Labor Statistics, U.S. Department of Labor.

[5] In 1993, U.S. mine production of gold was more than 10 times its 1980 level.

[6] U.S. Department of the Interior, Bureau of Mines. *Survey Methods and Statistical Summary of Nonfuel Minerals, 1992*, by Jacqueline A. McClaskey and Stephen D. Smith. pp. 5 and 21

Much of U.S. metal mining is accounted for by divisions or subsidiaries of large, vertically integrated, metal mining and manufacturing firms. This is less true in the case of nonmetal mining. In 1987, the latest year for which a Census count is available, there were about 500 companies operating about 750 metal mines and/or mills, and about 1,600 companies operating about 2,900 nonfuel nonmetallic hardrock mines and/or mills.[7] Closures, mergers, and acquisitions since the mid-1980s probably have reduced the number of companies and mines and mills operating in the United States.[8]

Particularly in the case of metal mining, closures, mergers, and acquisitions have been accompanied by a drastic rationalization of operations that, among other things, has greatly increased productivity. Output per employee hour in iron ore mining, copper ore mining, and nonmetallic nonfuel mineral mining rose an average of 5.3, 7.2, and 1.7 percent per year, respectively, between 1979 and 1990, compared with 0.8 percent for nonfarm business as a whole. Employment in hardrock mining fell from nearly 140,000 to the 105,000 noted above.

The consequent reductions in production costs reversed previously distressed conditions in the U.S. hardrock mining industry by making U.S. operations very cost-competitive with producers abroad. U.S exports of metal concentrates and raw nonfuel nonmetallic minerals have exceeded imports in recent years, based upon data published by the International Trade Administration.[9] U.S. exports of primary metals also have tended to increase relative to imports, partly reflecting the decreases in mining costs.

Because much of the industry is composed of portions of firms that are also engaged in other activities, it is difficult to ascertain the profitability of hardrock mining per se. To the extent that the overall financial results of such firms over the last five years may be indicative of hardrock mining profitability, it is interesting that the average return on common equity from 1989 through 1993 for a group of seven or eight companies (10.5 percent) was approximately the same as that for all industries (11.1 percent), based upon data compiled by *Business Week* magazine.[10] Such companies' return was higher than the all-industry average in the earlier years, and lower in the more recent years.

---

[7] Estimates are based upon the *Census of Mineral Industries, 1987*, "Subject Series, General Summary." Bureau of the Census, U.S. Dept. of Commerce.

[8] Comparable data from the 1992 *Census of Mineral Industries* are scheduled to be published within a year.

[9] U,S. Department of Commerce, International Trade Administration. *U.S. Industrial Outlook 1994*. page 1-1.

[10] *Business Week*, March 19, 1990, March 18, 1991, March 16, 1992, March 15, 1993, and March 7, 1994.

MINING ON FEDERAL LANDS

The great preponderance of Federal land is concentrated in 12 Western States; 53 percent of the land in those States is Federal;[11] and a substantial portion of hardrock mining occurs on Federal lands in those States. The General Accounting Office (GAO) has estimated that at least $1.2 billion worth of minerals (based upon value of shipments) were produced from Federal lands in the Western States in 1990 out of a total of $8.6 billion of Western States hardrock mineral production.[12] An Interior Department Task Force (IDTF) tally puts hardrock mining output on Federal lands at $1.8 billion for 1991, or about 15 percent of the total value of U.S. hardrock mineral production.[13]

The distribution by mineral of hardrock mining on Federal lands differs from that on non-Federal lands. GAO estimated that Federal lands accounted for 30, 29 and 24 percent, respectively, of total gold, silver, and lead production in the Western States in 1990; the IDTF estimated the 1991 shares for gold and silver at 43 and 36 percent, respectively.[14] Gold, because of its high value, accounted for about 80 percent of the total value of hardrock mineral production on Federal lands, based upon the IDTF data.

Somewhat correspondingly, a large portion of Western Federal lands and of hardrock mining activity is located in the States of Alaska and Nevada. In 1990, 67 and 83 percent, respectively, of the land in those States was Federal, and 37 percent of mining claims on Western Federal lands were in Nevada.[15]

THE 1872 LAW AND THE 1993 BILLS

The law in effect and the proposed legislation pertain to the exploration for and development of hardrock mineral resources on Federal public domain lands other than those that have been acquired (by purchase, condemnation, or gift).[16] This report will refer to those lands open to exploration or

---

[11] This excludes lands that once were Federal. U.S. General Accounting Office. *Value of Hardrock Minerals Extracted from and Remaining on Federal Lands*, GAO/RCED-92-192, p. 2. The 12 States are Alaska, Arizona, California, Colorado, Idaho, Montana, Nevada, New Mexico, Utah, and Wyoming.

