CHAPTER 3

Global Expansion

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As explained in Chapter 2, scarcity has always been one of the key challenges for gold miners. In this chapter and the succeeding ones, we discuss the different ways in which the global gold production system has responded to this challenge of scarcity. We draw attention to a first type of response: the global expansion of gold mining from its historical core into new gold mining destinations. Before proceeding, two important caveats are in place. First, when we talk about gold production, a distinction can be made between "above-ground" and "below-ground" stocks. Above-ground stocks consist primarily of recycled gold, and typically account for one-fourth to one-fifth of the global gold supply. In 2017, supply from above-ground stocks represented 26% (1167 tons) of the total gold supply. The remaining 74% (3305 tons) are accounted for by below-ground stocks, in the form of newly mined gold. While our theoretical framework

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can certainly be applied to gold recycling (see Laha 2015), this book looks first and foremost at newly mined gold. Second, as the title indicates, this chapter is concerned primarily with gold mining, which is but one stage in the gold production cycle which also involves processing, refining, product fabrication, and recycling (Mooiman et al. 2016). In Chapter 5, we will piece together the global gold production system, which will also involve paying more systematic attention to these other stages.

3.1 South Africa: The Birth of Industrial Gold Mining

Until the early nineteenth century, gold was mined in different parts of the world (particularly in West Africa, Brazil, and Spanish colonial America), but in relatively small quantities. In fact, according to the information on the website of the World Gold Council, less than 10% of all the gold that has been mined in history (187,200 tons) has been mined before the middle of the nineteenth century.[1] Following a series of gold rushes in Australasia and North America, annual gold production reached over 180 tons by the 1850s (Reeves et al. 2010). Ninety percent of this production originated from the United States and Australia.

The next important event occurred in 1886, with the discovery of the rich Witwatersrand goldfields in South Africa. The involvement of British capital and the introduction of cyanide processing (to which we will return later on in this chapter) transformed the gold mines around Johannesburg into the "gold factories" of the world (Lynch 2004; Schoenberger 2014). Crucially, from the start, the South African gold mining industry would revolve around labor-intensive underground mining and depended on a steady supply of cheap mining labor. The apartheid regime played a key role in ensuring such a supply. For much of the twentieth century, South Africa continued to dominate global gold production, and by the early 1970s, it reached a peak production of more than 1000 tons per year, or nearly four fifths of global gold production (Richardson and Van Helten 1984). We will return to the South African case in Chapter 4.

3.2 Post-1980s: The Global Gold Boom

Until the 1970s, consecutive gold standards had pegged the value of gold to one or several major currencies, which created stability in the

global gold market (Shafiee and Topal 2010). When the last of these gold standards (which formed part of the Bretton Woods system) was abolished in the 1970s, the gold market entered a period of rapid expansion and rising volatility. Ever since, global gold demand has more than doubled, from less than 2000 tons in 1980 to over 4000 tons in 2017 (World Gold Council 2018a). Gold prices reached a first peak in 1980, which was due in large part to the increased political and economic instability that followed the global oil crisis (Shafiee and Topal 2010). This first peak was followed by a period of relative stability, which lasted roughly from 1990 until the mid-2000s, when prices started to rise again, reaching a second (and more sustained) peak in 2011–2012. While gold prices have decreased since, current prices (which fluctuate between USD 1200 to 1300 per troy ounce) are still substantially higher than during the pre-boom years. By mid-2018, the prices started to rise again, and by mid-2019, it reached over USD 1400 per troy ounce (Fig. 3.1).

