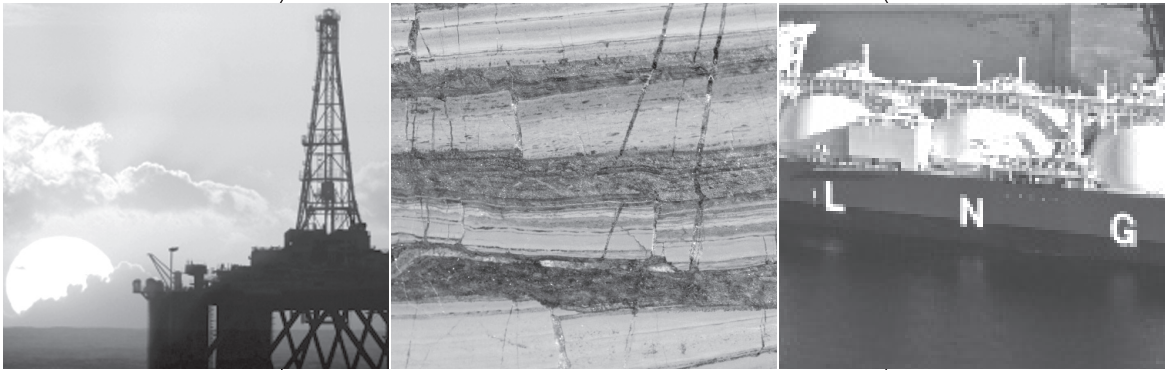


The Contribution of the Mining Sector to Socioeconomic and Human Development



Gary McMahon
Susana Moreira

Contents

Abbreviations	iv
Abstract	v
Executive Summary	vi
1 Introduction	1
2 Literature Review on Natural Resources and Socioeconomic Growth	3
3 Human Development and Governance in Mineral-Rich Countries	11
4 Increasing the Benefits from Mining Operations	31
5 Conclusions and Recommendations	45
6 References	47
Annex 1	51
Annex 2	51
Annex 3 Additional or Expanded Tables	52

Abbreviations

AIA	Association of Antofagasta Industries
CODELCO	National Copper Corporation of Chile
CORFO	Chilean Economic Development Agency
CSR	Corporate Social Responsibility
FDI	Foreign Direct Investment
FI	Freeport Indonesia
GEM	Special Mining Contribution (Peru)
GDP	Gross Domestic Product
HDI	Human Development Index
HDSA	Historically Disadvantaged South African
ICMM	International Council on Mining and Metals
IEM	Special Mining Tax (Peru)
IPN	Nemangkawi Mining Institute
MDG	Millennium Development Goals
NGO	Nongovernmental organization
OPEC	Organization for Petroleum Exporting Countries
PMSP	Mining Program of Solidarity with the People (Peru)
SERCOTEC	Service for Technical Co-operation (Chile)
SLP	Social and Labor Plan (South Africa)
SME	Small and Medium Enterprises
SSA	Sub-Saharan Africa
UNCTAD	United Nations Conference on Trade and Development
UNDP	United Nations Development Programme
Valco	Volta Aluminium Company
VRA	Volta River Authority
WGI	World Governance Indicators

All dollars in this report are U.S. dollars.

Abstract

Many low- and middle-income mineral-rich countries have experienced strong growth for a decade or longer, propelled by a rapid expansion of their mineral exports and a rise in prices of these commodities. This sustained strong economic performance goes against the accepted wisdom that even though the mining sector, like other extractive industries, can generate foreign exchange and fiscal revenues, it contributes little to sustained economic growth and, by extension, human development. Through the presentation of trends and patterns of various indicators, this paper shows that in addition to economic growth, countries rich in minerals other than oil have experienced significant improvements in their Human Development Index (HDI) scores that are on average better than those experienced by countries without minerals. The same is true for the education and health components of the HDI. Improvements in attaining the Millennium Development Goals (MDG) were strong and similar to countries without mineral resources. While improvements in governance have been small, there has not been a widespread deterioration as predicted by the natural resource curse.

In a sample of five low- and middle-income countries with relatively long histories of mining, benefits came from foreign direct investment (FDI), export revenues, and fiscal revenues. The overall impact of the mining sector was much stronger if there were infrastructure benefits and strong linkages to other industries, especially through domestic procurement. Contrary to the notion that there are no jobs in mining, in this small sample, employment related to the mining sector was very high in countries where linkages were strong, even before the multiplier and fiscal expenditure impacts were accounted for. Cooperation between the public and private sectors seemed essential to increasing such linkages. In addition, mining firms often made substantial contributions to local and regional development, at times due to legal requirements but often not. All five countries have either relatively high HDIs (compared with neighboring countries) or strongly improving HDIs.

Executive Summary

Introduction

Many low- and middle-income countries have benefited from the commodity super cycle underpinned by China and, to a lesser extent, India. They all have experienced strong growth rates for a decade or longer, propelled by rapid expansion and increasing prices of the minerals they export. The sustained strong economic performance of these countries goes against accepted wisdom, which states that while the mining sector, like other extractive industries, can generate foreign exchange and fiscal revenue, it contributes little to sustained economic growth and, by extension, human development. In fact, it is argued that mining might even have a negative impact by increasing inequality, causing environmental damage that destroys other livelihoods, fostering corruption and rent seeking, and supporting nondemocratic regimes. This is not the first time empirical evidence contradicts the “natural resource curse” hypothesis, however. Botswana, the most mineral-dependent country in Sub-Saharan Africa, has been one of the fastest-growing countries in the world for decades and has the highest HDI. Chile, the most mineral-dependent country in South America, has not only been the fastest-growing country in its region for the past 20 years, but it also scores highest on that region’s HDI. In earlier times, the United States, Sweden, Canada, and Australia all leveraged their mineral wealth for sustained and substantive economic development and strong HDIs; in the latter two countries, the mining sector continues to play a leading role in economic growth more than a century after it rose to prominence.

This paper does not aim to prove or disprove the resource curse but provides evidence that most low- and middle-income mineral-dependent countries have avoided it in the 21st century, and that mining-sector growth has been important in the overall growth of many countries. Moreover, this growth has not come at the expense of human development, and its impact on governance has been mixed. In countries with longer mining histories, often where reforms began the earliest, impacts on employment have been fair to very strong. Using a sample of five

low- and middle-income countries with relatively long mining histories, the paper also describes and analyzes the different channels through which mining operations can impact development and have done so already; it also investigates under what circumstances and policy frameworks the mining sector has been able to act as an engine of sustained and widespread socioeconomic growth in low- and middle-income countries.

The Natural Resource Curse

For centuries, it was generally believed that a large natural resource endowment was beneficial to a country's development. Since the 1950s, however, opposition to this conventional wisdom has been brewing, at first focusing on the downward secular trend in commodity prices and the limited linkages from primary product exports to the rest of the economy, associated with Prebisch (1950) and Singer (1949). In the 1970s, the rent-seeking behavior induced by natural resource riches rose to prominence (Krueger 1974), soon to be accompanied by the vagaries of Dutch disease (*Economist* 1977), which argued that resource abundance often killed off the parts of the economy that were more innovative, and had more linkages and greater technological externalities.

However, it was likely the rise in the 1970s and '80s of the resource-poor "Asian tigers"—Hong Kong, Singapore, South Korea, and Taiwan—in contrast with countries rich in resources, especially oil—that led to a general rethinking of the role of natural resources. A number of empirical studies—including Gelb (1988), Auty (1990), Sachs and Warner (1995, 1997)—showed that countries with abundant natural resources, particularly nonrenewables, fared both much more poorly than they should have and in comparison to less well-endowed countries at similar stages of development. By the late 1990s, the natural resource curse became the accepted wisdom, leading to a large and expanding literature that tried to verify it or explain why it happens. While some of these explanations were economically oriented—e.g., Dutch disease and export price volatility—sociopolitical effects dominated the discourse. A large part of the research associated with this approach concentrates on pathologies intrinsic to countries that are dependent on natural resources, including rent seeking, corruption, lack of democracy, and conflict.

Despite its popularity, the literature that promotes the natural resource curse has been under growing criticism by those who dispute some of the earlier empirical results and others who argue that it is too deterministic. Curiously, so far there has not been much emphasis on the fact that

many—if not most—of the fastest-growing countries in the world since 2000 have been resource-rich countries, particularly in Sub-Saharan Africa. Moreover, even in the highly diversified economies of China, India, and especially Brazil, mining and industries linked to mining have been important sources of growth in this century.

Nevertheless, despite its limitations, the resource curse approach has brought much-needed attention to the developmental differences across countries and has helped accumulate substantial amounts of data on a variety of different development paths. By underscoring the pitfalls of natural resources, this approach may also help countries develop better-informed and more sustainable policies.

Growth, human development, and governance in mineral-rich countries

The performance of mineral-dependent countries in the past 20-plus years is presented in this section. The authors do not undertake econometric analysis, but show trends and patterns in various measures of growth and human well-being. While causal linkages are not analyzed, in the next section a deeper presentation is made of five relatively successful middle-income mining countries.

The most recent commodity boom began in 2003. Unlike previous booms, this one has been broad-based and sustained, with the prices of most commodities rising sharply and remaining high until the world financial crisis erupted. While the 22 mineral-dependent low- and lower-middle-income countries had the lowest average growth rate of gross domestic product (GDP) from 1991 to 2000 (compared with non-mining countries and global averages), from 2001 to 2010, mining-dependent low-income and lower-middle-income countries posted higher average GDP growth rates than comparable non-mining countries. Furthermore, the subset of countries that had undergone mining-sector reform had an even stronger average growth rate. From 2007 to 2011, mining low-income and lower-middle-income countries outperformed all other groups by 0.8 percent annually. In Sub-Saharan Africa (SSA) mining countries grew, by 1.3 percent annually, more than non-mining/oil countries from 2001 to 2010 and 1 percent more from 2007 to 2011.

Mineral-dependent low-income and lower-middle-income countries' HDI performance outperformed that of their income cohorts for all periods, even when GDP growth rates were lower. Moreover, while mining and non-mining low-income and lower middle-income country classifications experienced higher rates of HDI improvement than the world

average from 1991 to 2010; since the global financial crisis in 2007, only mineral-dependent low-income and lower-middle-income countries posted higher rates than the world average.

With respect to progress in health and education measures in the HDI, mineral-dependent low-income and lower-middle-income countries have outperformed their income peers since 2000, particularly when comparing 2007 to 2012, except for education from 2000 to 2010. In addition, low- and lower-middle-income mineral-dependent countries outperformed the world average, except when comparing health scores from 1990 to 2000. This trend becomes particularly apparent when comparing 2000–10 and 2007–12 data. The above suggests that mining-dependent low- and lower-middle-income countries have begun the long road to bridging the disparity gap and increasing access to quality health and education services. Moreover, it demonstrates that mineral-dependent countries have not been ignoring health and education during the mineral price boom and that there is at least some sharing of the benefits, in contrast to pre-2000 empirical results—e.g., Gylfason (2001)—that showed various education levels being inversely related to resource abundance. The good to rapid progress on the Millennium Development Goals (MDGs) of most mineral-dependent countries, which has been similar to nonmining countries—reinforces these conclusions.

With respect to governance—and contrary to what the resource curse theory argues—mineral-dependent countries do not perform significantly differently in governance indicators than non-mining countries in the same income cohorts. On average, for the six widely used World Governance Indicators (WGI)—voice and accountability, political stability and absence of violence, government effectiveness, regulatory quality, rule of law, and control of corruption—mineral-dependent countries in 2010 had slightly higher scores than their nonmining cohorts on two indicators, the same on one, and slightly lower on three indicators. More importantly, low-income and lower-middle-income mining countries have experienced particularly positive developments in their voice and accountability, regulatory quality, and rule of law in recent years. On five of the six indicators, mineral-dependent countries showed greater improvement from 2003 to 2010 than their counterparts without minerals, precisely at the time that their governance indicators should have been deteriorating according to the natural resource curse theory. Nevertheless, the overall improvement in governance from quite low levels has not been very large. This suggests that if sustainability is to take hold, there is still a great deal of work to do.