[12] *op. cit.*, pp. 4, 6.

[13] U.S. Department of the Interior, Task Force on Mining Royalties, *Economic Implications of A Royalty System for Hardrock Minerals*, 1993. p. 119.

[14] GAO, *op. cit.*, p. 6; Department of the Interior Task Force. *op. cit.*, p. 48.

[15] GAO, *op. cit.*, GAO/RCED-92-192, pp. 2-3.

[16] If they are on acquired land, they considered to be "leasable," and not covered by the 1872 Law.

development under the General Mining Law of 1872 as "Federal lands." All other lands — private, State or local government, and Federal lands not open to mining under the 1872 law — will be called "non-Federal lands."

GENERAL MINING LAW OF 1872

The General Mining Law of 1872 as amended permits U.S. citizens and businesses to (a) freely prospect for hardrock minerals on Federal lands, (b) mine the land, if an economic deposit is found, (c) without reimbursing the Government, sell the extracted minerals (which usually have been processed to some extent), and (d) purchase the land for $2.50 or $5.00 an acre.[17]

First, a prospecting entity may establish, at no administrative cost, a claim to an area that it believes may contain a mineral deposit of value. To preserve its right to the claim, the entity must pay an annual holding fee of $100 per claim, effective through September 1994.[18] If a mineral deposit found on a claim is determined to be economically recoverable and a total of at least $500 in development work has been performed, the entity may apply for a "patent" to give it title to surface along with the mineral rights. Fees of $200 per application and $50 per claim (within each application) have been required since January 3, 1989. Approved placer deposit claims command the $2.50-per-acre price; lode deposits command $5.00 per acre.[19] The procedure transfers the land to private ownership.

The Law has been amended mainly to (a) remove fuel minerals from its jurisdiction, and (b) apply some limited environmental provisions, but with no requirements to restore mined lands after production has ceased.[20]

---

[17] The Bureau of Land Management, U.S. Department of the Interior, defines hardrock minerals as those "locatable" minerals for which the rights are initiated by the location, recordation, and maintenance of a mining claim. In the context of the 1872 Law, the terms "hardrock" and "locatable" are synonymous. Presence of a recognized mineral not excluded by legislation subsequent to the General Mining Law of 1872 on public domain lands in sufficient quantity and quality to make the land valuable for mineral development makes that land and the contained minerals subject to the 1872 Law.

[18] P.L. 102-381 substituted the holding fee for previously-required annual development of $100 per year.

[19] A hardrock minerals placer deposit is one contained in clay, sand, silt, etc. that has been deposited by water. A lode, or vein, deposit is minerals contained in a rock formation with definite boundaries. Minerals in a placer deposit originate in one or more lode deposits.

[20] Unless otherwise specified, the General Mining Law of 1872 as amended will be referred to as the 1872 Law in the rest of this report. The two major "amendments" were the Mineral Leasing Act (1920) and the "Materials Act of 1947" (not the official title).

SENATE-PASSED BILL (S. 775)

The "Hardrock Mining Reform Act of 1993," introduced by Senator Craig (Idaho) on March 3, 1993, embodies changes in the 1872 Law that industry interests appear to be willing to accept. It would make the requirements applicable to hardrock mining on Federal lands (with respect to filing and maintaining claims, operations, and reclamation) somewhat more strict and a little bit more costly, but would retain access and the right to patent. The bill passed the Senate by unanimous consent (May 25, 1993); however, that does not necessarily indicate unanimous support for every provision.

S. 775 would impose a fee of $25 for each claim "located" after date of enactment and a $100 annual maintenance, or holding, fee per claim, adjusted periodically based upon changes in the Consumer Price Index. Partial and full exemptions from the maintenance fee would be granted to holders of 11 to 50 claims and holders of 10 or fewer claims, respectively.

This bill also would impose on claims located after enactment a two-percent royalty on the value of the minerals measured at the mouth of the mine, after subtracting direct and indirect costs of mining (including related exploration and development expenses). The royalty may be reduced if the Secretary of the Interior determines that such action is necessary to promote development or that the claims cannot be successfully operated if subject to a royalty.