Two trends in particular have contributed to the gold boom of the late 2000s. One was increased demand from Asia, where economic growth and rising per capita incomes have combined with long-standing cultural affinities for gold (Ali 2006). In India and China, annual gold demand increased respectively with 304 and 2500% during the last three decades (World Gold Council 2018a). Together, both countries now account for

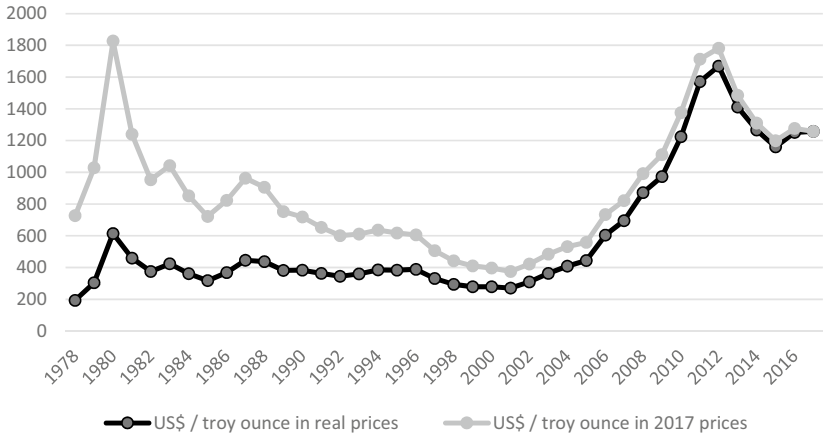

Fig. 3.1 Historical gold prices in USD per troy ounce (*Source* www.gold.org, 2017 prices based on own calculations)

over half of global consumer demand for gold. This growth in demand from the East has more than compensated for the stagnation—and in some cases even decrease—in gold demand in Western economies.

A second important factor is increased investor demand. Since the 1980s, but particularly since the mid-2000s, a growing number of institutional investors (including hedge funds, private equity funds, and asset management funds) have found their way into gold (de los Reyes 2017). The rise of gold as an investment asset was facilitated by the emergence of so-called exchange-traded funds (ETFs), which reduced transaction costs by enabling investors to buy gold without having to physically own it (Shafiee and Topal 2010). While jewelry has historically been, and still remains, the number one source of gold demand, investor demand now accounts for nearly one-third of global demand.

3.3 Global Expansion: From Core to Periphery

Figure 3.2 brings together gold mine production data for the period 1980–2017 for six major gold-producing countries and for the "rest of

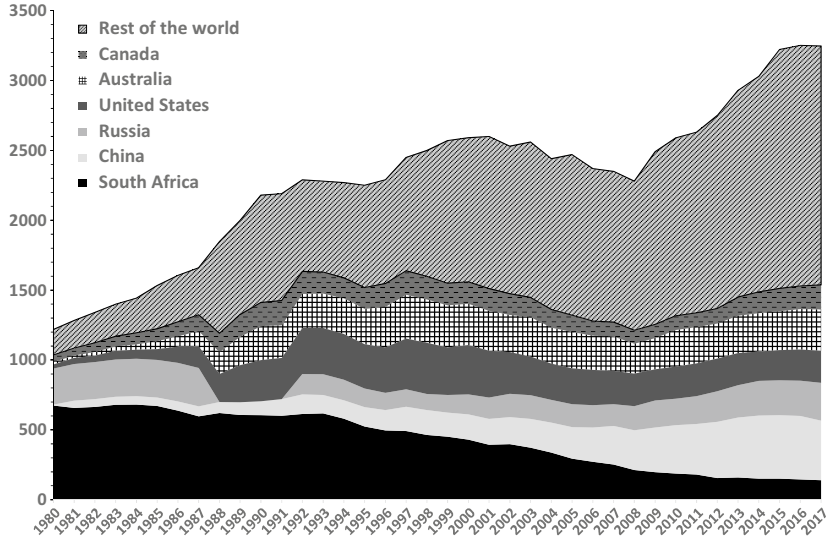

Fig. 3.2 Gold production in six major producer countries and the rest of the world, 1980–2017 (*Source* USGS Mineral Yearbooks; Thomson Reuters 2018)

the world." It clearly demonstrates that rising demand was met with a strong expansion of global mine production, which rose from approximately 1200 tons in 1980 to more than 3200 tons in 2017. It also shows the declining importance of South Africa, whose share in global mine output has dwindled to less than 5%. This decline can be attributed to different factors, including political uncertainty following the end of the apartheid regime, and a continued reliance on inefficient and labor-intensive underground mining techniques at a time of rapidly rising labor costs (Neingo and Tholana 2016; MacMillan 2017). Arguably most important, however, was the exhaustion of easily accessible gold reserves. This combination of factors now implies that South Africa has the highest gold production cost in the world (Thomson Reuters 2018).