Increasing the impacts from mining operations

Many countries receiving substantial direct benefits from mining operations, including fiscal revenues, want the sector to contribute much more to the overall industrialization and employment levels of the country through linkages, infrastructure investment, and community and regional development. Accordingly, the impacts of the mining sector on the social and economic development of five countries—Chile, Ghana, Indonesia, Peru, and South Africa—were analyzed in order to investigate the success of these countries in enhancing the sector's impacts. The countries were chosen because they have had relatively long mining histories and could generate recommendations for the bulk of the low- and low-middle-income mining countries for which most of the indirect benefits have been relatively weak. With the exception of South Africa, these countries had greatly expanded their mining sectors since either the early 1990s (Chile and Ghana) or the early 2000s (Indonesia and Peru).

The mining sector is an important export sector for all five countries. The net impact on foreign exchange, however, is much higher for Chile, Peru, and South Africa given that large portions of the great amount of inputs required by mining companies are bought domestically in these countries, with much lower levels of domestic sourcing in Ghana and Indonesia. Mining investment is by far the largest source of FDI in Chile, Peru, and South Africa. Historically, it has been just as dominant in Ghana, although in recent years FDI in the oil sector has surpassed that in the mining sector. In Indonesia, mining FDI has been relatively less important, but it has been increasing rapidly in recent years. Taxes as a percentage of total revenues range from very low in South Africa to very high in Peru, with the other countries in between. However, even in South Africa the amount of tax revenue ultimately dependent on the prosperity of the mining sector is likely to be quite substantial given the large amount of domestic sourcing done by its very large industry, as well as sales of inputs to other African countries, and the taxes paid by its large mining workforce.

The mining sector's total impact on socioeconomic and human development in a country is determined partially by the size and composition of the sector, partially by the amount of fiscal revenue generated and how it is used, and partially on how it contributes to overall industrialization of the country—i.e., the sector's ability to serve as an “engine of growth.” South Africa is the only country in this small sample with substantial downstream linkages to manufacturing from the mining sector. Nevertheless, it is clear that there are major spin-off opportunities

available from a large mining sector, particularly from local sourcing and beneficiation. While the latter is the most obvious, the big gains in value added, employment, and learning by doing are likely to come from the former, particularly because many of the skills needed by companies selling goods and services to mining operations—such as machine repair and servicing, tubing, construction, industrial clothing, and catering—are easily transferable to other industries. Chile has moved from a situation in which most goods and services bought by the mining and related industries were imported to one in which it is now becoming a regional supplier, employing about 10 percent of the workforce (720,000 jobs). The next step is to try to break into global markets; in 2011 the Ministry of Mining joined with large mining companies to establish a program to transform 250 Chilean-based firms into world-class suppliers by 2014. In Peru, there were an estimated 709,000 jobs in mining service industries in 2011, a number expected to rise substantially given the planned \$54 billion of investment from 2012 to 2015.

Large mining projects often bring infrastructure with them. This can then be used by other industries, but among the five countries studied, mining companies have contributed significantly to regional or national infrastructure in just Chile and Peru. The infrastructure demands of the mining companies have been limited in the other countries—such as in Ghana’s gold-mining industry—or there has not been an organized attempt to achieve large-scale cooperation. In Chile, in addition to acting as a base customer for infrastructure projects, the mining industry is undertaking a series of investments in water supply projects valued at \$7.7 billion in desert mining regions II and III. While there is a growing push for new large mining projects to coordinate their infrastructure development with national or regional infrastructure plans, the shape of such future “natural resource corridors” is still to be determined.

In the sample, corporate contributions for local development, either directly or through foundations, are high in all five countries, while local infrastructure development is medium or high in all but Ghana. Legislation to support local development varies widely across the sample, from weak in Chile and Indonesia to very strong in Peru through voluntary taxes that partially target local development. South Africa uses programs intended to benefit historically disadvantaged groups. Nevertheless, in Chile and Indonesia there are a number of programs that have been developed by companies, governments, and research institutions that have contributed enormously to local development. The situation with respect to targeting mining taxes to local communities is similar to legislation, from nonexistent in Chile to extremely high in Peru.

All five countries have either relatively high HDIs (compared to neighboring countries) or strongly improving HDIs. The HDI has remained stagnant only in South Africa, the only country where the mining sector has not shown strong growth in the past decade. The inequality trends are very diverse, from medium and improving in Peru to very high and increasing in South Africa. While rapid growth is normally associated with worsening inequality, inequality levels in Ghana and Peru—two of the fastest-growing economies since 2000—are moving in opposite directions from similar starting points. Clearly further analysis would be necessary to understand what is driving inequality measures in each country.

Similarly, the natural resource curse predicts that strong mineral dependence will result in deteriorating governance. But the sample countries show quite diverse results: Three of the five countries are above their regional averages, two of them well above, while the trend for two countries is stagnant, for two others is improving, and for one is declining. Again, as with human development and inequality, since at least the turn of the century there does not seem to be ‘path dependence’ on governance for countries with large mineral endowments.

What lessons can “newer” low- and middle-income mineral-rich countries take from the five countries in the sample about increasing the benefits, including employment, from their mining sectors? Perhaps the clearest lesson is that it is not going to happen on its own—that is, due to market forces alone. Nevertheless, the failed experience of many import-substitution plans suggests that linkages cannot be forced upon the mining sector without enabling business conditions. These include access to power and transport infrastructure, adequate human capital, access to financial capital, economies of scale, and outreach or technical assistance programs. The second biggest lesson may well be that public-private cooperation is required to kick-start the process. The experience of Chile is perhaps the most appropriate. In that country, a mature mining sector began to develop extensive domestic linkages only after a series of public-private programs began in the early 1990s.

Conclusions and recommendations

Since the turn of the century, most low-income and lower-middle-income mineral-rich countries have had high growth rates led by their mining sectors, despite the global financial crisis. For most of these countries, the present decade will likely have more of the same. With respect to growth, the natural resource curse as it pertains to mineral-rich countries does not seem to have been widespread for the past two decades. The

rapid growth of the mining sector was partly due to high mineral prices but also to major revisions to mining policies, institutions, and capacities—the fastest-growing countries were those that reformed or began the reform of their mining sectors before the boom began. Moreover, many of the fast growers saw their mining sectors begin to grow rapidly even before the boom in mineral prices, following comprehensive mining sector reform. Few of these countries, however, can be said to have gotten definitively past some turning point where a decade of low mineral prices would not result in stagnation. In some cases, this may be because the country's mineral-sector reform has outpaced its general socioeconomic reform, and there is still a danger that the latter might pull down the former. Nevertheless, many if not most mineral-dependent low- and lower-middle-income countries are putting more emphasis on increasing the benefits from the mining sector. They are doing this particularly through spin-off industries and using higher levels of fiscal revenues to build infrastructure and develop human capital, which in turn will lead to the development or expansion of other industries unrelated to mining. While there has been substantial progress on fiscal issues in recent years, programs and policies to increase linkages and employment and better manage large-scale infrastructure are just beginning in most of these countries.

For this same group of countries, the level of well-being, as measured by the Human Development Index, has shown strong improvement over the prolonged rapid growth period, faster than countries not dependent on extractive (mining or oil) industries, and substantially more in the past five years. These results largely hold when the HDI is decomposed into its education and health components. Mineral-dependent countries have also made strong progress in attaining the MDGs albeit at about the same rate as countries without mineral industries.

Finally, it is clear that mineral-rich countries can get more out of their mining sector than mines—and this can be seen without going back in history to cases like Australia, Canada, Sweden, and the United States. In many countries, substantial linkages and employment have been developed from mining operations, and tax revenues are increasing to build national and local capital, both physical and human. Mining firms have usually been partners in the attempt to move the industry from an enclave status to an “engine of growth,” sometimes voluntarily, other times due to legal requirements. Many other countries are currently trying to do the same, although given that many of them are smaller in geographic size, with fewer mines, their success may depend on the ability to develop regional or subregional markets—which means cooperation

on trade barriers, infrastructure, and the development of training and educational institutions. These are strong challenges and not likely to succeed without overall deepening of socioeconomic reforms. Still it might be true that in some countries the success of the mining sector and related industries might lead to general reform, rather than the other way around.

Introduction

In 2011, Mongolia's exports of copper and iron ore were a record \$1.4 billion. In 2014, it is estimated that export revenues from the mining sector, including coal, will be \$6–7 billion. While a sizable share of profits arising from these exports will be repatriated, the country's government has argued that the mining boom will help Mongolia's GDP (\$6.2 billion in 2010) triple over the course of this decade and transform the economy and the lives of Mongolians, a third of whom still live under the poverty line.

Mongolia is just one of many low- and middle-income countries that has recently benefited from the commodity super cycle underpinned by China and, to a lesser extent, India. These countries all have experienced strong growth rates for nearly a decade, often longer, propelled by a rapid expansion of their mineral exports and a rise in prices of these commodities. The sustained strong economic performance of these countries goes against the accepted wisdom that, while the mining sector, like other extractive industries, can generate foreign exchange and fiscal revenue, it contributes little to sustained economic growth and—by extension—human development. In fact, it is argued that mining may even have a negative impact by increasing inequality, causing environmental damage that destroys other livelihoods, fostering corruption and rent seeking, and supporting nondemocratic regimes. This is not the first time empirical evidence contradicts the “natural resource curse” hypothesis, however. For instance, after analyzing the growth trajectories of a large number of resource-dependent countries Stevens (2003) concluded that “in some cases, oil, gas and mineral projects have contributed to economic progress. A negative impact is by no means preordained.” Chile is one of the strongest examples of this result given that this highly mining dependent South American country had the highest HDI in the region in 2010. In earlier times, the United States, Sweden, Canada, and Australia all leveraged their mineral wealth for sustained and substantive economic development and strong HDI. In fact, in the latter two countries, the

mining sector continues to play a leading role in economic growth more than a century after it rose to prominence.

This paper does not aim to prove or disprove the resource curse or prove that it is beneficial to have a large amount of mineral wealth. Its purpose is to prompt further analysis on the causal links underlying this prevalent explanation given the apparent extended success of many mineral-rich countries since the turn of the century. It will present evidence of a varied nature on how low-income and low-middle-income mineral-rich countries have fared in the past two decades, as well as show that the number of channels through which mining operations can impact development and have done so already is broadening in number and scope. The paper will also investigate under what circumstances and policy frameworks the mining sector has been able to act as an engine of sustained and widespread socioeconomic growth in low- and middle-income countries. This is intended to promote a better understanding of the circumstances in which mining wealth results in positive or negative consequences, which could lead to more effective development strategies.

The rest of the paper is organized as follows:

- Section 2 reviews the evolution of the literature on the relationship between natural resources and growth.
- Using cross-sectional data, Section 3 presents trends and patterns over the past 20 years in various indicators of economic growth, human development, inequality, and governance for mineral-rich low-income and lower-middle-income countries and otherwise similar countries that lack mineral resources. The authors do not undertake econometric analysis of these changes, although the basic data can be seen as an invitation for future work in this direction.
- While causal analysis of these developments is not undertaken, Section 4 contains an analysis of the types of programs and policies that have been followed in a small sample of relatively successful mineral-rich countries that have been able to increase, to varying extent, the benefits from mining and to use the sector as an “engine of growth” for the economy. Lessons on how to increase mining sector benefits for newer or less advanced mineral-rich countries are distilled from the experiences of these countries.
- The paper concludes with a summary and elaborates on the policy implications of the research findings.

