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Competition and Regulation in the Gold Industry: An American Perspective

J. Wilkerson*

ABSTRACT

When taken from a domestic viewpoint, the primary gold market appears to be noncompetitive and marred by concentration. However, when seen at the global scale, it is clear that the primary gold market is competitive and diluted. Further, even if the primary market were noncompetitive and concentrated at the global level, that market probably could not readily affect the price of gold. Regardless of competitiveness, gold mines in the United States and elsewhere are subject to environmental and safety regulations that increase the cost of production; Regulations are stringently enforced in the United States as compared to competitor countries, potentially creating a competitive disadvantage for US primary producers.

1. INTRODUCTION

Gold markets have been regulated for at least five thousand years—since the first dynastic ruler of Egypt, Menes, declared that the value of gold would be two and a half times that of silver.¹ The market has arisen in different areas at different times, with distinct civilizations discovering, exploiting, and coveting gold from the days of their earliest records.

America has been no exception, and the United States has been a major consumer of gold since its inception. The U.S. has also produced gold, beginning in 1799 when the young son of Hessian-turned-farmer John Reed found a seventeen-pound nugget while bow fishing on his father's North Carolina land.² This discovery led to the creation of placer associations and mining cohorts in the Colonies – Appalachian organizations that dominated gold production in the United States until January 1848, when California Gold Rush started at the American River.³

Once mining came to California in earnest, it spread throughout the American West, from Alaska to New Mexico and Oregon to Colorado. Wherever there were mountains and streams, there were miners and gold pans. Solo miners and small teams did their best to gather the easy pickings from streams and veins, but “[b]y the early twentieth century, the best high-grade deposits of precious metals were either exhausted or being worked

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1 O. E. Young, Jr., *The Southern Gold Rush, 1828–1836*, 48 J. of South Hist. 373, 375 (1982).

2 *Id.* at 373.

3

out,⁴ and mining became more capital-intensive. The need for capital moved mining away from a collection of individual miners to the formation of companies. Luckily, this time of needed capital struck during the Second Industrial Revolution, a period that saw the harnessing of hydraulic, electrical, steam, and internal combustion power. These new technologies allowed mining companies to dig deeper than ever, to dredge stream beds, to communicate with far-flung operations, and to transport capital to mines and ore away from them.

Consequently, technological innovation has been the key to gold mining in the last 100 years. From cutting mountainsides with pressurized water, to blasting tunnels with TNT, and – most importantly – to extracting gold from hard rock through the cyanidation and active-carbonation processes, new technologies have led to enormous startup costs and, therefore, huge mining conglomerates looking to exploit economies of scale. The benefits of scope economies have also arisen: since mining one mineral can lead to discovery of another, and the equipment and know-how used to dig one mineral can be used to dig another, mines often employ their expertise and equipment to gather gold while mining something else – or vice versa.⁵

Technological necessity has made size the watchword of modern economically-sustainable gold mining. Enormous haul trucks, excavators, underground facilities, open pits, and mills are getting bigger every year to make up for decreases in ore grade. Today, a mine can stay operable even at grades of one-hundredth of an ounce per ton of ore, but the capital costs that allow for such operations are astronomical: up to two billion dollars per mine for startup costs alone.⁶ It is true that entry into the gold primary market is relatively easy if a high-grade deposit can be extracted with minimal effort (e.g. artisanal sluice mining in Alaska), but such deposits are increasingly scarce and often run dry after a short extraction period. In other words, these deposits are too small, too easily depleted, and too scattered to support long-term, large-scale operations.⁷ Indeed, the average ore grade of large operations is 3 grams per ton, which leads to a cost per ounce of gold of between \$300 and \$400 at well-capitalized firms. Experts agree that as time marches on, ore grade will generally decrease and cost of production will increase on an exponential curve.⁸ Indeed, there is a very high long-run

4 M. Malone, *The Collapse of Western Metal Mining: An Historical Epitaph* 55 *Pacific Hist. Rev.* 455, 458 (1986).

5 The Bingham Canyon Mine in Utah, for example, is a Kennecott Copper mine that supplements its copper production by finding gold in the process. As shown in Table 1, Kennecott copper is one of the top four gold producers in the United States, due almost entirely to its Bingham Canyon Mine, which produces 12,300 kg of gold per year (the seventh largest gold-producing mine in the U.S.).