The decline of South African gold mining was partly compensated for by a revival of three older gold mining destinations: Canada, Australia, and the United States. Throughout this entire period (and with the notable exception of the transition period between 1989 and 1991), Russia also continued to make an important contribution to global gold production, with annual production levels fluctuating between 100 and 300 tons.

In addition to these established mining destinations, which constitute the historical "core" of the gold mining industry, recent decades have witnessed the emergence of a new gold mining giant: China. Today, China is not only the world's top consumer of gold, but also its top producer. The Chinese gold mining industry was long composed of a large number of relatively small-scale, labor-intensive, and state-controlled mining operations (Zhang et al. 2015). Yet in recent years, the Chinese mining industry has undergone a process of privatization and consolidation. Today, four companies dominate Chinese gold production: China National Gold Group, Shandong Gold, Zijin Mining Group, and Shandong Zhaojin Group (World Gold Council 2018b). In addition to developing activities inside China, these companies have ventured abroad, acquiring mineral properties in other countries and entering into joint ventures and partnerships with foreign mining companies. While Australia has been the primary target of Chinese expansion, various other countries have also seen the entry of Chinese mining firms. In some cases, these Chinese mining activities take the form of large-scale industrial mining. Yet as indicated by several chapters in this book (particularly Chapter 11 on Ghana, Chapter 15 on Zimbabwe, and Chapter 16 on Madagascar), Chinese mining may also take the form of smaller activities that are driven

by a logic of rash and rapid extraction that have dramatic environmental effects, and often involve messy interactions with local powerbrokers.

Alongside the rise of China, Fig. 3.2 reveals the growing importance of the "rest of the world." In 1980, mine output in countries other than the six discussed so far was a mere 182 tons, or less than 15% of global mine output. By 2017, this figure had increased to 1709 tons, or more than half of global output. While the rise of the rest of the world was already apparent in the 1990s and early 2000s, it became particularly pronounced during the gold mining boom of the late 2000s. It is also reflected in Table 3.1, which lists the top 30 gold-producing countries in 2017. In addition to the rise of China (ranked first) and the spectacular decline of South Africa (now ranked eight), we have seen the rise of two new gold mining giants (Peru and Indonesia), alongside a geographically wide range of other new gold mining destinations. With the notable exceptions of Chile and Argentina, all of these new gold mining destinations are low- or middle-income countries.

Table 3.1 Gold production per country for 2017, in metric tons

China	426.1	Kazakhstan	55.1
Australia	295	Mali	52.2
Russia	270.7	Colombia	50.6
United States	230	Tanzania	49.1
Canada	175.8	Burkina Faso	49.1
Peru	162.3	Philippines	47.9
Indonesia	154.3	Chile	35.9
South Africa	139.9	Dominican Republic	35.3
Mexico	130.5	Suriname	33.4
Ghana	101.7	Turkey	26.1
Uzbekistan	84.9	Venezuela	25.4
Brazil	79.9	Zimbabwe	23.3
Papua New Guinea	61.9	Côte d'Ivoire	22.7
Argentina	61	Guinea	22.4
Dem. Rep. of the Congo	60.1	Guyana	20.4

Source Thomson Reuters (2018)

