



Economic rent and the mining industry

by Phillip Crowson

The economist's concept of rent is purely technical and descriptive, yet it gives rise to many misconceptions and much emotional argument within the minerals industry. Many people in the industry, lacking the necessary theoretical background, even deny its very existence. Their objections are nearly always based on concerns about how any rent or surplus is to be divided between the various stakeholders, or, more narrowly, on resistance to the use of a theoretical concept as a basis for taxation policy. The concept of economic surplus or rent is, however, crucial to any understanding of the mineral industry's contribution to development, and of the extent to which that contribution is genuinely sustainable. This article tries to behind the emotions to the basic concepts involved.

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Economic rent is merely a technical economic concept. It differs from both value added and profit. The former is the reward to all the factors of production, land, labour and capital, and is a measure of an industry's contribution to the gross domestic product. That is nothing more than the sum of the value added by economic activity of all types. Profit, as the reward to capital, is part of value added. Economic rent is that portion of value added which exceeds the costs of all the factors of production, and it will form part of profit.

Most manufactured products differ slightly from each other. Their prices are normally based on their production costs, plus a profit margin to cover capital amortisation, and a return to capital whose size will vary with the efficiency of the firm and the structure of the industry. By contrast, many mineral products, and especially the precious and non-ferrous metals, are fungible commodities, whose prices are determined in world markets beyond the control of any individual supplier. Prices fluctuate in step with changes in supply and demand. As the quality of mineral deposits, and the efficiency of any operations based on them vary widely, even within a single country, the profitability of mines also varies at any given product price. Such divergences give rise to economic rent. In the minerals industry it can be broadly defined as "the value of the product less all the direct and indirect costs of production, including the minimum return to capital required to make an investor commit funds in the first place".¹ An alternative way of looking at economic rent is as a reward solely for the possession of a property, as distinct from the compensation required for the various factors of production used to develop and work it.

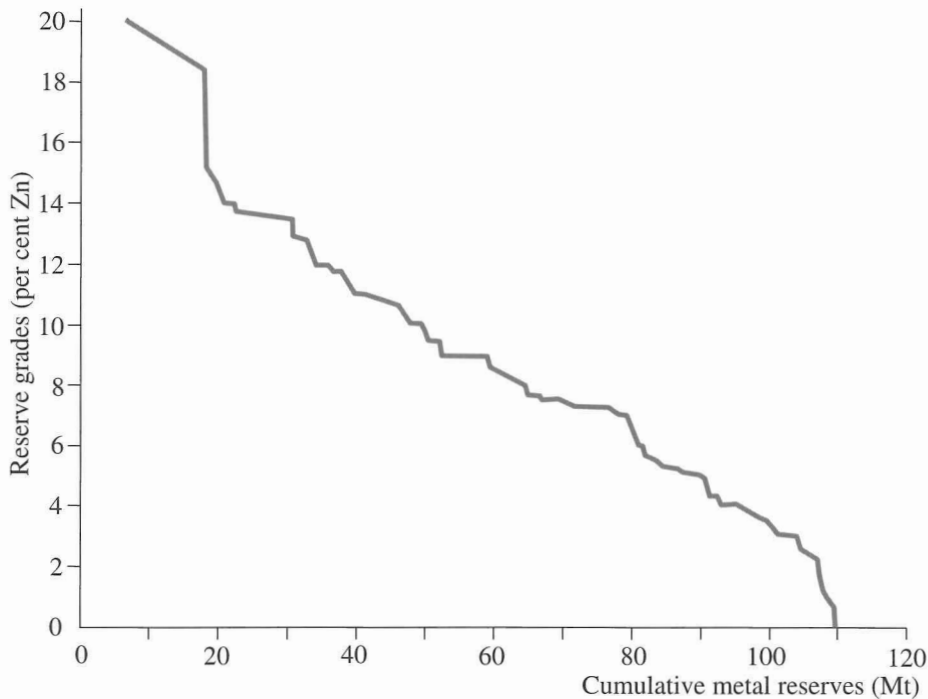
Economic rent will accrue over the life time of a worked ore deposit, until all the economically usable ore has been extracted. After mining and processing have finished, costs will be incurred in rehabilitating the site and restoring it for other uses. These costs, which may be

substantial, should properly be included with all the other costs of working the property before calculating any economic rent. For long lived mines (and many can have lives of fifty years or more), annual rents may accrue unevenly between different generations. The varying incidence of rent over time means that all calculations of its magnitude should be made in net present value terms using an appropriate discount rate.