Chapter 2

Literature Review on Natural Resources and Socioeconomic Growth

This section presents a critical survey of the literature on the relationship between natural resources and socioeconomic growth. It starts with a brief discussion of how this view has evolved over time. It then focuses on its most prominent subliterate, the “natural resource curse” literature.¹

Natural resources: from engine of growth to source of underdevelopment

For centuries, it was generally believed that having large natural resource endowments was beneficial to a country’s development. Since the 1950s, however, opposition to this conventional wisdom has been brewing. At first, this opposition was based on the observations of Prebisch (1950) and Singer (1949) of a downward secular trend in the terms of trade between the “center” and the “periphery.” This was coupled with concern over the limited economic linkages from primary product exports to the rest of the economy.² Krueger (1974) coined the term “rent seeking” in writing about instances when economic actors gain wealth by increasing their share of a fixed amount of wealth (land, other preexisting natural resources, and so on). The net effect of this process reduces the sum of social wealth, as resources are expended but no new wealth is created. Shortly thereafter, the *Economist* (1977) published an article, “The Dutch Disease,” which attributed the troubles of the Dutch economy in the 1960s to three causes: high industrial costs, strong currency, and use of

1 A greatly extended version of this section is in annex 2, which is available online at <http://www.worldbank.org/en/topic/extractiveindustries>.

2 See Harvey et al. (2010) for a review of the evidence on the Prebisch-Singer hypothesis.

government gas revenues to increase spending rather than investment. Natural gas revenues were not only being poorly allocated, according to the authors of the article, but they were also responsible for the strong guilder, which in turn eroded the competitiveness of Holland's exports in areas other than natural gas. Nankani (1979) went a step further when, based on various economic indicators from countries with and without mining, he concluded that mineral economies performed relatively poorly in terms of agricultural growth, export diversification, and inflation compared with non-mineral economies and were more likely to be characterized by poor savings performance, greater technological and wage dualism, high unemployment, high external indebtedness, and high export savings instability.

Despite this growing body of literature questioning the role of natural resources, the view that they were a "blessing" still dominated both public discourse and scholarly research until the early 1990s. At that time, two major developments led scholars and policy makers to rethink the role of natural resources. On one hand, the oil price windfalls of the 1970s did little to advance socioeconomic development in most oil-exporting countries. Many OPEC countries, for instance, spent their petrodollars on construction projects that required imported equipment and skilled foreign workers, but did little to create local jobs or to diversify their economies. On the other hand, the rise of the resource-poor "Asian tigers"—Hong Kong, Singapore, South Korea, and Taiwan—in the 1970s and 1980s proved that rapid economic growth could occur without large natural resource endowments.

One of the first to react to these developments was Gelb (1988: 136), who coined the expression "resource curse." In his analysis of the impact of the 1970s' oil windfalls on oil-exporting countries he observed, "From 1974 to 1981 average growth rates were well below what would have been predicted by a simple neoclassical model, given the size of the investment boom in relation to either the past experience of the individual countries or the performance of developing countries in the 1960s." Furthermore, "a great proportion of the potential gains to the exporters in this study were nullified by a combination of the changes induced in the global economy by the oil shocks and the poor economic policies of the exporters themselves during the period. Together, these seriously reduced the efficiency with which the countries used their resources, as judged by their own criteria of diversification and growth. To some extent, policy errors reflect a generally incautious approach to greater global uncertainty, but the abundance of oil wealth seems to have encouraged a deterioration over and above this" (Gelb, 1988: 143). In

the end only countries, such as Indonesia, that had relatively strong policy and institutional features prior to the oil boom were able to use the oil revenues effectively (Gelb, 1988: 223).

Auty (1990) analyzed the results of resource-based industrialization (RBI) for several countries and found that countries underestimated the risks associated with large capital-intensive projects and that many RBI plants were poorly implemented and became uncompetitive when prices fell below forecast levels. Like Gelb's, Auty's research underscored the importance of policy in growth generation as it determines whether or not natural resources are used effectively.

Although the work by Gelb, Auty, and others garnered some attention, the concept of the "resource curse" took off only after Jeffrey Sachs and Andrew Warner (1995) established that natural resource abundance was negatively correlated with economic growth. In their follow-up article, Sachs and Warner (1997: 26) concluded, using a sample of 95 countries, that "there has been an inverse association between natural resource intensity and growth between 1970 and 1990." They found that the effect remained when they introduced alternative measures of natural resource abundance.

Natural resource curse

Following the publication of Sachs and Warner's empirical study, the commonly accepted view of natural resources shifted, and the natural resource curse became the accepted wisdom, leading to a large and expanding literature that tried to verify it or explain why it happens. Auty (2001), for example, concludes that the per capita incomes of resource-poor countries grew two to three times faster than those of resource-rich countries between 1960 and 1990. Isham et al. (2003) and Sala-i-Martin and Subramanian (2003) observe that different natural resources affect growth differently. Countries dependent on point-source natural resources such as minerals and oil have more disappointing growth performances than countries with diffuse natural resource exports such as agricultural products. This is because oil and minerals often result in massive rents, a factor that generally is not the case in agricultural resources. Moreover, extractive resources are often capital intensive, while agricultural resources are labor and land intensive.

There are several different economically oriented explanations for how wealth in natural resources undermines growth, two of the most popular being the Dutch disease and the volatility of commodity markets. The Dutch disease argues that a resource boom causes the national currency

to appreciate in real terms, thus hurting exports and import-competing industries and a reallocation of resources from high-tech, high-skill intensive manufacturing industries to low-tech, low-skill-intensive primary production. The problems are that it is difficult to find a country that has had long-term negative impacts from Dutch disease and, moreover, mining is very high-tech, high-skill-intensive (McMahon 1997).

Alternatively, high dependence on a small number of exports makes countries vulnerable to volatility of international prices, which leads to wild fluctuations in fiscal policy and to general macroeconomic instability. According to Hausmann and Rigobon (2003: 2), when the “non-resource tradable sector disappears, the economy becomes much more volatile, because shocks to the demand for nontradables—possibly associated with shocks to resource income—will not be accommodated by movements in the allocation of labor but instead by expenditure-switching.” Poelhekke and van der Ploeg (2007) and Blattman, Hwang, and Williamson (2007) used cross-country data to determine the link between resource dependence, volatility, and growth. Both papers concluded that volatility is the key to growth performance and accounts to a great extent for the divergence in incomes between commodity dependent countries and the rest. Nevertheless, many analysts are not convinced that “pure” economics alone can explain the resource curse, and many researchers combine economic and sociopolitical effects and justifications in their analyses.

Sociopolitical development effects and justifications

Gelb (1988) and Auty (1990) are among the precursors of the subliterature that focuses on the links between natural resource wealth and sociopolitical development. A large part of the research associated with this approach concentrates on pathologies intrinsic to countries that are dependent on natural resources, including rent seeking, corruption, lack of democracy, and conflict. Scholars have also devoted a lot of attention to governance and institutional quality, which are widely believed to determine the impact of natural resource abundance on growth.

Lane and Tornell (1996: 214) argued that resource-rich countries tend to have lower growth rates than resource-poor countries because of the “voracity effect,” i.e., natural resources generate rents that generate rapacious rent seeking with substantial nefarious effects on the country’s political economy. Moore (2001) and others have contended that if a large share of government revenues comes from resource rents, state elites will be less dependent on citizens and therefore less accountable

to them. If leaders do not have to be accountable, states are more likely to be predatory; i.e., they will maximize the exploitation of the resource base and neglect to formulate and support policies that nurture industrialization and economic development. Auty and Soysa (2006: 7) explain that fungibility is an important characteristic of resource rents; i.e., they can be detached from the economic activity that generates them. This allows “developing country governments [to] use them either to accelerate economic development or to enrich themselves and their political clients.” Devarajan, Le, and Raballand (2010) and Gylfason (2010) both contend that weak accountability to citizens of government’s spending decisions results in below-average expenditure efficiency.

A substantial amount of effort has been dedicated to the analysis of the link between natural resource abundance and regime type. Collier and Hoeffler (2009) contend that large resource rents tend to undermine checks and balances, unleash patronage politics and undercut the benefits that normally flow from democracy to growth. However, Collier (2010: 37, 43) also argues that “the failure to harness natural capital is the single-most important missed opportunity in economic development. . . . Properly used it can lift growth and income to levels at which the risk of violence and social unrest become negligible.” Harnessing natural capital requires good governance, though. After testing his database for the impact of governance on growth Collier (2010: 44) contends, “if a country has decent governance, far from there being a resource curse, the long-run effects of high commodity prices reinforce the short-run effects. The resource curse is confined to countries with weak governance.”

Several authors have tried to tease out the governance and/or institutional factors that have been central to a country’s successful management of natural resources. Stevens (2003), for instance, argues that countries were able to avoid the negative impacts of abundant natural resources because they implemented good policies, tailored to local challenges, were willing to learn from mistakes and adopt policies to rectify error, and were also lucky. Gelb and Grasmann (2010: 18) suggest that important requirements are a strong political consensus on the need for stability, a strong and engaged technocracy, and interest groups able to act as agents of restraint on spending. They add that countries “such as Chile, Indonesia and Malaysia show that even resource-rich countries with a history of instability and fractious politics can experience windows of opportunity for good management,” hence poor institutions do not inevitably lead to poor results. Barma, Kaiser, Le, and Vinuela (2011: 4) suggest that “the credibility, quality, transparency, and accountability of policy-making processes, public institutions, the

legal regulatory climate, and sector governance are major determinants of how successfully countries can channel their resource wealth into sustainable development.”

Despite its popularity, the natural resource curse literature has been under growing criticism. So much so that one of its most famous proponents, Collier (2010: 43), recently declared, “whether an abundance of natural assets is a blessing or a curse is currently one of the disputes raging among economists.” There are now multiple studies suggesting that the Sachs and Warner findings are not robust for econometric and measurement reasons. Brunnschweiler (2008), for example, revisited the resource curse and contends that per capita mineral and fuel production had a positive effect on growth from 1970 to 2000.

Even those that agree with Sachs and Warner that the majority of resource-abundant countries have performed poorly in developmental terms, say the theory is too deterministic. Rosser (2006) maintains that the resource curse theory does not explain the considerable variation in the development outcomes experienced by individual resource-abundant countries: while many resource-abundant countries have performed poorly in economic terms, descended into violence, and developed authoritarian regimes, some have done quite well. Furthermore, Rosser argues, the resource curse fails to explain the variation in the extent to which resource-abundant countries suffer from the various political pathologies (e.g., corruption, rent seeking) that are seen as mediating the relationship between natural resource abundance and development performance.

In sum, for the past 20 years the negative impacts of the natural resource curse have dominated the debate on resource-rich economies but there are signs that times are changing. A growing number of voices accuse it of being reductionist, an oversimplification of what is an intrinsically complex phenomenon, product of the dynamic interactions between various elements within countries (companies, governments, civil society) and between those elements and the surrounding environment (foreign governments, the Organization for Petroleum Exporting Countries (OPEC), international organizations, nongovernmental organizations (NGOs)). Despite its limitations, the resource curse approach has brought much needed attention to the developmental differences among countries and has helped accumulate substantial amounts of data on a variety of different development paths. By underscoring the pitfalls of natural resources, this approach may also help countries develop better-informed and more sustainable policies. Consistent implementation of these policies is, however, no guarantee of success. As case studies have

shown, success is often associated with an element of luck, leadership, and commitment to the future—and these are hard to mimic. To further complicate matters, as will be seen in the next section, most of the world’s fastest-growing countries with respect to GDP since 2000 have been mineral-dependent countries or countries in which mining and industries linked to mining operations are very important, even such giants as India, Brazil, and China.