3.4 Industrial Gold Mining: Opportunities and Threats

3.4.1 Opportunities: Financialization, Liberalization, and Innovation

The global expansion of industrial gold mining was facilitated by several factors. Here, we focus on three factors in particular. The first one is increased investor appetite. Until the early 1980s, mining companies relied primarily on traditional forms of debt financing. This changed in the 1980s and particularly in the 2000s, when several events increased the appetite of investors for gold (mining) (de los Reyes 2017). Prime among these events were the signing of the Central Bank Gold Agreement[2] in 1999 and the financial crisis of 2008–2009. This investment bonanza was particularly apparent in the risky exploration segment of the gold mining industry. Spurred on by a rapid expansion of exploration budgets, so-called junior mining firms increasingly moved into risky gold mining destinations, in the hopes of finding promising ground and attracting the attention of major mining companies (Tsing 2003; Dougherty 2013; Majury 2014; Luning, this volume). We will return to these issues in more depth in Chapter 5.

A second factor that facilitated the global expansion of industrial gold mining was regulatory change. The long investment horizon in the mining industry, combined with the fact that the fixity of gold deposits forces companies to go wherever the gold is, greatly increases the importance of having a stable and investor-friendly regulatory environment (Humphreys 2018). From the 1990s onward, a growing number of governments in (soon to become) new gold mining destinations started adopting investor-friendly mining regimes in an attempt to attract foreign investment. In many cases, these reforms were part of a broader package of structural adjustment reforms that were championed by international lenders (Campbell 2009). According to Bridge (2004: 407–408), these regulatory changes profoundly altered the ways in which mining companies perceived risk in new mining destinations. Yet regulatory innovations did not remain confined to new gold mining destinations. Instead, governments in traditional mining destinations like Canada (Heidrich 2016; Dougherty 2016) and Australia (Maponga and Maxwell 2000) were not only attempting to rejuvenate their own mining industry, but also started to support its outward expansion through various fiscal and regulatory

incentives. In the case of Canada, Dougherty (2016) has even argued that the Canadian government has erected a full-blown "mineral resource protection network" that serves the interests of the thousands of mining companies listed on the Toronto Stock Exchange (TSX). The nascent Chinese gold mining industry, likewise, has benefited from the government's "resource-led diplomacy" (Wong et al. 2013) and various measures under the banner of the "Belt and Road Initiative" (World Gold Council 2018b).

Third, while the mining industry is a slow adopter of new (technology) (Clifford et al. 2018), technological innovations throughout the gold production cycle have greatly improved the efficiency and profitability of gold mining, which in turn facilitated its expansion into frontier zones. In addition to the rise of digital mines and the increased availability of bigger and better mining equipment, the advent and subsequent improvement of cyanidation methods in gold processing has radically improved the profitability of gold mining. We return to these and other technological innovations in more depth in Chapter 5.

3.4.2 Threats: Resistance and Costs

The global expansion of industrial gold mining has not gone uncontested. In response to rising gold prices and growing concerns over the social and ecological impacts of mining, a growing number of governments are now (partly) relinquishing on their efforts to liberalize mining and are instead imposing new forms of regulation. In some cases, governments are renegotiating contracts with mining companies or may even decide to nationalize mining operations in a bid to re-assert national control over mineral resource wealth (Humphreys 2018). While this trend toward resource nationalism is typically associated with Latin American countries like Venezuela and Bolivia (Kohl and Farting 2012), a similar trend has periodically surfaced in sub-Saharan countries such as Tanzania, South Africa (Bothma 2018), and Uganda (Fisher et al., this volume); and in Asian countries like the Philippines (Chaloping-March 2014) and Indonesia (Junita 2015). The expansion of gold mining—particularly where it concerns large open-pit mines—is also generating increased resentment from local (indigenous) communities and civil society organizations (e.g., Rasch 2012; Luning, this volume). This resistance may be driven by various factors, but often revolves around the distribution of risks and benefits associated with mining (Conde 2017). In places like the southern