To patent the land, claim holders would be required to pay the fair market value without regard to mineral deposits. But claimants who filed mineral survey and patent applications within six months of enactment and who find "valuable minerals" would be exempt from this requirement and the royalty.

To engage in operations that disturb the surface more than minimally, claim holders would have to file a plan of operations in accordance with all Federal and State environmental laws. A financial guarantee, such as a bond, would be required before operations begin, to assure that reclamation would be done. Land patented after enactment would be subject to the reclamation laws of the State where the land is located.

HOUSE-PASSED BILL (H.R. 322)

The "Mineral Exploration and Development Act of 1993" was introduced by Representative Rahall (West Virginia) on January 5, 1993, and passed by recorded vote (316-108) on November 18, 1993. Supported by environmental interests and some others, it would considerably tighten access to Federal lands, significantly increase the effective cost of mining operations on those lands, and eliminate the right to patent.

While retaining the right to stake claims on Federal lands, H.R. 322 would institute a two-tier permitting procedure for exploration and operations. In addition, the Secretaries of the Interior and Agriculture would be empowered to

determine that particular lands are unsuitable for mineral activities, and to withdraw those lands or impose special conditions of operation.

H.R. 322 would impose a fee of $25 for each claim located after date of enactment, extend the annual maintenance fee of $100 for existing claims, and impose a $200 annual maintenance fee on new claims. However, new claims would be 40 acres rather than the 20 provided for in the 1872 Law. The maintenance fee could be waived for holders of 10 or fewer claims. Existing unpatented claims would be deemed "converted" to claims under the new Act.

The bill would impose on claims located or converted after enactment a royalty of eight percent on the net smelter return from all locatable minerals produced from the claim. ("Net smelter return" is the sales value of the processed mineral less the cost of smelting and/or refining and the cost of transportation from the mine to the smelter and/or refinery.) Any maintenance fee paid would be credited against a royalty owed for the same period.

Another major difference with S. 775 is that H.R. 322 would eliminate the option to patent and take title to the land, except for claimants who had filed applications and who had met statutory requirements by January 5, 1993. Rights to use of the land would terminate upon completion of mineral activities.

Claim holders would have to restore the property to a condition capable of sustaining the same activities the land could support before mining began, or to a condition consistent with existing land-use plans for the area. A financial guarantee, such as a bond, would be required before issuance of permits to assure that reclamation would be done. Those whose plan of operations had been approved prior to enactment, and those who had submitted a plan for approval by November 3, 1993, could operate under the old plan (including approved minor changes) for five years after enactment, but would have three years from enactment to file new plans (to meet the more stringent new rules).

Revenues from the royalty and fees would go to a (new) fund to restore abandoned hardrock mined areas on Federal lands.

SENATOR JOHNSTON'S "MARK"

On May 3, 1994, Chairman of the Senate Energy and Natural Resources Committee, J. Bennett Johnston, offered a draft "Chairman's Mark" as a hoped for means of advancing debate. The draft would set a 2-percent royalty on gross income[21] that would be "indexed" upward for copper and gold with increases in the prices of those metals. Patenting would be retained, but the surface would remain under Federal ownership and the patent would revert to the United States upon completion of mining and reclamation. This report does not analyze the Chairman's mark.

---

[21] This differs from net smelter return in that mine operating costs, allocated general and administrative costs, and taxes would be deducted from revenue along with smelting and refining costs to establish the royalty base.

WHY CHANGE THE LAW?

It seems from the foregoing descriptions that, although to different degrees, *both* bills passed by the chambers of Congress would significantly change the economic regimen of U.S. hardrock mining on Federal lands. And it seems probable that other aspects of the economy would be affected as well. Is there an economic case for change? This section presents the 1872 Law in an economic framework, and lists pro and con arguments in that context.

BENEFITS AND COSTS OF THE 1872 LAW

The General Mining Law of 1872 was enacted to promote domestic mineral resource development in general,[22] mineral industry development in the West in particular, and the settlement and economic growth of the West. And it appears that, whatever factors were responsible, the intended benefits followed.

In the first few decades after enactment, the U.S. mining industry, aided by ample mineral deposits, expanded rapidly into a major world producer, industry employment soared, and the number of people living in the West multiplied. Between 1880 and 1919, the value (in current dollars) of U.S. mineral output grew to 13 times its 1880 level, the physical volume of mineral production sextupled, production worker employment more than tripled, and the population in the West quintupled.[23]

To the extent that the benefits stemmed from the 1872 Law, a likely cost is a different, less economically efficient, allocation of resources. Generally accepted economic principles hold that resources (factors of production) are allocated most efficiently if the prices of their use reflect the full costs to society. The incentive offered by the 1872 Law to mining firms was (and still is) very inexpensive access to Federal lands (a factor of production), including any contained minerals. Other things being equal, the price for access is lower than what mining companies would have to pay on the open market, making hardrock mining on Federal lands less costly and, initially, more profitable than what it would be on other lands with comparable mineral deposits.