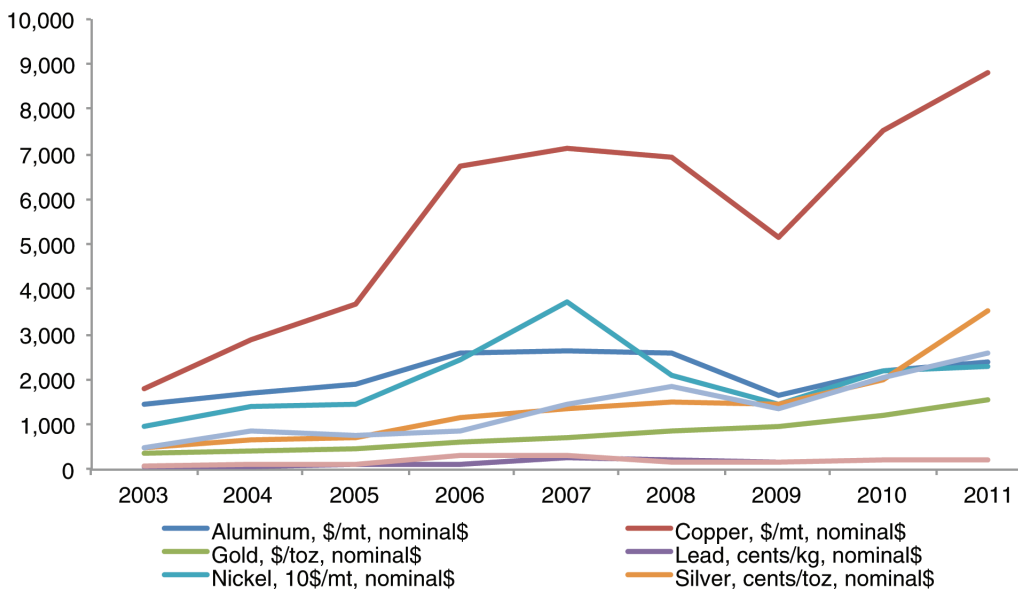
Chapter 3

Human Development and Governance in Mineral-Rich Countries

The most recent commodity boom began in 2003. Unlike previous booms, this one has been broad-based and sustained, with the prices of most commodities rising sharply and remaining high until the world financial crisis erupted. Moreover, low- and middle-income countries were well-prepared for the boom as they had recently reformed their mining sectors or were in the processing of doing so. As can be seen in Figure 3.1, minerals experienced a significant and sustained increase in prices during the commodity boom despite a dip during the 2008 global financial crisis. In this section, the impact of this price boom on the socioeconomic development of mining-dependent low and lower-middle-income countries will be described and analyzed. The trends and patterns of a selection of variables that are both an important part of a country's socioeconomic development but also easily measurable from 1990 to 2010, such as GDP growth, HDI, MDGs, and governance indicators are presented. The performance of mineral-dependent countries will be compared with otherwise similar countries that do not depend on mineral wealth.

If the mining sector is contributing little to human development in low-income and lower-middle-income countries, at least two things must be true. First, the benefits of rapid growth in many of these countries over the past decade must not be spread very widely across the population, with inequality increasing significantly. Second, the connection from mining sector development to overall socioeconomic and human development must be much weaker for current low- and low-middle-income countries than for countries such as Australia, Canada, Sweden, the United States, and Chile, where mining was (and still is in at least three of these countries) one of the main engines of growth and human development.

Figure 3.1 Selected Mineral Prices, 2003–11



Source: World Bank 2012.

Mineral dependence in numbers

The concept of mineral dependence captures the extent to which a country's economy relies on mining revenues. The mineral dependence observed in many countries is driven mainly by the fact that there are relatively few alternative forms of economic activity, as evidenced by a low per capita GDP or a low level of other exports. The state's fiscal reliance on revenues from the mining industry also depends on the size of other revenue streams, including external aid. Mineral dependence can be measured in proportion to GDP, exports, or government revenues. The standard approach, however, is to compute the ratio of mineral exports to total exports and use some cutoff value of this ratio to determine which countries are significantly dependent on mineral wealth. Export data is easy to obtain on a consistent basis for almost all countries and for relatively extended periods of time, so this approach has great merit. In an effort to maximize the size of the sample, the cutoff ratio used was an average of 20 percent of merchandise exports in 2010. The original data was cross-checked with United Nations Conference on Trade and Development (UNCTAD) data collected by the International Council on Mining and Metals (ICMM) to achieve a sample of 22 low- and

Table 3.1 Low-Income and Lower-Middle-Income Mineral-Dependent Countries (2010)

Low-income countries	Mining exports as % of total exports	Lower-middle-income countries	Mining exports as % of total exports
Burkina Faso	67.5	Armenia	50.6
Central African Republic	35.8	Bolivia	34.3
Congo, Dem. Rep.	90.6	Mongolia	87.0
Ghana	47.8	Namibia ¹	42.9
Guinea	65.2	Papua New Guinea	62.7
Kyrgyz Republic	38.1		
Laos	44.6		
Liberia	20.6		
Mali	76.0		
Mauritania	66.1		
Mozambique	74.4		
Niger	40.5		
Rwanda	27.4		
Sierra Leone	35.5		
Tanzania	40.7		
Zambia	77.8		
Zimbabwe	50.3		

1 Namibia is included in the tables in this section as it was lower middle income for most of the period covered, having “graduated” to upper middle income in 2008.

Source: Authors

lower-middle-income mineral-dependent countries with a population greater than 1 million (see table 3.1).³

The selection shows a preponderance of low-income countries (17 of 22). Africa is the dominant region, with 16 out of 22 countries. Based on the available data for 2010, five of these countries depend on fiscal revenue paid by mining companies and their staff employees for more than 15 percent of their government revenues: Namibia, Papua New Guinea, Mongolia, Liberia, and the Democratic Republic of Congo.

³ The authors acknowledge that countries often move in and out of mineral dependence, especially where there has been conflict. However, of the countries in the sample, the only country that seemed somewhat out of place in a longer-term perspective was Rwanda, whose data is likely influenced by smuggling from the Democratic Republic of Congo.

Measuring socioeconomic and human development

In this section, trends in GDP and HDI growth rates and various MDGs will be compared for mining dependent and non-mining dependent low-income and lower-middle-income countries from 1991-2000 (low mineral prices and few countries with sector reform), 2001-2010 (high mineral prices and many countries with sector reform), 1991-2010, and 2007-12. The last time period is particularly interesting as it covers a period when large investments in new or revived mining countries were moving to production as well as the period during and after the global financial crisis. The different components of the HDI will also be compared for the various country groups as well as the reductions in the HDI due to inequality.

Table 3.2 shows that mineral-dependent low-income and lower-middle-income countries had the lowest average GDP growth rate from 1991 to 2000.⁴ In the subsequent 10 years, mineral-dependent low and lower-middle-income countries posted higher GDP growth rates, which helped reduce the gap between them and the rest of the countries in the selection. From 2001 to 2010, mining-dependent low- and lower-middle-income countries posted higher average GDP growth rates than all countries in the selection except for non-mining lower-middle-income countries. From 2007 to 2011, mining low-income and lower-middle-income countries outperformed their counterparts without mineral wealth by almost 1 percent.⁵ Countries that began mining-sector reform before 2003 performed the best of all groups, even though this group is heavily weighted with countries that were among the poorest in the world in 1990. The results for Sub-Saharan Africa (SSA) were similar, with countries lacking mineral wealth performing much better in the 1990s but with annual growth rates 1.3 percent lower than mineral-dependent countries in the 2000s, and 1.0 percent lower from 2007 to 2011.

⁴ Nine of the mineral-dependent countries in table 3.1 would not have been classified as such in 2000—although most were “mineral latent” in that they were actively developing their mining sectors. However, the growth rate for the reduced sample was 1.7 percent, not much different from the 22-country sample.

⁵ The study separates out oil dependent countries from mining-dependent countries as they have had quite different performances on the indicators presented here, with mineral-dependent countries generally performing better. This paper does not attempt to analyze these differences, which would be an interesting study in itself.

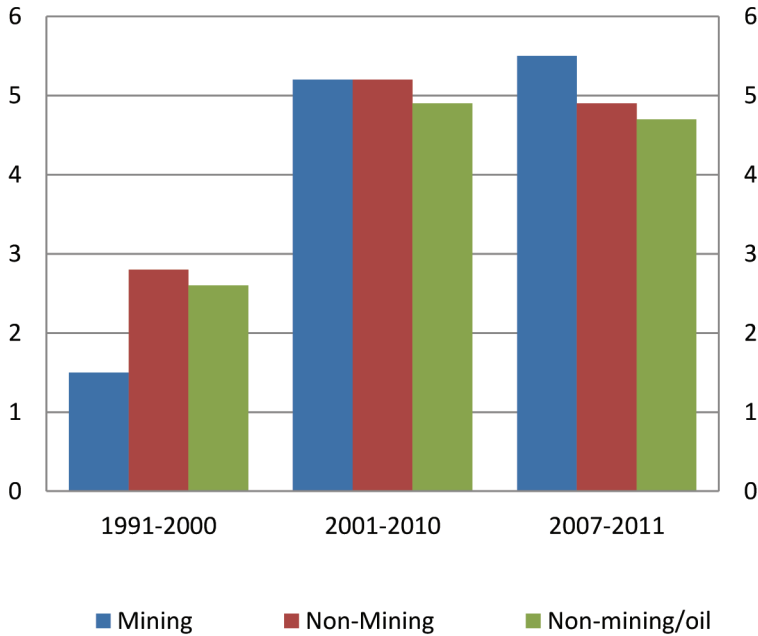
Table 3.2 GDP Annual Growth Rate

Countries	1991–2000	1991–2010	2001–10	2007–11
Burkina Faso	5.4	5.7	6.0	4.9
Central African Republic	1.7	1.4	1.0	2.8
Congo, Dem. Rep.	-5.5	-0.3	5.0	5.9
Ghana	4.3	5.1	5.8	8.3
Guinea	4.1	5.2	6.3	2.4
Kyrgyz Republic	-3.7	0.0	3.9	5.1
Laos	6.2	6.7	7.1	7.9
Liberia	2.7	3.1	3.5	11.6
Mali	4.1	4.9	5.7	4.5
Mauritania	3.0	4.1	5.1	2.8
Mozambique	5.6	6.7	7.8	6.9
Niger	1.9	3.2	4.5	4.3
Rwanda	0.3	4.0	8.1	7.3
Sierra Leone	-7.6	0.6	9.5	5.2
Tanzania	3.1	5.0	7.0	6.8
Zambia	0.8	3.2	5.6	6.4
Zimbabwe	1.6	-1.6	-4.7	0.6
Armenia	-6.4	0.5	7.9	2.6
Bolivia	3.8	3.8	3.8	4.7
Mongolia	0.1	3.3	6.5	8.3
Namibia	4.2	4.5	4.7	3.7
Papua New Guinea	4.4	4.1	3.8	7.3
Low- and lower-middle-income mining	1.5	3.3	5.2	5.5
Low- and lower-middle-income nonmining/oil ¹	2.6	3.8	4.9	4.7
Low-income mining	1.6	3.4	5.1	5.5
Low-income non-mining ¹	2.9	3.9	5.0	4.9
Pre-boom mining sector reform ²	2.7	4.0	5.6	5.9
Sub-Saharan Africa	2.3	3.6	4.9	4.6
Low- and lower-middle-income SSA mining	1.8	3.4	5.1	5.3
Low- and lower-middle-income SSA nonmining/oil	3.2	3.5	3.8	4.3
World	2.9	2.7	2.5	2.0

1 Using World Bank's 2010 classification, excluding countries with population less than 1 million plus the West Bank, Somalia, Iraq, and Afghanistan due to persistent political instability.

2 This category includes the 13 nonsocialist countries that began major mining-sector reforms between 1990 and 2002. all but one, Argentina, were low-income or lower-middle-income countries. The countries are Argentina, Bolivia, Burkina Faso, the Democratic Republic of Congo, Ghana, Madagascar Mali, Mauritania, Mongolia, Mozambique, Papua New Guinea, Tanzania, and Zambia.