6 J.H. Morris, *Going for the Gold: The History of Newmont Mining Corporation* (Univ. of Al. Press 2010).

7 Datamonitor, Ref. Code 0199-2063, *Industry Profile: Global Gold 14* (2010).

8 J. Muller & H.E. Frimmel, *Numerical Analysis of Historic Gold Production Cycles and Implications for Future Sub-Cycles*, 4 *Open Geology J.* 30–31 (2010).

minimum efficient scale at modern mines that is going to get higher.⁹ This will force small firms to either bow out as soon as their high-grade ore is gone, or accept a takeover bid by a better-capitalized firm.

2. PRODUCT MARKET IS BOTH DOMESTIC AND GLOBAL

The relevant product in this analysis is primary gold, meaning gold extracted from the ground in order to be sold. This is in contrast with secondary gold, which is produced by recycling scrap – a method that took hold in the mid-1960s and has resulted in secondary production rivaling the size of primary output.¹⁰ Although my concentration is on the primary market, the secondary market produces a significant amount of world supply (or, more appropriately, its re-supply). The gold produced in the secondary market is indistinguishable from that produced in the primary market. Thus, I cannot altogether ignore the secondary market – or gold sold on the market by central banks and others – in the following discussion. Most gold mining companies are not involved in the refining processes directly. Instead, gold mines take the refining process to about 80–90% purity on-site, forming the gold into *doré* bars and sending them to external refineries that take the bars to 99.6–99.99% pure bullion.¹¹ In addition to this break in vertical integration, I assume that gold mining companies are not involved in recycling.

Geographically, the market has both domestic and global aspects. Although gold is bought and sold globally, making concentration and competition analyses tempting from the world-level, its production is intimately connected to countries' land. Thus, individual countries have a stake in how their gold is mined and how mining affects their economy. From a regulatory standpoint, many statutes (such as the General Mining Act of 1872) and the common law are generally applicable to all gold mining

9 It must be noted that large mining corporations appear to be waiting to enter some countries for political and governmental-efficiency reasons rather than ore grade. These countries' rich resources are currently exploited by small-scale firms. China is the poster-child of such countries, in which one state-supported producer mines about 20% of all reserves, while innumerable small firms make up the difference. See generally, L. Tole & G. Koop, *Do Environmental Regulations Affect the Location Decisions of Multinational Gold Mining Firms?* (12 August, 2008) (unpublished manuscript on file with the University of Strathclyde).

10 United States Geological Survey, 2007 Minerals Yearbook: Gold 31.9 (2008).

11 J. Marsden & I. House, *The Chemistry of Gold Extraction* 449 (2nd Ed., Society for Mining Metallurgy & Exploration 2006). There is a good possibility that gold mines will begin vertical integration with dedicated refineries ("i.e.", refineries that take the gold to maximum purity), especially as gold in circulation (and therefore available for recycling) increases and the gold in the ground decreases. A move on the large scale would lead to more of a possibility that firms could exercise market power. One South African gold mining company, Harmony, has already integrated, and takes its gold from ore to 99.99% purity on its own. See R. Short & B. Radebe, *Gold in South Africa* (2008), available at <http://www.goldinsouthafrica.co.za>. It must also be noted that at least some dedicated refineries are owned by a conglomerate of nearby gold mines. *Id.*

operations in the U.S.¹² Thus, since both perspectives can be valuable in creating policy that affects primary production, I examine both the United States and global mining industries.