Mining companies, assuming they behave as rational profit seekers, tend to expand operations on Federal lands — increasing both revenues and profits — until the profitability is the same as on other lands. Thus, the Law has tended to result in more hardrock mining en toto than would have occurred otherwise, a higher proportion of mining on Federal lands than would have occurred, and less of other types of activity and land uses than would have occurred. In some cases, mineral development may have precluded other land

---

[22] The 1872 law originally applied to virtually all minerals.

[23] U.S. Dept. of Commerce, Bureau of the Census. *Historical Statistics of the United States, Colonial Times to 1970*, Part 1. The Census Bureau defines the West as the area now containing Arizona, California, Colorado, Idaho, Montana, Nevada, New Mexico, Oregon, Utah, Washington, and Wyoming.

uses or activities. The 1872 Law gives little consideration to alternative uses and/or environmental values.

A second, more elusive, cost develops from the fact that the Government, as custodian of the land for citizens as a whole, receives little return for providing a factor of production. Because the effective price paid by mining companies to use Federal lands and extract the minerals does not equal the economic value of such use and of the minerals, the 1872 Law effectively transfers wealth from the U.S. public to the hardrock mining industry, resulting in a different distribution of income by industry, income level, and geographic region than would otherwise occur.

Another cost of the 1872 Law, not directly related to the price of access, stems from shortcomings with respect to enforcement. Abuses of the claim and patent system (for example, land speculation and unauthorized activities on the land) have occurred, and have diminished the stimulus to hardrock mining and to the general economic development of the West that the Law aims to generate.

ARGUMENTS FOR CHANGE

Economic arguments for change in the law governing hardrock mining on Federal lands include the following:

- As a matter of economic equity, citizens, who really own the land and the minerals, should receive fair value.

- Access to minerals at much below market prices is inappropriate, because it leads to a less than optimal allocation of resources. Less than optimal allocation results in lower output and higher prices in the economy as a whole.

- The 1872 law pays little or no attention to values embodied in environmental concerns or other possible uses of the land. This also leads to a less than optimal allocation of resources.

- Because the U.S. hardrock mining is a mature industry and the West is economically developed, the development benefits per unit of lowered general economic efficiency are much less than in 1872. (See the discussion of the costs of the 1872 Law, above.)

- Shortcomings in the law that invite abuse of the claim and patent system, or any replacement of that system, diminish the intended economic benefits.

- Treatment of hardrock mining under the 1872 Law is inconsistent with the treatment of extractive industries on other Federal lands.

ARGUMENTS FOR LITTLE OR NO CHANGE

Economic arguments for little or no change in the law governing hardrock mining on Federal lands include the following:

- The 1872 Law embodies principles important to efficient mining: self-initiation of mineral rights, access to prospects, exclusive right to develop a prospect, and security of tenure to "hold" a discovery. Weakening the codification of these principles would increase the uncertainty in investment decisions, tending to raise costs and reduce hardrock mining on Federal lands.

- Additional costs resulting from stricter permitting, a "high" royalty, and strict environmental standards would make some mines (existing and potential) uneconomic, resulting in fewer jobs and reduced economic activity.

- Many developing countries are lowering barriers to foreign investment in their industries (including mining). Maintaining easy access to minerals on Federal lands helps minimize the shift of investment and production abroad, and limit losses of relatively high-paying hardrock mining jobs in the United States.

- Executive branch decisions to withhold land from mineral development may not necessarily be based upon accurate valuation of competing uses. (As described above, such discretion is provided in H.R. 322.)

- A measure that would diminish the amount of hardrock mining would mean less Federal and State revenues.

SIGNIFICANCE OF PROFITABILITY?

Whether hardrock mining in general or on Federal lands in particular currently is more, or less, profitable than other activities is not necessarily relevant to whether the law governing hardrock mining on Federal lands should be changed. By itself, a difference in profitability from what is earned in other industries or on nonFederal lands does not necessarily indicate that there is a problem (from a public policy point of view) or require an action. Because productive resources tend to flow from less profitable to more profitable activities, a deviation in profitability from what could be earned in other industries or on nonFederal lands will tend to be eliminated in the long run, other things being equal.