Figure 3.2 GDP Annual GDP Growth Rate



All low-income and lower-middle-income country classifications regardless of being mineral dependent or not have grown significantly more rapidly than the global average since the early 2000s with mineral-dependent countries posting the highest growth rates in the past five years, which, as noted earlier, was when large investments in mining began to bear fruit for new or revived mining countries (see figure 3.2).⁶

Human Development Index

The Human Development Index (HDI) calculated by the UNDP (United Nations Development Programme) is a measure of human well-being that factors in improvements in income, education, and health, each category of which has its own separate index. Table 3.3 shows that mineral-dependent low- and lower-middle-income countries' HDI performance clearly outperformed that of their income cohorts for all periods, even when GDP growth rates were lower. They also outperformed

⁶ In the countries sampled, the new and revived mining countries include Burkina Faso, Laos, Liberia, Mozambique, Rwanda, Sierra Leone, Tanzania, Zambia, and Mongolia.

Table 3.3 HDI—Percentage Change

Countries	1990–2000	1990–2010	2000–10	2007–12
Burkina Faso	NA	NA	NA	9.6
Central African Republic	-1.3	9.4	10.8	9.0
Congo, Dem. Rep.	-23	0	30.4	8.6
Ghana	7.9	27.5	18.2	9.8
Guinea	NA	NA	NA	5.3
Kyrgyz Republic	NA	NA	5.9	2.8
Laos	19.1	38.3	16.1	8.6
Liberia	NA	NA	6.2	21.6
Mali	34.8	74.5	29.5	1.8
Mauritania	16.1	27.8	10	5.7
Mozambique	22.5	58.5	29.4	9.4
Niger	18.7	51.8	27.9	11.4
Rwanda	34.9	83.2	35.8	8.2
Sierra Leone	4.6	38.6	32.5	12.5
Tanzania	3.4	31	26.6	8.2
Zambia	-5.8	7.9	14.6	10.6
Zimbabwe	-12.5	-14.4	-2.2	13.4
Armenia	NA	NA	11	2.0
Bolivia	9.3	17.9	7.8	4.7
Mongolia	2.8	19.8	16.1	7.0
Namibia	2.3	10.3	7.8	0.2
Papua New Guinea	14.9	25.5	9.2	4.3
Low- and lower-middle-income mining	12.2	26.0	12.3	7.1
Low- and lower-middle-income non-mining	6.3	19.1	12.1	5.0
Low- and lower-middle-income non-mining/oil	8.4	20.6	11.3	4.6
Low-income mining	11.6	28.6	15.2	8.8
Low-income non-mining	10.9	24.7	12.5	6.6
Pre-boom mining-sector reform	8.0	27.4	20.9	6.5
Sub-Saharan Africa	3.4	16	12.1	7.2
Low- and lower-middle-income SSA mining	4.3	20.7	15.7	8.6
Low- and lower-middle-income SSA non-mining/oil	4.0	14.8	11.8	7.2
World	6.7	14.3	7.1	7.0

Source: UNDP.

their cohorts in Sub-Saharan Africa in all periods, where most mining dependent low and lower-middle-income countries are from. The largest average group improvement in HDI by a wide margin from 2000–10 was in the pre-boom mining sector reform countries, with a 20.9 percent improvement compared to, for example, a 12.1 percent improvement by non-mining low-income and lower-middle-income countries. Finally, all the various low and lower-middle-income country classifications experienced higher rates of HDI improvement than the world average except in the 2007–2012 period, when only mineral-dependent countries (both low- and lower-middle-income) posted higher rates than the world average.⁷

Table 3.4 presents the changes in the education and health components of the HDI for the various classifications in order to see if the previous results were driven mainly by the income component of the index. (See table A3.1 in annex 3 for the country data of the mineral-dependent sample.)

With respect to progress in health and education measures in the HDI, improvements in the low and lower-middle-income mining dependent countries were slightly lower in health than their counterparts but substantially higher in education in the two decades from 1990 to 2010. However, in recent years, 2007–12, the mineral-dependent low- and lower-middle-income countries saw a much higher improvement in their health and education HDIs. For the low-income cohorts, the health and education HDIs always improved more for the mineral-dependent countries. Note that unlike the overall HDI, countries that reformed their mining sectors before the boom improved their health and education HDIs roughly the same as the other groups from 2000 to 2010.

In addition, both low-income and lower-middle-income mineral-dependent countries outperformed the world average, except when comparing health scores from 1990 to 2000. This trend becomes particularly apparent when comparing 2000–10 and 2007–12 data (also see Figure 3.3). The above suggests that mining-dependent low-income and lower-middle-income countries have begun the long road to bridging the disparity gap and increasing access to quality health and education services. Moreover, it demonstrates that mineral-dependent countries have not been ignoring health and education during the mineral price boom and there is at least some sharing of the benefits. These results contrast with

⁷ Note that Davis (1995) found that in 1991 extractive (oil and mining) low- and middle-income countries had higher HDIs on average than nonextractive countries and had slightly higher increases in their HDIs from 1970 to 1991.

Table 3.4 Percentage Change in Education and Health Indices

Countries	1990–2000		1990–2010		2000–2010		2007–2012	
	Education	Health	Education	Health	Education	Health	Education	Health
Low- and lower-middle-income mining	16.4	4.4	30.6	20.0	12.2	14.9	3.7	6.9
Low- and lower-middle-income non-mining/oil	17.2	4.5	35.8	13	15.8	8.1	2.6	4.1
Low-income mining	20.1	4.2	38.4	22.3	15.2	17.4	5.7	8.2
Low-income non-mining/oil	16.2	0	32.7	17.9	14.2	12	4.9	5.9
Low- and lower-middle-income SSA mining	20.9	2.3	40.6	21.5	16.2	18.8	4.6	8.5
Low- and lower-middle-income SSA non-mining/oil	23.7	-0.1	41.5	12.7	14.3	12.8	6.5	7.2
Pre-boom mining-sector reform	15.5	6.0	33.2	18.5	15.4	11.9	4.4	5.3
World	12.5	6.3	24.9	11.7	11.1	5.1	2.2	2.4

Source: UNDP.

Table 3.5 Average loss in the HDI due to inequality (%)

Countries	2010	2011
Low- and lower-middle-income mining	32.5	31.1
Low- and lower-middle-income non-mining/oil	27.9	27.2
Low-income mining	33.8	32.6
Low-income non-mining	33.6	33
Low- and lower-middle-income SSA mining	34.4	33.2
Low- and lower-middle-income SSA non-mining/oil	34.8	34.8
World	21.7	23

Source: UNDP.

earlier results by Gylfason (2001), for example, that showed various education levels being inversely related to resource abundance from 1980 to 1997.

Table 3.5 shows the percentage drop in the HDI score due to inequality in the sampled countries and global averages.⁸ Given the general lack of data on inequality, the inequality-adjusted human development index can be used to compare average inequality rates of the different groupings as well as determine whether the countries in the sample have experienced any reduction in inequality. The inequality drop in the HDI of 31.9 percent for low-income and lower-middle-income mineral-dependent countries is similar to the 27.5 percent for their nonextractive counterparts. The mineral-dependent countries also had a small improvement from 2010 to 2011 as the negative impact of inequality on their average HDI fell from 31.9 percent to 30.5 percent. The evidence suggests that mineral-dependent countries have more inequality than their counterparts but it is not substantial.

Millennium Development Goals

The story is somewhat similar for the MDGs plus a widely used access to power index. Whereas mineral-dependent countries mostly had

⁸ For the individual country scores of our sample, see table A3.2 in annex 3.

Table 3.6a MDG Indices, 1990–2010
—Percentage Improvements, Part 1*

Countries	Portion of population below \$1.25/day (ppp) ¹			Net enrollment ratio in primary education			Under 5 mortality rate (deaths/1,000 births)		
	1990–2000	2000–10	1990–2010	1990–2000	2000–10	1990–2010	1990–2000	2000–10	1990–2010
Low- and lower-middle-income mining	16.3	4.7	20.3	6.7	21.4	29.5	17.9	31.5	43.8
Low- and lower-middle-income non-mining/oil	23.0	14.0	33.7	-0.9	13.1	13.3	20.4	32.9	46.6
Lower-income mining	8.7	15.1	22.4	9.9	29.0	41.8	16.7	30.8	42.4
Lower-income non-mining/oil	0.9	26.5	27.2	-3.7	24.7	20.2	19.5	29.1	42.9

*For the absolute scores in each category for each time span, see annex 3, tables A3.3 and A3.4.

¹ In many cases for several countries, there was no measure in the given year. If there was a measure in a nearby year, then it was used. Otherwise, that country was excluded from the calculation in that cell.

greater HDI improvements than their counterparts, especially since 2000 with respect to the MDGs, the improvements were quite equal for the two groups. Improvements in these indices for low- and lower-middle-income mining countries was very similar to low- and lower-middle-income countries without mineral wealth over the two decades and the entire period from 1990 to 2010, whether referring to poverty, child mortality, or access to water, sanitation, primary education, and power. When the scores for mining versus non-mining/oil countries are compared on a decade-by-decade basis, each had a higher percentage improvement in six of 12 categories. Similarly, over the 20-year time span, mining and non-mining/oil countries each had higher scores in three of six categories.

Tables 3.2 to 3.6 together present a number of results that go against the resource curse hypothesis. First, mineral-dependent countries have had strong growth rates over an extended period, at least 10 years in almost all cases—and these strong growth rates are likely to continue for

Table 3.6b MDG Indices, 1990–2010
—Percentage Improvements, Part 2

Countries	% of Population With Improved Drinking Source			% of Population with Improved Sanitation Facility			% of Population with Access to Power ¹		
	1990-2000	2000-2010	1990-2010	1990-2000	2000-2010	1990-2010	1990-2000	2000-10	1990-2010
Low- and lower-middle-income mining	16.5	12.4	30.9	27.4	8.6	38.3	20.3	26.6	52.3
Low- and lower-middle-income non-mining/oil	11.5	9.7	22.3	14.4	13.1	29.4	15.8	18.2	36.9
Low-income mining	18.2	12.4	32.9	46.7	10.8	62.5	18.8	29.9	54.4
Low-income non-mining/oil	18.4	15.9	37.3	13.2	17.0	32.5	36.6	45.2	98.4

¹ This is not an official MDG but a commonly used measure of improved living standards.

most countries in the classification, given the amount of FDI that is forecast to come just in the mining sector (see Table 3.7 for forecasted investment in SSA mineral-dependent countries). Second, there clearly has been some sort of spreading of benefits given that HDIs have increased both significantly and substantially faster than non-mineral dependent countries as well as the global average, and the mineral-dependent countries have done about the same on MDG improvements. Third, as the countries have become more mineral-dependent (in the 2007/12 time period), the absolute and relative performance of these countries has become even stronger. Fourth, the education and health components of the HDI of low- and lower-middle-income mineral-dependent countries have been improving rapidly and also have been generally increasing faster than their peers, contrary to some theoretical analysis and pre-2000 empirical results. Fifth, while low- and lower-middle-income mineral-dependent countries have more inequality, as measured in the HDI, it is not markedly different than other countries at similar income levels.

Table 3.7 Investment in Mining in a Sample of Sub-Saharan African Countries, 2000–17

Country	Investment, 2000–11	Forecast Investment, 2012–17	GDP, 2010
Burkina Faso	1 billion	500 million–1.5 billion	8.8 billion
Congo, Dem. Rep.	3.1–4.1 billion	9–14 billion ¹	13.1 billion
Ghana	7–8 billion	1–1.5 billion ²	31.3 billion
Guinea	4–5 billion	12–20 billion	4.5 billion
Liberia	3–4 billion	9–12 billion	1.0 billion
Mauritania	2–3 billion	3–5 billion	3.6 billion
Mozambique	6.1 billion	11.6 billion ³	9.6 billion
Namibia	4 billion	3.5 billion	12.2 billion
Niger	250–500 million	1.5 billion	5.5 billion
Sierra Leone	1–2 billion	4–5 billion	1.9 billion
Tanzania	3 billion	4–6 billion	23.1 billion
Zambia	3–3.5 billion	4–6 billion	16.2 billion
Total	37.4–44.1 billion	63.1–87.6 billion	132.8 billion

1 Lower figure includes half of funds discussed for aluminum smelter and Chinese infrastructure for metals (\$5b); upper figure includes full amount (\$10b).