3. THE DOMESTIC PRIMARY MARKET APPEARS HIGHLY CONCENTRATED

Technology, capital, and large firms seem necessary to keep up with demand. Since gold is sold on a global market both as an investment and as an input, each gold-producing country (unless centrally-planned) is both an exporter and an importer of gold. The United States was, from 1900 to the early 1960s, generally a net importer of gold. Since then, the U.S. has been, almost without exception, a net exporter.¹³ In 1971, Richard Nixon deregulated the gold market by removing the United States from the gold standard. This move led to an immediate jump in prices, which further led, in the 1980s, to a production level more than four times that of 1971. United States production continued to grow throughout the 1980s and 1990s, peaking at 366 metric tons in 1998 and then tapering off as prices began falling. Production has steadily fallen since 2001 despite rising prices, and in 2008 the United States primary producers generated only 233 tons of gold. Notably, the 2008 price of gold was the highest it had been since 1987, but the American production level was the lowest it had been since 1988.¹⁴

Today, gold is produced at only about fifty-five mines in the United States, with 78% of all gold production coming from the state of Nevada.¹⁵ Thirteen gold producers owning thirty mines make up over 99% of total U.S. gold production (*see* Table 1). Among these producers, Barrick Gold Corporation has the largest market share, at 37.8%, followed by Newmont Mining Corporation, at 29.5%. As shown in Table 1, the market is highly concentrated, with an HHI of 2521.06 and the top four firms holding more than 85% of the market. Barrick and Newmont have for years been major players in American gold mining (although they were accompanied by other similar-sized firms until the early 2000s)¹⁶ and show no signs of slowing.

12 It should be pointed out, however, that U.S. courts are not shy about finding jurisdiction over companies that affect American interests – even when the case has more effects in foreign jurisdictions. *See Consolidated Gold Fields PLC v Anglo American Corp.*, 698 F. Supp 487 (S.D.N.Y. 1988) *aff'd in part, rev'd in part, sub nom. Consolidated Gold Fields PLC v Minorco, S.A.*, 871 F.2d 252 (1989) (finding personal and subject matter jurisdiction over Luxembourg (Minorco) corporation and its hostile takeover bid for a British (Consolidated Gold Fields – plaintiff) corporation, because the merger would have created a 32% market share for the new company and because the new company would have minority control over some American mines).

13 United States Geological Survey, Gold Statistics (2009), available at <http://minerals.usgs.gov/ds/2005/140/gold.pdf>.

14 *Id.*

15 United States Geological Survey, *supra* note 10, at 31.1

16 M. Callahan, *To Hedge or Not to Hedge ... That Is the Question: Empirical Evidence from the North American Gold Mining Industry 1996-2000*, 11 Financial Markets, Institutions and Instruments 271 (2002).

Indeed, it could be argued that the primary gold market in the United States is likely subject to collusion among the top producers: Barrick and Newmont would have a majority market share if taken together. However, this argument would overlook the global market in which these companies play. Prices are set at a global scale; thus, while it is true that the top producers could leverage market power if they were only competing domestically, I now turn to the competitive landscape at the global level to see this seemingly bleak picture in a larger context.

Company	Gold Production (kg)	% Mkt Share	(% Mkt Share)
Barrick	90611	37.8	1428.84
Newmont	70788	29.5	870.25
Kinross	28800	12	144
Kennecott	15372	6.4	40.96
Creek	8770	3.7	13.69
Teck	8080	3.4	11.56
Goldcorp	4380	1.8	3.24
Yukon	3790	1.6	2.56
Quadra	3360	1.4	1.96
Wharf	1800	1	1
Coeur d'Alene	1570	1	1
Jipangu	1360	1	1
Apollo	1040	1	1
	239.721		HHI: 2521.06

4. GLOBAL SUPPLY AND DEMAND FOR GOLDPREVENT PRIMARY PRODUCERS FROM EXERCISING PRICING POWER

The global market is much less concentrated than the domestic scene. The global primary gold market produced 2,380,000 kilograms of gold in 2007 (a number that stayed relatively constant through 2009), meaning that United

States gold production consisted of only 10% of the global market.¹⁷ On a global level, Barrick is the largest producer with a 10.2% market share – meaning that Barrick alone produces as much as all U.S. mines combined – but its market share is far from overbearing. Newmont is the second-largest producer, at 8.9%.¹⁸ AngloGold Ashanti and Gold Fields follow, at 6.0% and 4.7%, respectively. In other words, at the global level, the four-firm concentration ratio is only 29.8% – hardly a number that should raise regulatory red flags. Thus, given that American gold production is merely a facet in the larger market – within which every producer in the world competes – the fact that domestic gold production is focused in the hands of a few is meaningless from a price-fixing standpoint; the closest to market power that domestic firms could come, would be to hold vast deposits and mine them only when prices are high.