Somewhat similarly, the industry's *absolute amount* of profits of hardrock mining on Federal lands may be higher than it would be if the industry had to pay a market rate for access to land and minerals even though the *profitability* of its operations on Federal lands is the same as that for nonFederal lands or the same as that experienced by other industries.

HOW TO RAISE THE PRICE? AND BY HOW MUCH?

The above pros and cons notwithstanding, it appears reasonable to conclude from the section describing the provisions of the respective bills that designers of change in the law include in their objectives, or accede to, an increase in the explicit price charged by the Federal Government for access to Federal lands for the purpose of hardrock mineral exploration and development.

Royalties and maintenance, or holding, fees are the chief means selected toward that end by the respective chambers. Generally accepted economic principles state that each should be part of an overall system of payments for use of the land, sharing of risk, and removal of resources.

Basically, and ideally, the question for legislators is how to structure payments to the Government as landowner so that individual types of payments are targeted to particular objectives in the most economically efficient way — with respect to allocation of resources and with respect to interfering least with profitmaking incentives. Other considerations are ease of administration, stability of revenue, and maximization of revenue. This section analyzes the concepts and attributes of royalties and fees in the context of the sometimes conflicting considerations.

ROYALTIES[24]

Royalties are just one of several types of payments that are used to compensate the landowner for removal of a resource and for use of the land. A royalty also can be considered as payment for at least some of the economic rent yielded by the land.[25] Compensation arrangements usually include more than one type of payment. To a mine operator, a royalty is a cost of production.

Determining what should be the magnitude and nature of a royalty (as part of a "package" or in isolation) is difficult, however. There are questions of determining the value of the resource removed,[26] the value of occupying the

---

[24] The discussions of royalties and other fees benefitted from consultations with Roderick Eggert and Wade Martin, Colorado School of Mines, Golden, CO. In addition, some of the discussion below is based upon material in chapter 2 of *Economic Implications of a Royalty System for Hardrock Minerals*, by the U.S. Dept. of the Interior Task Force on Mining Royalties. August 16, 1993. That report has an extensive discussion of mineral royalties. For another analysis of Federal royalty and tax treatment of hardrock mining, see *The Federal Royalty and Tax Treatment of the Hard Rock Minerals Industry: An Economic Analysis*, CRS Report No. 90-493 E, by Salvatore Lazzari, October 15, 1990.

[25] Economic rent is profit in excess of production costs, the latter including a rate of return on investment.

[26] How to measure nature's bounty, part of which is to be returned to landowner, sometimes is a difficult empirical question.

land (largely determined by the value of alternative uses), and how much risk each of the parties is willing to assume. In part, other types of payments are used with royalties as means of sharing risk; and royalties themselves may be structured to suit a particular risk-sharing agreement.

The structure of a royalty is composed of an output base and a rate. While physical measures, such as volume or weight, are not uncommon, many royalties are related to a value in order to avoid loss of value over time due to inflation. Among value measures commonly used are mine-mouth or wellhead value of the production (determined by sale price), gross income from mining or from mining plus processing, and net income from mining or from mining plus processing. It stands to reason that the same rate imposed upon a larger base yields a larger royalty obligation and revenue stream, barring a cessation or drastic reduction in output and/or price. Other things being equal, this is taken into account when the percentage is set.

Economic Attributes of the Royalties in S. 775 and H.R. 322

The royalties in S. 775 and H.R. 322 essentially are a net income and a gross income, or gross value, royalty, respectively. These are more appropriate than a royalty based strictly upon a mine-mouth measure of value, because the hardrock minerals on the Federal lands are diverse and undergo substantial processing (smelting and, often, refining) before actually sold (when market value is established). It is appropriate in principle to subtract the costs of such processing from the value or income subject to a royalty, because that processing adds value to the mineral that is not part of the use value of the land or of the mineral.

The fact that, in many cases, minerals undergo substantial processing at or near the mine site before arm's-length transactions take place (and establish a market value) can be a major difficulty in calculating a royalty.

A net smelter return royalty (provided in H.R. 322) is considered a modified gross income royalty because it retains the gross value of minerals in the base while taking account of non-mining processing costs.

As described earlier, S. 775 would impose a royalty of two percent on the value of the minerals measured at the mouth of the mine, after subtracting all the direct and indirect costs of mining and processing (including related exploration and development expenses). H.R. 322 would impose a royalty of eight percent on the net smelter return from all locatable minerals produced from the claim. "Net smelter return" is the gross value of the sale of the processed mineral less the cost of smelting and/or refining and the cost of transportation from the mine to the smelter and/or refinery.