The higher the discount rate adopted, the more highly the present is valued relative to the future, and the needs of subsequent generations are played down. The discount rates normally used by companies in evaluating projects are much too high in this context, and the consensus of opinion has tended towards the use of the social rate of discount, or the rate that best reflects the time preferences of society as a whole. In its work on measures of national wealth the World Bank uses a rate of 4 per cent per annum, but others favour a lower, risk-less, rate of 2 to 3 per cent, or even zero. The latter is probably too extreme. It effectively denies the existence of any time preferences, which have been empirically shown to exist, or implies that they should be ignored. The argument for ignoring them is that the present generation should not pre-empt resources from future generations under any circumstances. That presupposes, *inter alia*, that technology, and patterns of demand are static, that all exploitable resources are known and fully delineated today, and that there is no substitution between materials and their uses.

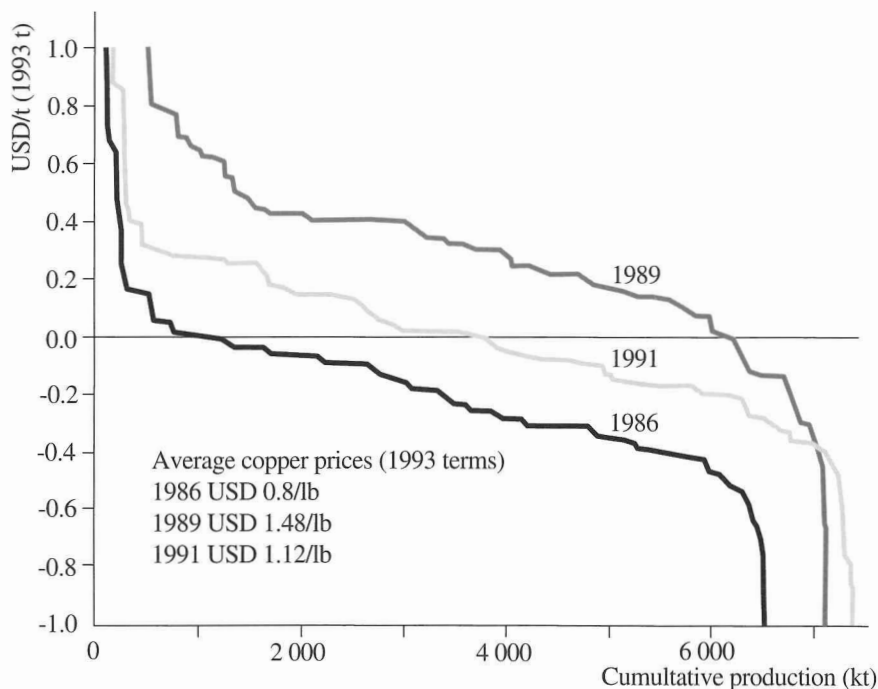
Some mines will never create any economic rent, and will not even cover all their costs, whereas others might, under favourable circumstances, generate a great deal of rent. This is not just because of variations in metal prices from one year to another. Some mines will be highly profitable throughout their prospective lives, but others will always be marginal. Indeed, the marginal mine, in economic terms, is not necessarily the highest cost mine presently in produc-

Figure 1. Cumulative ore reserves and grades, zinc mines 1991



Source: RTZ Mine Information System.

Figure 2. Illustrative economic rents. Estimated rents in copper mining – in 1993 terms assuming 40 cents/lb capital charges



Source: RTZ Mine Information System.

tion, but the highest cost mine that can be expected to come into production in the foreseeable future. This immediately introduces a degree of uncertainty. The growth of demand, and hence the need for new mines, will be affected by the varying pace and location of economic activity, changing technology, fashion, and governmental regulations. As the techniques of exploration, mining, extraction, and processing improve so the marginal ore deposit will change. It is, therefore, possible that nearly all mines will at times be earning economic rent, whereas virtually none will be at other times.

Mineral rent is not an abstract magnitude completely independent of prevailing conditions. Ore bodies are worthless until they are discovered, often through expensive and skilful prospecting and exploration. Their full value is only realisable when mines and processing plants have been developed to exploit them. Just as the technical and managerial capabilities of mining companies can vary widely, so can their capacities to maximise the potential rent from individual ore deposits. Incompetent management can dissipate rent, as can inappropriate governmental policies towards mining. These might include tax systems which encourage "high-grading" rather than maximising the net present value of the resource, or requirements to process ore in expensive local plants, or employ needlessly large numbers of workers.