2 There is a very large amount of exploration taking place in Ghana but it is difficult to determine the feasibility of various projects. This number includes only projects where investment figures are concrete; it could easily vastly understand the true amount that will take place.

3 Excludes natural gas.

Source: Authors' compilation, World Bank (2012).

While some of these results—or at least their magnitude—may be due to the length of time that most mineral prices have been well above historic trend values, some do seem to refute some of the earlier analysis of mineral booms that stressed that 1) there would be significant negative impacts on other sectors of the economy due to rent-seeking, corruption, and poor investments, and 2) benefits would quickly be captured by elite groups and not widespread.

Measuring governance

As argued by Naazneen, Kaiser, Le, and Vinuela (2011), the quality of institutions is central to the resource paradox. They argue that holding income levels constant, resource-dependent countries perform less well in governance indicators. In this section, additional evidence is brought to this hypothesis by measuring and comparing mining-dependent low- and lower-middle-income countries' governance performance with

that of their income peers, using the World Bank governance indicators. These indicators measure six dimensions of governance:

- Voice and accountability (V);
- Political stability (S);
- Government effectiveness (E);
- Regulatory quality (R);
- Rule of law (L);
- Control of corruption (C).

These indicators are scored from minus 2.5 (bad) to plus 2.5 (good). For the purposes of computing averages in Tables 3.7 to 3.10, we added 2.5 to each score, thereby giving a total maximum score of 5 and a minimum of 0. Moderately reasonable performance would be indicated by a score of 2.5.

Table 3.7 shows that low-income and lower-middle-income countries have consistently had lower governance scores in voice and accountability, political stability, and government effectiveness than the world average. Mining-dependent low-income and lower-middle-income countries post governance scores that are not too different from their income peers—compared to non-mining and non-oil countries, in 2003 and 2010 they are slightly higher in four cases and slightly lower in two others. As can be seen in Table 3.8, they also have not changed very much since the mineral price boom began in 2003. The biggest variation was a 5.6 percent decline from 2003 to 2010 for the mineral-dependent countries on government effectiveness.

Table 3.9 illustrates that, as with the previous set of governance indicators, mining-dependent low-income and lower-middle-income countries have regulatory quality, rule of law, and control of corruption scores that are strikingly similar to those of their income cohorts. Non-mining and non-oil-dependent low-income and lower-middle-income countries mostly outperformed their mining-dependent counterparts, but the gap closed over time and by 2010 the scores were almost identical, with only a small difference in regulatory quality and rule of law. This can also be seen in table 3.10, where from 2003 to 2010, mineral-dependent countries saw their scores increase more rapidly than their non-mining/oil counterparts.

From the perspective of the resource curse and long-run socioeconomic development, tables 3.8 to 3.11 make an important contribution to the understanding the performance of low-income and lower-middle-income mining countries in terms of governance. Contrary to what the

Table 3.8 Governance Indicators—Voice and Accountability, Political Stability, and Government Effectiveness

Countries	1996			2003			2010		
	V	S	E	V	S	E	V	S	E
Burkina Faso	1.7	2.1	1.5	2.2	2.6	1.9	2.3	2.4	1.9
Central African Republic	1.7	1.3	1	1.2	0.9	0.9	1.4	0.4	1.1
Congo, Dem. Rep.	0.8	0	0.8	0.9	0.3	0.9	1.1	0.3	0.8
Ghana	2.1	2.2	2.4	2.8	2.5	2.2	3.0	2.5	2.5
Guinea	1.1	1.3	1.3	1.3	1.7	1.7	1.6	0.7	1.4
Kyrgyz Republic	1.5	2.3	2.1	1.4	1.4	1.9	1.5	1.5	1.9
Laos	1.6	2.8	1.8	0.7	1.3	1.4	0.9	2.3	1.6
Liberia	1.0	0	0.6	1	0.3	1	2.3	2	1.3
Mali	2.4	2.8	1.3	2.8	2.7	1.9	2.7	2.2	1.6
Mauritania	2.0	2.8	2.4	1.6	2.5	2.5	1.6	1.2	1.6
Mozambique	2.2	2.3	2.4	2.5	2.7	2	2.4	2.8	2
Niger	0.8	2.3	1.3	2.4	2.5	1.8	1.9	1.4	1.8
Rwanda	1.0	0.4	1.3	1.3	1.3	1.8	1.2	2.4	2.5
Sierra Leone	1.8	0.5	1	2.1	1.4	1.3	2.3	2.3	1.3
Tanzania	1.8	1.8	1.8	2.1	1.6	2.1	2.4	2.5	2
Zambia	2.1	2.3	1.4	2.1	2.6	1.6	2.2	3	1.7
Zimbabwe	1.8	2	2.3	1.1	1.3	1.6	1	1.3	0.9
Armenia	1.7	2	2.1	2	2.7	2.3	1.7	2.5	2.4
Bolivia	2.5	2.3	2.3	2.5	1.7	2.2	2.4	2.1	2
Mongolia	2.8	3.2	2.1	2.8	3.4	2.2	2.5	3	1.9
Namibia	2.9	3.2	3	2.7	2.9	2.6	2.8	3.3	2.6
Papua New Guinea	2.6	1.7	2.2	2.4	1.9	1.9	2.6	1.7	1.7
Low- and lower-middle-income mining	1.8	1.8	1.7	1.9	1.9	1.8	2	1.9	1.7
Low- and lower-middle-income non-mining	1.8	1.7	1.8	1.7	1.7	1.8	1.7	1.7	1.8
Low- and lower-middle-income non-mining/oil	1.9	1.8	1.9	1.8	1.8	1.9	1.8	1.8	1.9
Low & lower-middle-income SSA mining	1.7	1.7	1.6	1.9	1.9	1.7	2	1.9	1.7
Low & lower-middle-income SSA non-mining	1.5	1.6	1.7	1.7	1.7	1.6	1.6	1.7	1.6
Low & lower-middle-income SSA non-mining/oil	1.7	1.9	1.8	1.8	1.9	1.7	1.7	1.9	1.7
World	2.5	2.4	2.5	2.5	2.5	2.5	2.5	2.5	2.5

Source: Kaufmann, Kraay, and Mastruzzi (2012).

Table 3.9 Governance Indicators—Voice and Accountability, Political Stability, and Government Effectiveness (% Change)

	1996-2003			1996-2010			2003-2010		
	V	S	E	V	S	E	V	S	E
Low- and lower-middle-income mining	5.6	5.6	5.9	11.1	5.6	0	5.3	0	-5.6
Low- and lower-middle-income non-mining	-1.1	-2.3	-1.9	-1.2	-2.6	-2.5	-0.1	-0.4	-0.5
Low- and lower-middle-income non-mining/oil	-3.6	-4.7	0.2	-1.9	-4.8	0.4	1.7	-0.1	0.2
Low & lower-middle-income SSA mining	9.9	8.6	7.9	17.6	12	4.6	7.1	3.1	-3
Low & lower-middle-income SSA non-mining	9.5	3.7	-5.9	4.6	3.3	-8.1	-4.5	-0.4	-2.4
Low & lower-middle-income SSA non-mining/oil	5.4	0	-5.9	1.6	-3.5	-5.4	-3.7	-3.5	0.5
World	-0.4	2.5	-1	0.8	3.7	0.2	1.2	1.2	1.2

Source: Kaufmann, Kraay, and Mastruzzi (2012).

resource curse theory predicts, mineral-dependent countries have not in recent years performed significantly differently in governance indicators than non-mining countries in the same income cohorts. By 2010, they had slightly higher scores on two of the six indicators, the same on one, and slightly lower on three indicators. More importantly, low-income and lower-middle-income mining countries have experienced particularly positive developments in their voice and accountability, regulatory quality, and rule of law in recent years. More surprisingly, on five of the six indicators, mineral-dependent countries had greater improvements than their non-mining/oil counterparts from 2003 to 2010, precisely at the time that their governance indicators should have been deteriorating according to the natural resource curse theory. The fact that only one of six indicators (control of law) declined from 2003 to 2010 also has implications for the sustainability of the boom led by increases in mineral prices, as it indicates that the conditions have not deteriorated in such a manner that a drop in mineral prices will have disastrous consequences. Of course, the overall improvement in governance from quite low levels has not been very large, suggesting that for sustainability to take hold there is still a great deal of work to do in this area.

In conclusion, this section does not attempt to directly refute the resource curse hypothesis but to show that it is far from deterministic

Table 3.10 Governance Indicators—Regulatory Quality, Rule of Law, and Control of Corruption

Countries	1996			2003			2010		
	R	L	C	R	L	C	R	L	C
Burkina Faso	2.2	1.6	2.7	2.2	1.9	2.5	2.4	2.3	2.1
Central African Republic	1.6	1	1.1	1.4	0.8	1.3	1.4	1.2	1.7
Congo, Dem. Rep.	0.7	0.6	0.4	1	0.7	1.1	0.9	0.9	1.1
Ghana	2.1	2.2	2.3	2.2	2.5	2.3	2.6	2.4	2.6
Guinea	1.8	1	2	1.5	1.5	1.7	1.4	1	1.3
Kyrgyz Republic	2.2	1.9	2	2.1	1.8	1.6	2.3	1.2	1.4
Laos	1.3	1.6	2	1	1.3	1.3	1.5	1.6	1.4
Liberia	0.5	0.3	0.8	0.8	0.8	1.3	1.4	1.5	2
Mali	2	2	2.1	2	2.5	2	2	2	1.8
Mauritania	2	2.2	2.5	2.4	2	2.7	1.7	1.6	1.8
Mozambique	2	1.7	2.1	2	1.8	1.9	2	2.1	2
Niger	1.4	1.5	1.4	1.9	1.8	1.5	2	1.9	1.8
Rwanda	1	1	1.6	1.8	1.6	1.9	2.3	2.2	3
Sierra Leone	0.9	1	1.7	1.4	1.3	1.6	1.8	1.6	1.7
Tanzania	2.1	2.3	1.5	2	2.2	1.7	2.1	2	2
Zambia	2.1	1.9	1.5	2	1.9	1.7	2	2	1.9
Zimbabwe	1.5	1.8	2.2	0.5	0.8	1.2	0.5	0.7	1.1
Armenia	2.2	2.1	2	2.7	2.2	2	2.8	2	1.8
Bolivia	2.7	2.2	1.6	2.4	1.9	1.7	1.7	1.4	2
Mongolia	2.3	2.5	2.4	2	2.7	2.3	2.2	2.1	1.8
Namibia	2.9	2.8	3.2	2.7	2.8	2.7	2.6	2.7	2.8
Papua New Guinea	2	1.8	2.1	1.8	1.2	1.5	2	1.6	1.4
Low- and lower-middle-income mining	1.7	1.6	1.8	1.8	1.7	1.8	1.9	1.7	1.8
Low- and lower-middle-income non-mining	1.9	1.8	1.8	1.8	1.7	1.8	1.9	1.7	1.8
Low- and lower-middle-income non-mining/oil	2.0	1.9	1.9	1.9	1.8	1.9	2.0	1.8	1.8
Low & lower-middle-income SSA mining	1.7	1.5	1.8	1.7	1.7	1.8	1.8	1.8	1.9
Low & lower-middle-income SSA non-mining	1.7	1.7	1.8	1.7	1.6	1.8	1.7	1.6	1.7
Low & lower-middle-income SSA non-mining/oil	1.9	1.9	2	1.9	1.8	1.9	1.8	1.7	1.8
World	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5

Source: Kaufmann, Kraay, and Mastruzzi (2012).