There have been recent murmurings of a Barrick-Newmont merger, and most industry commentators predict that the two will enjoy “operational synergies” – if not merger itself – within the next few years.¹⁹ Barrick, a Toronto-based company, has 26 operations scattered among the U.S., Australia, Canada, Peru, Chile, Argentina, and Tanzania.²⁰ Newmont, a Denver-based company, has gold operations in the U.S., Australia, Canada, Peru, Indonesia, Ghana, New Zealand, and Mexico. Thus, in the U.S., Australia, Canada, and Peru, these two companies could share resources and operations and possibly benefit from a merger. The merger of these two industry leaders could—if the agreement were to leave all mines operational – lead to a single firm with almost 20% market share. Such a merger of the industry’s top two firms might look suspect at first glance, but would not likely have an appreciable effect on the market because the price and quantity of gold on the global market is out of all primary producers’ hands – not just Barrick’s and Newmont’s. Indeed, the inability of primary producers to affect price, and their hedging against price fluctuations, is well-documented.²¹

A. Beyond Primary Production

Supply to the global market comes from primary producers, secondary producers, central banks, and anyone else who has gold and wants to sell it. The price of gold is fixed twice daily by the London Bullion Exchange,²² and this price is used as the benchmark for transactions in gold and gold derivatives all

17 Datamonitor, *supra* note 7, at 10.

18 *Id.* at 12.

19 See, “e.g.”, D. Kasich, *Newmont, Barrick Contemplate Operational Synergies, not Merger*, MINEWEB.COM, <http://www.mineweb.com/mineweb/view/mineweb/en/page34?oid=80653&sn=Detail>.

20 DATAMONITOR, *supra* note 7, at 20.

21 See, “e.g.”, M. Callahan, *supra* note 16 (detailing the hedging practices, such as long-term contracts, of primary producers in North America).

22 See the London Gold Fix home page, <http://www.goldfixing.com/home.htm>.

around the world. If primary producers such as Barrick and Newmont were the only players in the market, their joint action could affect the price fixed by the Exchange. However, secondary producers add millions of kilograms of gold to the market every year (over 1.2 million in 2008 and increasing at a rate of more than 25% per year).²³ In other words, the size of primary producers would probably have to be unforeseeably enormous (or they would have to organize a widespread cartel) before they could begin controlling prices on the global market.

Central banks, such as the United States Federal Reserve (of which most is held at the New York Branch), hold approximately 19% of all of the gold ever mined, or 31,350,000 kg. They primarily use these reserves to guarantee their currency, but countries buy and sell gold for various reasons – transactions that are controlled by international quantity agreements. A recent accusation against central banks is that they are using such firms as HSBC, Goldman Sachs, JP Morgan Chase, and Deutsche Bank to manipulate gold prices in order to make their currencies look more favorable.²⁴ Whatever their reasons for the purchase and sale of gold, central banks – especially those of the United States (8,133,500 kg), Germany (3,407,600 kg), Italy (2,451,800 kg), and France (2,435,400 kg)²⁵ – in conjunction with the huge and growing secondary market, pull market power away from primary producers. Indeed, annual global primary gold production is less than one-third the size of America's gold reserve alone; additionally, secondary production is growing and, in the U.S., is only 10% smaller than primary production.²⁶ Most importantly, since gold is priced daily by an external authority, anyone attempting to raise prices can be instantaneously detected and flushed by others dumping more on the market as prices rise. Consequently, primary gold producers do not currently have the ability to appreciably affect the price of gold on the global market, even though they collectively supply about 50% of the gold.