Philippines (Verbrugge 2015) and the eastern DRC (Verweijen 2017), this resistance may intersect in complex ways with the broader dynamics of armed conflict. In cases like South Africa, with its long tradition of labor-intensive underground mining, resistance primarily takes the form of labor unrest. Mining companies respond to this resistance by adopting various measures under the broad banner of "corporate social responsibility" and "social license to operate," but also by deploying different (and sometimes violent) counter-resistance strategies (Geenen and Verweijen 2017). In short, in a growing number of mining destinations, industrial mining now has to contend with a political backlash, which greatly increases investor risk. Each year, the Fraser Institute publishes a "Survey of Mining Companies," which provides a good indication of how investors perceive risk in particular countries. While low-risk destinations include countries with a strong state and a liberal mining regime, high-risk destinations are typically characterized by higher degrees of political instability and/or by more restrictive and unstable regulatory regimes. Prime examples include several of the new mining destinations listed in Table 3.1 (and included as case studies in the second part of this book), such as the DRC, Zimbabwe, and the Philippines.

A second structural challenge for the gold mining industry is rising cost pressures. While costs in gold mining are notoriously difficult to calculate, O'Connor et al. (2015) suggest that the average cost to produce an ounce of gold has increased from approximately USD 200 in 2003 to approximately USD 1000 in 2013. The World Gold Council (2018a) has estimated that gold production costs have increased with nearly 10% on an annual basis between 2003 and 2018. Underlying this increase in production costs is the growing scarcity of gold: As remaining reserves are more difficult and therefore more expensive to extract, they require growing inputs of energy, technology, and labor. Moreover, the global expansion of gold mining has led "to the opening of previously unprofitable mines increasing the average production costs" (O'Connor et al. 2015: 195). Once prices started to drop after 2011 and investors started to retreat into established mining territories, mining companies were left with these costly projects. Alongside these more structural trends, and depending on the specific context in which gold miners operate, production costs may be increased further by other factors, such as currency fluctuations, rising energy costs, fiscal costs, or rising labor costs (a problem that is particularly pronounced in South Africa). In response to these rising cost pressures, which became particularly acute during the fallout of the global

gold mining boom, the gold mining industry entered a period of rationalization (de Los Reyes 2017). In addition to trimming exploration budgets, mining companies introduced measures to reduce labor costs and increased reliance on outsourcing and subcontracting (see Chapter 4). This logic of rationalization was reinforced by investor preferences for "downsize and distribute" (to increase short-term returns), rather than "retain and reinvest" (Ibid.). Many mining companies also opted to sell of peripheral activities and to retreat (partly) into "tried and tested jurisdictions" like the United States or Canada.

While increased resistance and rising costs are posing obvious challenges to the global gold mining industry, they have not (yet) led to its unraveling. Instead, a steady rise in gold prices that started in early 2019 has re-ignited investor interest (Biesheuvel 2019). Moreover, at least in some countries, we are witnessing the rise of new players: In addition to the rise of new private and state-owned mining companies in countries such as Kazakhstan and Mexico (Humphreys 2018), several of the chapters in this book add to growing evidence of a rapidly expanding Chinese presence in new gold mining destinations.

3.5 The Unrelenting Expansion of ASGM

So far, we have focused on the global expansion of gold mining, from its historical core into new gold mining destinations. Yet in many of these new gold mining destinations, the expansion of industrial gold mining has been accompanied by a strong expansion of ASGM. While estimates about production levels in ASGM are notoriously unreliable (not least due to widespread informality), it is widely acknowledged that ASGM is responsible for approximately one-fifth of global mine production (IGF 2017). Seccatore et al. (2014) have made a rare attempt to estimate ASGM-production levels in different countries. In Table 3.2, we contrast their figures with figures for total gold mine production in US geological surveys for all the countries listed in Table 3.1 (top-30 gold producers) that were included in Seccatore et al.'s estimates. Despite the many question marks that hover over the USGS figures, and particularly over the estimates made by Seccatore et al.,[3] Table 3.2 does provide us with a rough indication of the absolute and relative importance of ASGM for each of the countries listed.