Table 3.11 Governance Indicators—Regulatory Quality, Rule of Law, and Control of Corruption (% Change)

	1996-2003			1996-2010			2003-2010		
	R	L	C	R	L	C	R	L	C
Low- and lower-middle-income mining	1.4	2.9	-3.2	6.6	3.2	-0.8	5.1	0.3	2.4
Low- and lower-middle-income non-mining	-4.3	-4.2	-3.1	0.8	-3.3	-4.3	5.3	0.9	-1.2
Low- and lower-middle-income non-mining/oil	-3.8	-4.6	-2.4	-0.9	-4.5	-5.3	3	0.1	-3
Low- and lower-middle-income SSA mining	3.5	8.7	-0.4	9.8	13.6	6.4	6.1	4.6	6.8
Low- and lower-middle-income SSA non-mining	1.2	-0.6	-3.5	-1.1	-3.5	-6.9	-2.3	-2.9	-3.5
Low- and lower-middle-income SSA non-mining/oil	-0.9	-0.6	-4	-5.3	-7.1	-7.8	-4.4	-6.5	-4
World	0	0	0	0	0	0	0	0	0

Source: Kaufmann, Kraay, and Mastruzzi (2012).

and that something different seems to be happening since the turn of the century. Most low-income and lower-middle-income mineral-rich countries have had high to rapid growth since the early 2000s and the prospects in the next few years, at least, seem bright. It also shows that benefits from mineral-led growth may have been widespread, using changes in HDI and the MDGs as indicators, including the health and education components of the former. It was also shown that on average countries that have benefited from the mining boom have not seen deterioration in their governance, but in fact have had some small improvements on average for most indicators. Of course, all of the above are just the underlying trends and patterns of the various indicators and are neither an econometric nor a causal analysis. In any particular country, a more in-depth study would be required to determine what was driving the increases in mining-led growth to improvements in the HDI and MDG scores, or whether something completely different was happening that was partially or mostly responsible. Nevertheless, these various trends do

suggest that broad statements about the limited contribution of mining in mineral-dependent countries should be made with care.

The above notwithstanding, there is little room for complacency as most low-income and low-middle-income mining countries are still heavily dependent on imports to build and operate their mines. In many countries, fiscal revenues from mining are low, although in several cases that is because most of the mines are still in or coming out of the depreciation phase. Host communities in many of these countries often receive few benefits from the mines in their localities and protests against mining operations are common. It cannot be said with any degree of confidence that many of the countries in the sample would be able to continue at reasonable growth rates if mining production began to fall in the medium-term or long-term—or there were steep drops in prices. Accordingly, in the next section, the experiences of five middle-income mining countries that have had some, albeit quite varied, success in increasing the benefits from their mining sectors are discussed and analyzed in order to extract lessons for the countries included in this section, most of which are low income or have only recently graduated to low middle income.

Chapter 4

Increasing the Benefits from Mining Operations

Section 3 demonstrated that mineral-rich countries have had rapid growth since the turn of the century and have done at least reasonably well on HDI and MDG indicators. This suggests that not all benefits from mining have been captured by the “enclave” and those with access to it. Nevertheless, it is often argued that there are few linkages from mining operations and the only way benefits can be spread is through the good use of fiscal revenues. However, the historical evidence has been that many countries have used the mining sector as a type of engine of growth, generating substantial backward and forward linkages and enhanced multiplier effects. Increasing domestic procurement by the mining industry—at times referred to as vertical linkages—may have often been the first step.

Currently, many countries receiving substantial direct benefits from mining operations, including fiscal revenues, want the sector to contribute much more to the overall industrialization of the country through linkages, infrastructure investment, and community and regional development. In this section, the impacts of the mining sector on the social and economic development of five countries—Chile, Ghana, Indonesia, Peru, and South Africa—will be analyzed to investigate the success of these countries in enhancing the sector’s impacts. These countries were chosen because they have had long mining histories, at least relative to most of the countries in the Section 3 sample, and some success with respect to generating additional benefits from the mining industry, although as will be shown with large differences in success. Only one of the five countries, Ghana, was in the Section 3 sample. Relative to their economies as well as on the global stage, two of these countries already had very large mining sectors in the 1980s (South Africa, Chile), one of them (Peru) had a large mining sector, and two had more modestly sized mining sectors (Ghana, Indonesia). With the exception of South Africa, they had very large expansions of their mining sectors since the early 1990s (Chile and Ghana) or the early 2000s (Indonesia and Peru). Table 4.1 indicates the importance of mining for a

Table 4.1 Evaluation of the Contributions of Mining Sector on Selected Factors

	Chile	Ghana	Indonesia	Peru	South Africa
Annual GDP growth rate (2001–10)	3.7%	5.8%	5.2%	5.7%	3.5%
Mineral exports (2007–11)	Very high (60%)	High (47%) ¹	Medium and rapidly increasing (15%)	Very high (60%)	Medium-high (21%)
Taxes paid by mining firms (% of total, 2007–11)	High (12%)	Very high (19%)	Low-medium (5%)	Very high (18%)	Low (0.9%)
Taxes paid by direct beneficiaries (employees, linkage industries) ²	Very high	Medium	Low-medium	High	Very high
FDI in mining (2007–11)	Very high (36%)	Very high (53%, 1983–2011)	Medium and rapidly increasing (9%, 2008–11)	Very high (50%)	Very high (35%, 2002–10)
Direct employment in mining	High	Low	Low but medium/high in some regions	Medium	High
Indirect employment	Very high	Low-medium	High ³	Very high	Very high
Downstream linkages—beneficiation	Very high	Low	Low but increasing rapidly	Medium and increasing	Very high
Downstream linkages—manufacturing	Low	Very low	Low	Low	High
Upstream linkages	Medium-high	Low	Low	Low, increasing	High
Domestic sourcing of Inputs	High-very high	Medium	Low-medium but growing rapidly	High	Very high

1 For exports, taxes, and FDI, the percentage of the total amounts for Ghana are likely to decrease significantly in the next few years due to the large expansion of the petroleum industry.

2 In this category, there is rarely direct evidence so the evaluation is based on the amount of employment and the importance of the linkage industries.

3 There have been three major studies done in Indonesia of the impacts of specific mines and the average employment multiplier was found to be about 20.

	Chile	Ghana	Indonesia	Peru	South Africa
Government programs/legislation for domestic linkages	Strong, programs only	Medium (but very recent)	Very strong but mostly recent	Weak	Strong
Nondedicated infrastructure built by companies	Regional—medium Local—high	National—very low Local—low	National—very low Local—medium-high	Regional—medium Local—medium	National—low Local—high
Nondedicated infrastructure built by government to originally service mining industry	High	High (power)	Low but increasing	N/A but likely medium-high	Very high
Legislation on undedicated infrastructure	Weak	Weak	Medium—local (recent)	Medium—local only	Strong—local only
CSR for local development	High	High	Very high	High (through voluntary mining contribution) ⁴	Very high
Legislation on local development	Weak (but targeted programs)	Medium-strong	Weak	Very strong but through tax system	Very strong
Mining taxes to local communities	Not targeted	Low	High (including regions)	Very high	Not targeted
HDI levels and trends in country	High, well above LAC average, improving; very large drops in poverty rates	Low but above average for SSA and rapidly improving; very large drop in poverty rates	Medium, slightly below East Asia average but large improvement	Medium but above average for LAC and strong improvements	Medium but 40% above SSA average albeit stagnant
Inequality levels and trends	High but some improvement	Medium but worsening	Low but some worsening	Medium and improving	Very high and worsening
Governance levels and trends	Medium and stagnant, well above LAC averages	Medium, above SSA average; improving	Low-medium, below EA average, small improvements	Weak-medium and stagnant; slightly below LAC averages	High for SSA but declining

⁴ This recently changed to an involuntary special mining tax for all new mines and operations without stability agreements.

Source: Authors' analysis, World Bank (2012).

large number of factors—from exports to infrastructure to local taxes—plus the role of government programs and legislation in influencing some of these results, and general human development and governance trends in the countries. The values in the table are based on the results of case studies undertaken for each country, and the reasoning behind each valuation can be found in the case studies in annex 1, which is available on The World Bank's external website, <http://www.worldbank.org/en/topic/extractiveindustries>.⁹ At the end of the section, lessons for more recent mining dependent countries will be discussed.

Macro variables

The mining sector is an important export sector for all five countries, although slightly less so for Indonesia, which has a large and more diversified economy.¹⁰ The net impact on foreign exchange, however, is much higher for Chile, Peru, and South Africa, given that large portions of the great amount of inputs required by mining companies are bought domestically in these countries, with much lower levels of domestic sourcing in Ghana and Indonesia. Mining investment is by far the largest source of FDI in Chile, Peru, and South Africa. Historically, it has been just as dominant in Ghana, although in recent years FDI in the oil sector has surpassed that in the mining sector. In Indonesia, mining FDI has been relatively less important, but it has been increasing rapidly in recent years.

The situation with respect to tax revenues is much more complicated—and controversial. Like other countries, all five countries have increased various taxes in recent years to bring in more of the price-boom-induced rents to the state and the welfare of society. Nevertheless,

9 The valuations take as a starting point the actual values, when known, for the indicators, and put these amounts into the context of the size of the mining sector and the size of the country's economy. For example, the latest data on FDI for Indonesia has the mining sector accounting for 9 percent from 2008 to 2011. In the context of Ghana this would not be a very large amount, but for an economy as populous and large as Indonesia this is given a medium rating. In some cases, there are few, if any, quantitative figures available but qualitative assessments of the mining sector's role are available—for example, in the infrastructure categories. In other cases, professional judgment based on international experience had to be made—for example, in the valuation of the strength of legislation.

10 This paper does not analyze the interaction of mining-sector and general macro-economic and governance reform. It should be noted, though, that many countries have had very successful mining-sector reform with, at best, fair macroeconomic reform. However, the long-run sustainability of such reform is questionable.

Box 4.1 Fiscal Revenues from the Mining Sector in Peru

In Peru payments from just the mining operations themselves averaged 17.5 percent of fiscal revenue from 2007 to 2011, compared with 4.1 percent in 2001. Between 2005 and 2011, Peru collected approximately \$1.1 billion in royalties, all of which were allocated to the mining regions, with 95 percent going to subnational governments—municipal (20 percent), provincial (20 percent), districts (40 percent), regional (15 percent)—and 5 percent going to the regions' universities. The 2001 Canon Law established that 50 percent of the corporate income tax from mining must be used exclusively to finance projects designed to fight poverty and improve the quality of life in mining regions, as well as promote research and technological development. It also stipulated that the funds should be divided between mining districts (10 percent), mining provinces (25 percent), mining departments (40 percent), regional governments (20 percent) and regional public universities (5 percent). Between 2005 and 2011, mining canon funds allocated to the mining regions' subnational governments grew by more than 382 percent, or \$7.7 billion in total, making them the main source of public funding for subnational governments in mining regions.

Between 2007 and 2011, 39 mining companies participated in the Mining Program of Solidarity with the People (PMSP), better known as the Voluntary Mining Contribution. The companies contributed between 1 and 3.75 percent of profits to the PMSP, whose main goal was to promote social welfare in the mining areas. Mining companies decided how to spend these funds in collaboration with multilateral bodies and NGOs. By December 2011, the total amount contributed by mining companies to PMSP was approximately \$831 million. Of that amount, 61.5 percent was allocated to local funds, 37.7 percent to regional funds, and 0.8 percent to the Truth and Reconciliation Commission.