Supply will continue to increase as long as mining companies are able to cost-effectively detect it and remove it from the earth, but the market will probably remain relatively stable for at least the next few years as gold companies plan for expansion.²⁷ There are no good estimates of the amount of gold left in the earth, because finding new deposits requires a great deal of time and mines generally seek known reserves for only five to ten-year production increments. However, there are approximately 128,000,000 kg of

23 Gold Fields Mineral Survey, 2009 Annual Gold Survey: Overview 2 (2009).

24 See, "e.g.," J. Turk, *A Short History of the Gold Cartel*, GATA.org, <http://www.gata.org/node/7402>; M. Gray, *Metals Are in the Pits: Trader Blows Whistle on Gold & Silver Price Manipulation*, New York Post, 11 April, 2010, available at http://www.nypost.com/p/news/business/metal_are_in_the_pits_2arTIGNbMK7mb1uJeVHb00.

25 World Gold Council, World Official Gold Holdings (2010), available at http://www.gold.org/deliver.php?file=/value/stats/statistics/archive/pdf/World_Official_Gold_Holdings_Mar_2010.pdf.

26 United States Geological Survey, 2010 Mineral Commodity Summaries: Gold 66 (2010).

27 United States Geological Survey, *supra* note 10, at 31.7.

known gold deposits, which represent a miniscule of the gold in the top four kilometers of the earth's crust (the currently-mined range).²⁸ Thus, it is safe to assume that, as long as economic profits do not fall below zero due to increased extraction costs, gold mines will be producing for centuries to come.

Demand for gold is fueled by end-markets, including jewelry manufacturing (68% of demand); electronics, medical, and other industries (14%); and institutional investing (19%).²⁹ Given that gold has so many favorable elemental properties, such as its malleability, ductility, non-corrosiveness, reflectivity, and conductivity, there are no good substitutes for it in many applications. Gold has become a necessity in the high-tech industries. In jewelry manufacturing, gold has for millennia been the metal of choice, even in the face of substitutes such as platinum, silver, zinc, and copper. As an investment, gold is strong and growing stronger, with recession-afflicted investors looking to grow their savings by planting them in nonperishable metals. Overall, demand is not very elastic but varies by application, with areas such as dentistry seeing more elasticity due to recent viable substitutes.³⁰ Given that overall demand for gold is relatively inelastic and that gold is increasingly used as a financial investment by governments and individuals alike, demand is not likely to decrease anytime soon. Further, in our technological age that increasingly requires gold for the production of electronics for the private sector, the military, and personal consumption, it is likely that demand for gold will rise as time goes by.

5. REGULATIONS IN THE UNITED STATES

Countries are concerned with more than the competitiveness of the global market when they impede mergers or break up mining conglomerates. They are concerned with the gold in their own soil, and the possibility that a single firm or cartel will acquire rights to all of that gold and then mine it – or fail to mine it while waiting for higher prices – in a manner that hurts the national economy or kills jobs. It is conceivable, therefore, that nations look not to the global market but rather to domestic concerns when deciding how to regulate primary producers. Such motivations arguably led to the Second Circuit's antitrust decision in *Consolidated Gold Fields v Minorco*.³¹

28 H. E. Frimmel, *Earth's Continental Crustal Gold Endowment*, 267 *Earth and Planetary Science Letters* 45, 48 (2008).

29 Datamonitor, *supra* note 7, at 13.

30 *Id.* at 14-15.

31 J. B. Berman, *Consolidated Gold Fields, PLC v Minorco, S.A.: The Growing Over-Extension of United States Antitrust Law* 6 *Am. U. J. Int'l L. & Pol'y* 399 (1991).