In that light, it is debatable whether ore deposits per se, or the mines based on those ore deposits, earn any economic rent. Only the development of mines can mobilise any inherent value in unexploited ore. The prices that are often paid to the owners of known ore bodies, especially in recent years, may apparently demonstrate that much of their potential economic rent can be mobilised in advance of their development. In many instances, however, the sums paid may bear little or no relationship to the ultimately realisable economic rent. The mines, when developed, may not live up to expectations,

once all their relevant costs are properly taken into account over their full lives. It is, therefore, unwise to treat the prices paid to exploration companies or governments for virgin deposits as proxies for their potential economic rents, particularly when those prices are paid near a peak of a boom in stock market values or metal prices. Witness Busang!

The total economic rent in a mineral deposit will vary with its technical characteristics, such as the reserves, the hardness and processibility of the host rocks, and of the ore itself, the amount of the overburden, and its other physical characteristics. The most important is the grade of the ore. Figure 1 above shows how the grade of reserves of operating zinc mines varied in 1991, from a zinc content of 20 per cent or more, to under 1 per cent. No allowance is made for the grades of any other products, such as lead, silver, or copper, associated with the zinc. Their inclusion would not, however, radically alter the shape of the cumulative frequency curve of ore grades that is typical of most minerals. Cumulative costs follow an inverse path as the myriad other influences on costs of production can only modify but not completely offset the effects of differences in grades.

As noted, fluctuations in mineral prices and in the costs of inputs affect the distribution of rents over time. Technical innovation places continuous downward pressure on costs, but the extent to which that pressure flows through depends on the quality and competence of management. Figure 2, which is purely illustrative, shows how economic rent from mining can vary markedly over the course of a metal's price cycle. In this instance it is for copper, and it is based on observed cash costs in the three chosen years.

The figure is illustrative because it takes no account of the age structure of the mines, nor of their remaining reserves. A standard capital charge is assumed, rather than the actual capital costs of each mine. That charge is based on intuitively plausible assumptions, but the

shape of the curves, and their relationship to each other, will not change if the capital charge is set at lower, or higher, levels. In practice, the size of any rent will depend on each investor's risk premium. The opportunity cost of capital will itself vary for each prospective investor, and different investors will require different risk premia in different countries. One of the most important determinants will be perceptions about the host country's policies towards investors over the longer term. This means that rents, as the residual after all necessary costs, including a required return on capital, will be partly subjectively determined. This is an important qualification to attempts to introduce any scientific rigour to the analysis of mineral rents. Any estimates will always carry a wide, and probably fluctuating, margin of error.

Reverting to Figure 2, virtually no mines earned economic rent in 1986, when copper prices were weak, whereas in 1989 most earned some. In passing, it should be noted that the positions of individual mines on the curves can vary considerably from one year to the next.

The allocation of economic rents

There is no objective yardstick for sharing rent between the various interests involved in any mining operation. The relative bargaining strengths of those interests and political expediency will invariably prevail over any amount of economic theory.

Economic rent can be absorbed by excessive wage demands, and wages can be bid up well above the levels necessary to attract and retain workers, often with long lasting adverse consequences. That was one of the problems of the United States' copper industry in the decades up to the mid-1980s. Rent can often be dissipated through corruption and fraud, sometimes into overseas bank accounts. In some instances it can be hijacked by "traditional" landowners, who may have originally used the surface land above the mineral deposits. Mining companies often become embroiled in disputes be-

tween such landowners and host governments over the appropriate division of the host country's share of rents. From the mining company's viewpoint, the balance between them is largely immaterial, although it might be very important for the country's long term economic health. The use of rents for national development might be more advantageous than their enjoyment by a small group of rentiers.

To the extent that product prices remain below their expected long run levels for some years, as they did in the early to mid-1980s, economic rent will be diverted to consumers, often overseas. There may be occasions when it is economically sensible to defer production in order to maximise the net present value of economic rent. Once a mine has been developed, however, the pressures to produce at maximum throughput, as a means of minimising today's unit costs, are usually inexorable. The appropriate division of rent between companies and governments is partly governed by the available number of undeveloped ore deposits which are economic, and by the degree of competition to invest. Frequently individual host countries will have different interests, depending on the nature of their known or potential ore deposits. Specialist managerial and technical skills that can be mobilised to develop profitable long-lived mines are scarce, and in many instances scarcer than known ore deposits. Companies which possess them, and they are relatively few, can command a form of rent for these resources. These "quasi-rents" may exist for long periods of time, although new pools of expertise can be developed in due course. Equally, however, new ore bodies can be discovered, often in different countries or regions from those in which existing mines are concentrated. This is particularly so today, when large areas of the globe are opening up to the introduction of modern exploration techniques. This possibility, plus uncertainties about future trends in demand, mean that the occasions on which mine development should be deferred to maximise

present values are likely to be few and far between.