Table 3.2 demonstrates that in absolute terms (column 2), ASGM-production is highest in China (48 tons), followed by three Latin

Table 3.2 Official gold production compared to ASGM-production

	Gold mine production, 2011 (in tons) (Source *USGS 2012)*	*Estimated ASGM-production, 2011 (in tons)* (Source *Seccatore et al. 2014)*	*Ratio ASGM-production /official gold production (in %)*
China	403	48	8.4
Peru	166.2	40	24
South Africa	180.2	17	9.4
Mexico	84.1	0.9	1
Indonesia	96.1	20	20.8
Brazil	65.2	21	32.2
Ghana	82.9	4,1	4.9
PNG	61.8	2-5	3.2-8
Tanzania	44	2-3.5	4.5-8
Colombia	55.9	41.4-50.8	74.1-90.9
Mali	35.7	1,7	4.8
Burkina Faso	31.8	0.5-1	1,5-3.1
Philippines	31.1	28	90
Chile	49.9	5	10
DRC	3.5	5	142,9
Zimbabwe	12.8	2.8	21.9
Guyana	11.3	7.6	67.3
Guinea	15.7	6	38.2
Venezuela	12	7	58.3

American countries (Colombia, Brazil, Peru), all of which have ASGM-production levels of at least 40 tons. In relative terms, the importance of ASGM-production as a share of total mine production is highest in the DRC, where ASGM-production actually outweighs official mine production. In four countries (Colombia, Philippines, Guyana, Venezuela), ASGM-production amounts to 50–100% of official mine production, whereas in five countries (Peru, Indonesia, Brazil, Guinea, Zimbabwe) it amounts to 20–50%. Again, it should be noted that these estimates may be hampered by methodological problems and are outdated. For instance, in the case of Zimbabwe, Mkodzongi (this volume) notes that in 2018, ASGM-production (approximately 20 tons) was considerably higher than official mine production (approximately 12 tons). A similar situation exists in Ghana, where production from ASGM may now account for 41.4% of

total gold production (Crawford and Botchway, this volume). Yet available empirical evidence for most countries points in a similar direction: The importance of ASGM is growing rather than diminishing.

3.6 Conclusion

This chapter has demonstrated how, in response to increased demand, rising prices, and the looming threat of scarcity, gold mining has moved from its historical core into a geographically wide range of new gold mining destinations. In the case of industrial gold mining, this global expansion was facilitated by different factors notably, increased investor appetite, regulatory incentives, and technological innovation that enable the profitable extraction of gold at an industrial scale in increasingly remote environments. Yet the gold mining industry is now facing a number of systemic challenges, including a political backlash and rising cost pressures. We ended with the crucial observation that in many new gold mining destinations, the global expansion of industrial gold mining has been accompanied by, and in some cases even eclipsed by, a strong expansion of ASGM. As we will demonstrate in the following chapter, this expansion of ASGM should be seen as the product of a second structural trend in global gold production: the growing importance of informality.

Notes

1. For more information see https://www.gold.org/about-gold/gold-facts.
2. The Central Bank Gold Agreement or CBGA put a cap on the sales of gold by European central banks, which defused the threat of additional gold supplies.
3. In addition to potential methodological issues with the estimates made by Seccatore et al. (2014), the data in Table 3.2 are clearly outdated. This explains why there may exist significant discrepancies between ASGM-figures in Table 3.2 and the numbers provided in several of the case studies in the second part of the book. In the extreme example of Ghana, whereas Seccatore et al. put ASGM-production for 2011 at 4,1 tons, Crawford and Botchway (this volume) suggest that it might be more than 27 tons. Available estimates also suggest that ASGM-production in most if not all countries has notably expanded since 2011 (IGF 2017). Figures from the USGS mineral yearbooks are also prone to a significant degree of distortion. For instance, while some countries explicitly include (Brazil, Peru)

or exclude (Ghana, Tanzania) ASGM-production from official mine production, production figures for three countries (China, Venezuela, DRC) are based solely on estimates. Finally, in many of the countries listed here, a substantial share of ASGM-gold is smuggled illegally outside of the country and consequently may not appear in the estimates.

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