A. Antitrust

No discussion of market concentration and competitiveness in the American primary gold industry could be complete without a hard look at *Consolidated Gold Fields*.³² In that antitrust case involving the potential joining of the world's two largest firms, the relevant industry was determined to be *primary producers only* – and only those primary producers in the non-Communist world – even though the court recognized that 1) gold was a fungible product that was traded between Communist and non-Communist areas and 2) gold was being recycled and resupplied by the secondary market. The court held that, since Minorco (a member of the once-powerful Oppenheimer-controlled gold mines) would have a 32.3% market share in the narrowly-defined market if it were allowed to join with Consolidated, the hostile takeover bid violated the Clayton Act and had to be enjoined until the merits of the case could again be heard. On remand, the injunction stood.³³ *Consolidated Gold Fields* proves that determining the relevant market for gold mining antitrust cases is of paramount importance, and that courts might take a narrow view of that market to protect domestic interests by finding mergers or takeovers illegal. However, since *Consolidated Gold Fields*, no U.S. court has found a violation of the Sherman or Clayton Acts in the gold mining industry. This is unsurprising for three reasons: first, the Soviet bloc collapsed, expanding the market; second, the market definition began including secondary producers and other sellers, such as central banks; finally, no gold conglomerate since Oppenheimer has come close to such a large share of the global market.

B. Environmental Regulation

Consolidated Gold Fields is the only American gold mining antitrust case in the last 20 years,³⁴ and mines are not subject to direct economic regulation. Thus, the bulk of regulatory issues facing mining companies are environmental and safety concerns. Of the two, environmental regulations – imposed both by the federal government and by states – have by far the greatest impact on

32 *Supra* note 12.

33 *Consolidated Gold Fields, PLC v Anglo American Corp. of South Africa Ltd.*, 713 F.Supp. 1457 (S.D.N.Y. 1989).

34 Although the United States has not been much concerned with anti-competitiveness issues in gold mining, other countries have. For example, South Africa blocked a merger in 2000 and has been stalling another since 2009. See *SA Government Stops Gold Merger*, Mining Journal, 22 September, 2000; M. Creamer, *South African Government Softens Stance on Zstrata-Anglo Merger, Requests Detail*, MiningWeekly.com, 13 July, 2009. The South African government was concerned in these cases that intra-country competition and job creation would be stifled. This argument is based on the possibility that a single company or cartel can gain control of all of the gold resources in a nation in order to decrease production and raise prices. We have already seen that raising prices would be impossible – even for the gold-rich nation of South Africa – and therefore the mines would have little incentive to decrease production. The worst that could happen to South African workers would probably be the increase of capital efficiency through a merger, meaning less of a reliance on labor and, therefore, layoffs.

American mines, especially in light of the comparative cost advantage that U.S. regulation gives to mining operations in less-regulated countries.³⁵ Environmental regulations can be strong enough to force gold companies to avoid exploration in certain areas, to delay operational startup, or even to go bankrupt. However, mining companies tend to establish operations in those countries that have the most stable and smoothly functioning governments – which also tend to be those countries with somewhat strict environmental laws.³⁶ The tradeoff between effective government-business relations and exacting environmental laws seems to weigh in favor of government-business relations. Thus, major players in the mining industry are subject to environmental regulation almost everywhere they go.

In the U.S., whenever a mining company (or anyone else who wants to mine) finds gold on federal lands through exploration, it can apply for a mineral patent with the Secretary of the Interior.³⁷ If on Bureau of Land Management-managed land (as opposed to National Park Service, Fish and Wildlife Service, or Forest Service-managed land, where processes are more stringent), the process of obtaining a patent is quite simple: after receiving the application, the BLM determines whether gold can be cost-effectively extracted from the land. If it can, then the mine pays a nominal fee for the property rights, and the BLM approves the patent, which the Secretary then reviews and either issues or contests for failing to meet statutory requirements.³⁸

Once a firm has control of the land, it can begin mining operations – but not before it clears environmental hurdles.³⁹ The most important environmental laws in this arena are the Clean Air Act, the Resource Conservation and Recovery Act, the Clean Water Act, and the Comprehensive