Because both the base and the rate of the royalty prescribed by H.R. 322 are larger than that prescribed by S. 775, the royalty payable under the former would be much larger than that payable under the latter. However, because net income is more variable in relative terms than net smelter (refinery) return, the

royalty in S. 775, the royalty per pound of copper under S. 775 would increase relative to that under H.R. 322 as net income increases.

To illustrate with a simplified example, selected data for a hypothetical copper mine, mill, smelter, and refinery operation are shown in table 1, with two assumptions concerning the selling price of refined copper: 85¢ per pound and 110¢ per pound. The cost data are based upon averages for all operations in the United States. In this simplified illustrative case, the royalty imposed by H.R. 322 would be 5.0¢ and 7.0¢ per pound under the respective selling price assumptions, whereas the royalty imposed by S. 775 would be 0.1¢ and 0.6¢ per pound, respectively. The dynamics would be similar for gold and other minerals.

With respect to economic efficiency, the choice is not clear. Net income more closely approximates the concept of economic rent than gross income. An attribute of a net-income royalty is that, because it is calculated after production costs have been subtracted,[27] it does not disproportionately affect marginally economic mines. Also, the landowner shares in project and market risks. As noted, such risk-sharing may be altered by other types of payments in the compensation package.

On the other hand, with a net income royalty, unprofitable producers do not pay the land owner for depletion of the mineral resource or use of the land, while the owner is denied alternative uses of the land that could provide a return. The latter, however, might be addressed to some extent with some form of "rental" payment. Also, less efficient operations in effect pay a lower rate than more efficient ones. Partly because of this incentive and partly because a gross income royalty is to some extent a tax on the level of production, a gross income royalty distorts production decisions more than a net income royalty.

A gross income based royalty is "economically" appropriate on the grounds that a landowner should be assured of getting paid for minerals removed. This also is one way of assuring that the landowner is compensated for loss of income on alternative uses of the land. But, as in the case of a net-income royalty, this might be done by rental payments. A gross income royalty, without provision for lowering it to avoid shutdown, can disproportionately affect marginally economic mines, possibly making them uneconomic.

Administrative and Revenue Considerations

With respect to administrative ease, a gross income royalty is preferable, but the degree of preference depends upon how gross income is defined (including the stage of the production process). Mine production and the selling price are the only information needed to calculate and verify the royalty payment due when gross income covers only mining operations and (possibly processed) ores are sold in the market. When the mineral is smelted and refined before sale, information on those processing costs also is needed. Because the

---

[27] Here, "production costs" includes administrative costs, interest, taxes other than income taxes, and like items.

TABLE 1. Simplified Illustration of Royalties That Would Be Charged to a Hypothetical Copper-Producing Operation by H.R. 322 and S. 775[1]

Revenue, Cost, or Income Item	Cents per Pound	
(1) Revenue per pound sold assuming prices of $0.85 and $1.10 per pound, respectively	85.0	110.0
(2) Cost of smelting & refining (operating cost, depreciation, and transportation from mill)[2]	22.0	22.0
(3) Net smelter (refinery) return	63.0	88.0
(4) Cost of mining and milling (operating cost and depreciation)[2]	56.0	56.0
(5) Other costs (corporate overhead, interest on debt, other)	2.0	2.0
(6) Total costs (#2 + #4 + #5)	80.0	80.0
(7) Net income (#1 - (#2 + #4 + #5))[3]	5.0	30.0
Calculation of royalties		
H.R. 322: 8% net smelter return royalty (0.08 x #3)	5.0	7.0
S. 775: 2% net income royalty (0.02 x #7)	0.1	0.6

[1] The operation is assumed to consist of a mine, mill, smelter, and refinery. Cost figures used are rough national averages.

[2] Credits for byproducts are ignored.

[3] Ignoring credits for byproducts tends to understate net income.

Source: Based upon a conversation with Kenneth Porter, U.S. Bureau of Mines, the example roughly updates cost data in *The Availability of Primary Copper in Market Economy Countries*, by Kenneth E. Porter and Gary R. Peterson, Bureau of Mines, U.S. Department of the Interior. IC9310, 1992, p. 21. The cost data are based upon averages for all operations in the United States.

determination of *net* income is an even more complicated accounting procedure, administering/monitoring a net-income royalty is more difficult and expensive.