Economic rent is the surplus from which governments can raise revenues through taxes, over and above those which are treated as the normal costs of doing business. Yet governments have to tread carefully. If all rents are taxed away when prices are high, without any allowances for the losses incurred when prices are low, there is a danger that investors' rates of return will drop below their opportunity costs of capital. New investment will be discouraged, not only in new projects, which may not concern an individual host country, but in sustaining capital to maximise future value added from existing operations. National tax policies can, therefore, greatly influence the mining industry's long term global sustainability. Tax rates need to leave mine operators with a sufficient share of economic rent when times are good to compensate, at least partially, for the bad times.

The role of demand

Although the concept of economic rent may seem remote from concerns about the mineral industry's sustainable development, it is central to the proper analysis of the latter at all geographical levels, from the global down to the individual mine. The primary purposes of mining, as of all other forms of economic activity, are to satisfy human needs and wants, and to create wealth. The creation of wealth is especially important for the mining industry's host communities. Together with the value added, the amount of economic rent that is yielded by a mining operation is an important measure of the wealth generated. Mining only produces wealth, however, if it provides goods for which there is a demand. The existence of such a demand at remunerative prices is the acid test, in that it reflects the needs and wants of society as a whole. In recent years many people have questioned this, and argued that some products are socially worthless. The criteria for granting permission to mine, and

in particular the environmental and social yardsticks, should therefore be far more stringent than for more "useful" minerals. Some go so far as to assert that such products should not be mined if there is any permanent degradation either of the environment, or of the quality of life of those in the mine's immediate vicinity.

The list of "socially worthless" products is infinitely flexible, depending on each individual's social values and preferences. Those living near a projected mine may have more definite prejudices than those who purchase the products and services that may be created. These prejudices, paradoxically, may sometimes be more in favour of mining than those of people with comfortable living standards in metropolitan areas. The greatest concern has been expressed about the mining of gold in most regions, and of diamonds in north-western Canada. There is a huge stock of previously mined gold, which is sufficient to meet genuine industrial demand for many years ahead. It is argued that it makes little sense to dig up new supplies, with inevitable environmental disturbance, only to bury it again in a vault. Most diamonds required for industrial use can be produced synthetically, so that mining is really directed towards gem-quality stones, which merely have aesthetic and emotional appeal. Why wreck the environment to adorn a rich man's mistress, in an artificial market that is created and sustained by advertising? Arguments such as these, which are based on particular value systems, are not confined to gold and diamonds. Similar comments have been made about the extraction of fuller's earth in the south-eastern United States. Should even temporary damage to the natural landscape be allowed in order to produce cat litter for apartment dwellers in New York?

Those who voice arguments like these are aiming to impose their own set of values and judgements on society as a whole, and specifically on areas which may have no alternative sources of wealth to potential mining. Yet society

does express its preferences, through the market-place, and through the relationship between prices and costs. It does not adjudicate in other fields, for example between the relative worth of vacuum cleaners and motor cars, or between classical concerts and cinema cartoons. As long as value is added by mining, in the sense that the income earned exceeds all the costs incurred, including those of protecting and re-habilitating the local environment, and compensating for social disturbance, then the mining of any product is economically valuable. The wealth created can facilitate economic and social development, both today and for future generations. Not to mine potentially viable mineral deposits would be the very antithesis of sustainable development. There is seldom a guarantee that minerals will be even more valued in the future than they are today.

Final comments

Where there is concern about the mining of specific minerals, host communities and governments may require a greater than average share of any economic rent created. They may insist that a high proportion of the value added accrues to the local region, if mining is to go ahead. How the wealth that mining operations creates is distributed within the community, and the uses of mineral products, are certainly important issues, but it is first necessary to bake a cake before sharing it out.

Notes

This article draws heavily on a paper presented at the June 1994 Washington Conference on Development, Environment, and Mining. (Mineral rents, Taxation, and Sustainability by P.Crowson). It was then adapted for a paper commissioned by The International Council on Metals and the Environment (ICME) for the latter's internal use on Mining and Sustainability.

1. *Strategy for African Mining*, World Bank Technical Paper No.181. Mining Unit, Industry & Energy Division, World Bank. August 1992. ■