35 Environmental regulations in many other gold-rich countries, such as Peru, Indonesia, and South Africa, are not as stringent or as strictly enforced as those in the United States. Thus, environmental regulations – just like America’s necessarily higher wages and benefits – put mines in the U.S. at a comparative disadvantage to operations in many other countries. See, “e.g.” A. Kumah, *Sustainability and gold mining in the developing world* 14 J. of Cleaner Production 315 (2005); J. L. Sznopce & T. G. Goonan, U.S. Geological Survey Circular 1197, *The Materials Flow of Mercury in the Economies of the United States and the World* (2000); J. S. Ogola, et al., *Impact of Gold mining on the Environment and Human Health: A Case Study in the Migori Gold Belt, Kenya* 24 Environmental Geochemistry and Health 141 (2002).

36 Tole & Koop, *supra* note 9.

37 Most of this section flows from provisions found in the Mining Law of 1872, 30 USC §§22-42 (2006). This law was passed during a time of little environmental foresight and incentivized expansion in the West.

38 *Mining Law – Approval of a Patent – A Command Performance* 30 LAND & WATER L. REV. 109 (1995). For example, in 1994, Barrick obtained 1800 acres of land in northern Nevada from the BLM at the price of \$5 per acre (a total of \$9,000). There were an estimated 30,000,000 ounces of readily-extractable gold at the site – a value of \$30 billion. Secretary of the Interior Babbitt, deploring Barrick’s ability to get astronomically valuable land for a pittance, attempted to halt the patent but lost in court because Barrick had fulfilled all statutory requirements of the 1872 Mining Law and its amendments.

39 The National Environmental Policy Act of 1969, 42 U.S.C. § 4321 *et seq.* (2006), requires that the federal agencies study a project’s probable environmental impacts before giving the approval necessary for the project to begin. The agencies issue Environmental Impact Statements before making permitting decisions if the proposed activity will “significantly affect the quality of the human environment.” 42 U.S.C.A. § 4332(2)(C).

Environmental Response, Compensation, and Liability Act.⁴⁰ Under these and other laws, the mine is required to obtain permits for air quality, water quality, underground injection, water supply systems, solid and hazardous waste, wildlife and vegetation protection, surface disturbance, reclamation permits and bonding, use of toxic chemicals, exploration on Indian lands, and dredge discharge.⁴¹ After receiving the required permits, the mine then must both comply with them and issue regular updates on contamination levels, surface disturbances, water discharge quality, etc. The Environmental Protection Agency and Department of Justice (or states, which also issue environmental regulations)⁴² can use administrative, civil, and criminal sanctions to stiffly penalize a company that does not comply with its permits.

The EPA and DOJ have been stepping up environmental enforcement for the past decade, and mining companies consequently focus enormous resources on compliance – resources that add to the cost per ounce of production.⁴³ However, these resources are – if the enforcement actions are large enough to eviscerate economic benefits of noncompliance – less than what the companies would pay if caught violating the law. Whether the enforcement actions are large enough to remove economic benefits of noncompliance is unclear, but it is very clear that mines are in many instances not required to pay the full monetary effect of their actions; the EPA often strikes a deal with companies rather than driving them into bankruptcy.⁴⁴

C. Safety Regulations

In addition to environmental regulation, the Federal Mine Safety and Health Act of 1977⁴⁵ imposes regulations handed down by the Department of Labor’s Mine Safety and Health Administration (MSHA). This agency issues regulations on everything from personal protective devices to fire suppression systems, from airborne silica dust to sound levels, and mines are subject to

40 5 R. T. Connery, *et al.*, *American Law of Mining* §165.03 (2d. Ed. 2008).

41 *Id.* at §166.1. For a lucid discussion of hard rock bonding practices, see K. Wernstedt & R. Hersch, *Abandoned Hardrock Mines in the United States: Escape from a Regulatory Impasse?* 1 WM. & MARY POL’Y REV. 1 (forthcoming 2010).

42 Many states, such as Nevada and Colorado, enact broad-based, comprehensive environmental regulations that apply to mines on all private and public lands. Thus, mining companies cannot escape environmental regulations just because they purchase their property from a private landowner. *Id.* at §165.03.