With respect to predictability of revenues, a gross-income royalty is preferable. Gross income, mainly a function of physical sales volume and of price, is much less variable than net income, which is a residual and is affected by more factors. A predictable revenue stream can be important to Government when, as is sometimes the case, the funds are designated for programmatic uses that need stability.

In arrangements pertaining to State and private lands, gross-income royalties or variants are far more common than net-income royalties.[28]

FEES AND OTHER NONROYALTY CHARGES

Fees, broadly defined, can be used for a variety of purposes. It would appear that it is conceptually easier to design fees to correspond with value received, although it may not be easy to determine the value.

For example, the sub-section on royalties discussed the question of how to make sure landowners are compensated for the use of the land (without regard to the value of the minerals removed). As seen in the applicable section on the bills' provisions, both S. 775 and H.R. 322 include maintenance or holding fees of some size.

Both bills also include fees to compensate the Government for all or a portion of the cost of administering a program relating to mining on Federal lands: the modest "location fees" that appear to be reimbursement for administrative processing costs.

The bills do not have a Federal counterpart to the cash bonuses often used for private lands or in bidding for Federal leases for minerals not covered by the 1872 Law (including offshore mineral resources). While obtaining access to Federal lands is not competitive, bonuses payable in addition to holding fees and royalty obligations might be used as "entrance fees." The total payment package would not have to be larger than it would be without the bonus.

In general, depending upon the commercial success of an operation, the financial impact of fees probably would be small compared with royalties.

HOW HIGH THE PRICE?

Royalties and fees are prices that help determine the allocation of factors of production among various uses. If royalties and/or fees are set to reflect accurately the value of the mineral recovered and the alternative public value of the land, the resulting cessation or preclusion of some mining activities arguably may increase general economic welfare.

---

[28] Interior Department Task Force. *op. cit.* pp. 20-29.

In setting royalty rates on minerals extracted from Federal lands, sometimes it is argued that they should be comparable with those paid to owners of private lands. Royalty rates on private lands, however, usually are negotiated after exploration is completed, and more is known about the prospect. Case by case negotiations for Government lands probably would be difficult to administer.

Another consideration, is that "too high" a royalty (and its effects on production costs) can lead mine operators to cease operations after removing higher grade of remaining ore than would be the case at more moderate royalty rates. Such "high grading" reduces total production from a mine and results in lower recovery of resources than under a royalty that would be closer to optimal.

A tabulation of recent State royalty rates on State-owned minerals for 11 Western States shows a range from zero to 10 percent for gross or net smelter return royalties. Nevada is the State with no royalty; Alaska has a 3 percent net income royalty.[29] Thus, the royalties that would be imposed by S. 775 and H.R. 322 fall within this wide range.

According to Roderick Eggert, many developing countries are moving toward a mix of royalty types and bonuses. Thus, mine operators pay a cash bonus, an "x" percent gross income royalty, and a "y" percent net income royalty.

ECONOMIC EFFECTS

What would be the direct and indirect economic consequences of changes in the General Mining Law of 1872 implied by the proposed measures? Because hardrock mining on Federal lands is not inconsiderable, there is concern that measures that impose added costs on mining operations would make some mines uneconomic, resulting in lower production, fewer jobs, and reduced economic activity. In addition to hardrock mining itself, well over a dollar of other industries' output directly and indirectly goes into the delivery to final use of a dollar of hardrock minerals.[30]

DYNAMICS AND QUALITATIVE EFFECTS

To a greater or lesser extent, both bills would raise the cost of existing and prospective hardrock mining on Federal lands. Inasmuch as prices of metals and other minerals are set in world markets for the most part, mine operators on Federal lands would be able to pass on to customers little or none of the cost increase. Profitability of existing mines would tend to suffer in the short run.

---

[29] Department of the Interior Task Force on Mining Royalties. *op. cit.*, p. 19.

[30] U.S. Department of Commerce, Bureau of Economic Analysis. "Benchmark Input-Output Accounts for the U.S. Economy, 1982" *Survey of Current Business*, July 1991, p. 62. For this report, the figure for the non-ferrous metal ores mining industry is used as a proxy for hardrock mineral mining and processing.

Existing mines would continue production as long as revenues cover variable costs (which include royalties). However, the time at which revenues stop covering variable costs, and the mine closes, probably would be reached sooner than without the legislation. It is possible that, for a few mines, that point may be reached very soon.

Also, production by hardrock mines yet to be opened on Federal lands would tend to be lower. Mining companies probably would respond to more stringent environmental rules, higher holding fees, and the prospect of a royalty by not pursuing claims for prospects that become uneconomic as a result of the new costs.

Overall, by raising the cost of hardrock mining on Federal lands, such mining would become less attractive than what it would be without the changes. As a result, U.S. companies probably would tend to mine more on non-Federal lands and abroad than would be the case without the changes. However, the degree of any shift to mining on non-Federal lands may be limited by the extent to which parcels on private or State lands might be smaller than those available on Federal lands, and difficult to assemble into large enough units to make mineral activity economic.

While profitability would tend to suffer in the short run as a result of higher costs, in the long run, it would tend to return to its prior level, other things being equal. Mining companies would adjust their operations — partly by reducing output and refraining from opening mines whose prospective rates of return had been reduced below company targets by prospective higher costs.

Many proponents of little or no change in the 1872 Law argue that a large shift of mineral activity abroad will be a major consequence of raising the cost of operating on Federal lands. The strongest current trend in U.S.-company hardrock mining investment is movement overseas, they say; acceleration of this shift therefore would be the main consequence of higher costs on Federal lands. Increased activity in the United States on non-Federal lands, however, remains a realistic option for companies that have capital they wish to employ.

To the extent that present hardrock mining activity would be cut back and/or its duration shortened at a number of locations, employment would be reduced and some communities could lose their main source of income. Such relatively local impacts could be severe and hard to overcome.

Negative economic effects probably would be offset at least to some extent. In the long run, there will be gains in other industries as a result of normal reallocation of labor and capital in the economy to more profitable economic pursuits. And, under both bills, portions of the revenues from fees and/or royalties would go to the States, and abandoned mine reclamation funds would provide some stimulus. These types of offsets, however, tend to affect the overall national and State economies, and would not necessarily benefit the hardrock mining industry, its suppliers, or the hard hit localities.

To the extent that the benefits of mineral development do not equal the cost of lowered general economic efficiency (see page 4), overall productivity in the economy would rise as a result of reallocation of resources from development of mineral resources on Federal lands to other activities. The amenity value of Federal lands and the purity of streams and lakes also would tend to rise with less mineral development and restoration of mined lands to their prior condition.

Also, as noted earlier, gold mining represents a very large proportion of hardrock mining activity on Federal lands. Therefore, changes in the price of gold, often spurred by considerations other than the supply of and demand for gold for economic activity per se, could greatly affect how change in the 1872 Law would affect the capital and labor employed in gold mining.

ECONOMIC IMPACT STUDIES

Several groups have estimated in quantitative terms some of the above effects. These groups include Stephen Alfers and Richard Graff, John Dobra and Paul Thomas, Evans Economics, Inc., the Congressional Budget Office, the Department of the Interior Task Force on Mining Royalties, and Goldman Sachs.[31] The studies differ with respect to the bills analyzed, estimating methods, assumptions adopted, types of effects estimated, and quality of analysis. Such differences and certain shortcomings make descriptions and comparisons of results difficult. CRS Report 94-438 ENR reviews the results of five of the studies.[32]

A major difficulty and, sometimes, pitfall in estimating economic impacts of the types of measures proposed in S. 775 and H.R. 322 is determining how to extrapolate local effects to "national" levels. The economic impacts of a mine closure in a one-industry town with few employment alternatives for laid off miners probably would be large in relation to the local economy. But such cases are not necessarily the rule, and the precise assumption to use with respect to the short and long run reallocation of "displaced" labor and capital is not obvious.

crsphpgw

---

[31] Stephen Alfers and Richard Graff, "A Comparative Analysis of Mining Royalties and Fees," April 30, 1993; John Dobra and Paul Thomas. "The U.S. Gold Mining Industry 1992," Special Publication 14, University of Nevada, Reno, 1992; Evans Economics, Inc. "Testimony Before the Mineral Resources Development and Production Subcommittee, Committee on Energy and Natural Resources," by Michael K. Evans. March 16, 1993; Goldman Sachs. *Mining Law Reform*, November 23, 1993; U.S. Congress, Congressional Budget Office. "Statement of Jan Paul Acton before the Subcommittee on Mineral Resources, Committee on Energy and Natural Resources, United States Senate." March 16, 1993; U.S. Department of the Interior, Department of the Interior Task Force on Mining Royalties. *Economic Implications of a Royalty System for Hardrock Minerals*, August 16, 1993.

[32] See footnote 1 for full citation of CRS report.