44 See Wernstedt & Hersch, *supra* note 42, at 9. It is difficult to tell whether this relationship is marked by capture or by normative concerns, but companies’ long-term viability probably plays a role. A famous EPA/mine case is ASARCO, which closed down many of its regional plants after receiving enormous fines, but it usually found a way to strike a deal with the EPA so as to stay solvent. For example, in 2003 ASARCO and the EPA set up a joint, \$100 million trust fund to clean up all of ASARCO’s past misdeeds at Superfund sites, even though the task was valued much higher. It wasn’t until 2009, in a Chapter 11 settlement, that the EPA stopped playing pat-a-cake with ASARCO and demanded \$1.79 billion to clean up the company’s mess.

45 30 USC §§ 801 *et seq.* (2006).

unannounced inspections. MSHA can impose large fines and can even halt operation of a mine if safety concerns are not adequately met. Like environmental regulations, safety regulations are more stringently enforced in the U.S. than in many other gold-producing countries, creating a comparative advantage for those countries.

6. COMPETITIVENESS

The gold mining industry is both rivalrous at the large scale and subject to easy entry at the small scale. Large multinational conglomerates are constantly jockeying for control of the most underground deposits. They also fight to lower their costs per ounce and therefore increase their profits, something that is done both by improving technology and operational efficiency as well as by discovering or taking over rich ore deposits.

At the small scale, anyone who wants to stake a claim can do so, assuming the Department of the Interior is convinced that the applicant can extract gold at a profit; further, everyone who extracts gold from the ground can sell it at the same daily-fixed price as large firms, although large firms often hedge. From this perspective, the market is subject to infinite competition.⁴⁶ However, large conglomerates are hardly worried about tiny startups; they are reasonably confident that they are already sitting on the most lucrative ore deposits in the free world, and are equally confident that they can buy the smaller operations if need be. Practically, even a small modern mining operation will require permitting, extraction, electricity, transportation, labor, milling/leaching, legal, and communications costs – unless the operation is a tiny artisanal outfit. Even shutting down a mine is costly, given the costs of environmental cleanup and reclamation, long-term labor agreements, and dismantling/transporting mills and other capital. However, since gold is fungible, any production – even at artisanal outfits – competes with large-scale production.

Even given free entry and a fungible product, “rivalry” is probably a better term than “competition” to describe the interaction among the world’s top mining companies.⁴⁷ Each company is trying to expand, which means that they must either find previously unknown ore deposits or take over other companies’ deposits. In order to get into a position to swallow smaller fish, gold companies scramble to expand their in-ground reserves and make their operations more efficient. However, much of this rivalry is dispersed due to many large companies’ expansion into other minerals. For instance, Newmont Gold, like Kennecott, has recently begun mining copper. This diversification (along with the likely attendant economies of scope) lessens the degree to

⁴⁶ Datamonitor, *supra* note 7, at 13–15.

⁴⁷ Datamonitor, *supra* note 7, at 15.

which existing companies can compare balance sheets and makes merger or takeover more complicated.

Overall, gold mines produce a single, indistinguishable good, cannot affect the price of that good, and are subject to the relatively easy entry of competitors. Thus, the industry is, at the small scale at least, competitive.

7. CONCLUSION

The gold mining industry is dominated by relatively few large players with global market shares of at least 1%. However, only one mining company, Barrick, has a market share over 10%. Even if the global market were more concentrated, gold mining companies would not likely be able to control the global gold prices. Further, although entry is relatively free, long-run minimum efficient scale is high enough to allow in only well-capitalized firms, while small firms either quit or sell out. Large firms deal with each other as rivals, with each attempting to control the most and best-concentrated ore deposits, but even this rivalry is being diffused as companies expand into other mineral markets. Finally, the impact of regulations – including the impact of comparative cost disadvantages for U.S. mines – comes mainly from environmental and safety strictures, but countries may have an idiosyncratic incentives to protect domestic interests through antitrust.