In October 2011, a new mining tax framework came into force, comprising a Special Mining Tax (IEM), a Special Mining Contribution (GEM), and the Law on Mining Royalties. While the latter amends the existing royalty law, the IEM and GEM generate new income for the Peruvian government. The GEM is applicable only to mining companies with projects with Tax Stability Agreements in force. The IEM applies to the remainder, replacing the PMSP. In 2011, the new royalties, the IEM and GEM combined generated \$74.2 million in October alone for the government.

taxes as a percentage of total revenues and in relation to the size of the sector range from very low in South Africa to very high in Peru (see Box 4.1) with the other countries in between. However, even in South Africa the amount of tax revenues that are ultimately dependent on the prosperity of the mining sector is likely to be quite substantial given the large amount of domestic sourcing done by its very large industry, as well as sales of inputs to other African countries, and the taxes paid by workers. Because South African mining is still very much dominated by

much more labor-intensive underground work, the direct workforce is still quite substantial. In addition, the multiplier impacts of the expenditure mining operations, their suppliers, and the employees of both also have significant impacts on the tax-base revenues. A recent large study in South Africa found that in the Bafokeng platinum mining area, one job in the mine generates three other jobs, each of which supports 6.5 livelihoods on average (Solomon, 2012, Chapter 16).¹¹ Similarly, Kapstein et al. (2010: 18) found that in Ghana there were about 20 jobs created in total for every job in the Newmont Ahafo gold mine, and that the overall wage bill was 5.5 times higher than the mine's wage bill. In general, the amount of tax revenues being generated directly and indirectly by mining operations in recent years is quite substantial, although it is not clear how that will hold up if prices trend downwards. What is clear is that countries with strong linkages from the mining sector will receive significant revenues either directly or indirectly, even in less bullish times.

Linkages and employment

The mining sector's total impact on socioeconomic and human development in a country is determined partially by the size and composition of the sector, partially by the amount of fiscal revenue generated and how it is used, and partially by how it contributes to overall industrialization of the country—i.e., the sector's ability to serve as an engine of growth. The evidence suggests that the third channel is the most important. Countries that have been able to take advantage of the opportunities afforded by the demands of the mining industry to create spinoff industries are the ones most likely to see sustainable growth. While fiscal revenues can be used to develop other industries by providing missing factors such as infrastructure and human capital, the fact remains that for a country in which the only major industry is mining, if firms are not able to take advantage of the opportunities afforded by that sector, it is not clear why they would be able to take advantage of other opportunities where comparative advantage is likely to be lower. In fact, the only country in this small sample with substantial downstream linkages to manufacturing from the mining sector is South Africa. These developments are most likely due to the enforced self-sufficiency during the long apartheid era.

¹¹ The analysis includes jobs created in mine suppliers and first-round multiplier impacts of mine workers' expenditures, but it does not include full multiplier impacts or the employment effects of the eventual expenditure of the fiscal revenues generated by this activity.

As South Africa does not benefit from large regional markets or relatively cheap labor, the sustainability of its relatively large manufacturing sector—still more than 17 percent of GDP in 2011, albeit on a slow decline from its level of 20 percent in the early 1990s—is debatable. In 2014, the South African government is planning to introduce legislation that gives the Government the ability to mandate domestic beneficiation for some minerals, a step similar to the one taken by Indonesia very aggressively in 2012 when it imposed large export taxes on some unprocessed minerals.

Nevertheless, it is clear that there are major spinoff opportunities available from a large mining sector, particularly from domestic sourcing and beneficiation. While the latter is the most obvious, the big gains in value added, employment, and learning by doing are likely to come from the former, particularly as many of the skills needed by companies selling goods and services to mining operations—such as machine repair and servicing, tubing, construction, industrial clothing, catering—are easily transferable to other industries. In Chile in 2011, there were 720,000 jobs in the mining service industry and another 40,000 jobs in mining-related construction, more than 10 percent of the entire workforce. Box 4.2 presents a brief history of the development of the Chilean mining service industry in its most important mining region. Similarly, in Peru it is estimated that there were 709,000 persons employed in the mining service industry in 2011, a number that is expected to rise substantially in the near future due to 47 planned mining investments between 2012 and 2015 with a capitalization of \$54 billion.

Infrastructure

Large mining projects often bring along infrastructure, which then can be used by other industries. Except at the local level, however, these often are much less than expected. Except for bulk minerals—such as iron ore, copper, or coal—mining creates no great demand for transport infrastructure. The gold output of even a world-class gold mine can be flown out, with a need only for roads sufficient to supply inputs. Moreover, even for the bulk minerals the infrastructure may be dedicated entirely to the needs of the mining industry, as in the case of railroads that are used for large multicar iron ore or coal trains. All large mines need substantial power, however, so there is more of an opportunity for beneficial relations in this regard, particularly if the mining operation is used as an anchor customer for a large power project, as historically was the case in both Ghana and South Africa. The reality is, however, that many mines

Box 4.2 Mining Cluster Development in Region II of Chile

Region II in Chile is one of the world's most successful examples of an industrial cluster built around the mining industry. In the development of this cluster, centered on Antofagasta, mining companies and governments have worked together to maximize the positive linkages from mining for local development. In 1992, a consortium of 10 large companies and two universities established the Corporation for Productive Development to provide support services for the productive and technological growth of small and medium enterprises (SMEs) in Antofagasta. Until 1995, the dominant incentive to create new linkages was through financial instruments such as long-term credits and cofinancing from CORFO (Chilean Economic Development Agency). In 1995, CORFO and the European Union provided funding for a new initiative, The Program to Develop Suppliers for the Industrial Growth of Region II, which would further integrate SMEs in the supply chain of large companies (Culverwell 2000: 9). The core of this program was a subsidy to large companies in Region II who participated in supplier development, requiring the companies themselves to take responsibility for the training and integration of local suppliers. In 1997, this initiative took a big step forward when the Association of Antofagasta Industries (AIA) and the Service for Technical Co-operation (SERCOTEC), a subsidiary of CORFO, joined together to construct a program designed to address the qualification needs of SMEs supplying the mining industry. SERCOTEC provided credit programs, technical consultancy, subcontracting exchange, management training, and marketing and export assistance. AIA provided the organizational structure, including programs and specialist training courses, including one called the Program to Evaluate and Qualify Suppliers to the Mining Industry. The objective was to increase the competitiveness of regional suppliers so they would be able to maintain and strengthen productive linkages with mining companies (Culverwell 2000: 10).

In 2002 Antofagasta established an executive committee to encourage the development of a mining cluster in the region. This public-private partnership deliberately targets and fosters local suppliers, helping them adjust their practices in accordance with the needs of mining companies operating in Chile and overseas. In 2007, with assistance from Chile's Innovation for Competitiveness Fund, a public-private committee—the Strategic Council for the Mining Cluster—was created to identify the needs of the mining sector. It indicated the need to promote suppliers' associations and to improve research and development, human capital and the business climate. Since then the government has introduced various measures to support mining suppliers' expansion, including a research and development center focusing on mining at the University of Chile and a scientific park in Antofagasta. In April 2011, the Ministry of Mining joined BHP Biliton and CODELCO (the National Copper Corporation of Chile) in a new program titled Strategy for the Development of World Class Mining Suppliers. The goal is to transform 250 Chilean-based firms into world-class suppliers by 2014. CORFO committed to invest \$45 million over three years, with additional funding from other partners. .

Box 4.3 Ghana and the Akosombo (Volta River) Dam

Aluminum and the Volta Aluminum Company (Valco) smelter in Tema played an important historical role in the economic development of Ghana. The Akosombo Dam—the centerpiece of the Volta River Authority (VRA)—was completed in 1966 to provide power for Ghana, using the Valco aluminum smelter as a base-load customer. Without the demand from Valco, the dam and power source would not have been feasible for a number of decades. Even as late as 1994, Valco was using 45 percent of the electricity supplied by the VRA, and there was enough power available to meet nearly all the other demands from Ghana, Togo, and Benin in years of average rainfall. Nevertheless, due to rapid economic growth—led to a considerable extent by the mining industry—domestic demand for electricity has increased more than 8 percent per year since 1988, outstripping available capacity, and rendering the Valco smelter uncompetitive at market prices for power.

develop their own power supplies due to the scarcity or unreliability of local power.

In Chile in the 1990s, the government began an ambitious plan of public-private partnerships in infrastructure, starting with roads but soon expanding to ports, irrigation, and social services. Mining companies have been important beneficiaries of the approximately \$50 billion invested between 1993 and 2010, while at the same time they have been important customers for the concession owners.

In the sample, the only countries where mining companies have contributed significantly to regional or national infrastructure are Chile and Peru. In Chile, in addition to acting as a base customer for infrastructure projects, the mining industry is undertaking a series of investments in water supply projects valued at \$7.7 billion in the desert mining regions II and III.¹² In Peru, two of the largest mines have made very large infrastructure investments in recent years. Yanacocha (gold) invested more than \$739 million from 2009 to 2011 in the region of its operations, while Antamina (copper) invested in 28 different infrastructure projects in 2010 alone to improve local housing and regional irrigation, sanitation, water, mobile communications and power-generation systems. As box 4.3 shows, in the cases of South Africa (roads, railways, and ports) and

¹² *Global Business Reports* (2012: 57).

Ghana (power), the government has provided non-dedicated infrastructure as an incentive for the development of mining operations. More recently, the government of Indonesia is building and upgrading ports and railways, partly as an incentive to mining companies but as much due to the increased burden that the mining expansion has placed on the already overburdened existing infrastructure.

While there is a large scope for cooperation on infrastructure projects between large mining operations and regional and national governments, historically these have been rather limited—with the major exception of hydro power and aluminum smelters. When they have happened it seems as if it were more by accident than by design, often with unintended consequences, as in the controversial impact the opening of the gigantic Carajas iron ore project in Brazil has had on the Amazonian rainforest. There is a growing push for infrastructure developments for new large mining projects to be coordinated with national or regional infrastructure plans, such as happened with the Moatize aluminum project in Mozambique. The shape of future natural resource corridors is still to be determined, however.¹³

Local development

While mining firms contribute to local (in the area of the mine) development through job creation, given the relatively small number of jobs in new mining operations, most companies either voluntarily or due to government legislation or pressure provide other benefits to local communities. These come mainly via corporate social responsibility programs, local infrastructure development, foundations, and targeted tax payments.

In the sample, CSR (Corporate Social Responsibility) contributions—either directly or through foundations—are high or very high in all five countries, while local infrastructure development is medium or high in all but Ghana. Legislation to support local development varies widely across the sample, from weak in Chile and Indonesia to very strong in Peru—through voluntary taxes that partially target local development (see box 4.2)—and South Africa (see box 4.4). In Chile, there are a number of programs that have been developed by companies, governments, and research institutions that have contributed enormously to local development, as described in

¹³ See Jourdan (2008) for a description and functioning of a natural resource (development) corridor.

Box 4.4 Local Development Legislation in South Africa

Since 2004, all mining right holders or those applying for mining rights are expected to submit a Social and Labor Plan (SLP) to their regional government manager. The SLPs must include Historically Disadvantaged South Africans (HDSA) share of total procurement of capital goods, services and consumables and how mining companies' plan to expand it. The government went a step further in the Revised Mining Charter, which requires mining companies to procure 40 percent of their capital goods, 70 percent of services and 50 percent of consumer goods from Black Economic Empowered entities by 2014. South Africa's current mining legislation also requires multinational mining suppliers based in South Africa to contribute 0.5 percent of their annual income generated from local subsidiaries to the socioeconomic development of local communities.

Legislation also requires mining companies to report progress annually on development of communities near mines, as well as sustainable growth. Mining companies must describe their infrastructure and poverty-eradication projects for the areas in which they operate and major labor-sending areas as well as their plans to address the nutrition, housing, and living conditions of mine employees. They also are expected to have a human resources development program that includes a skills development plan, a mentorship plan, an internship and bursary plan, and an employment equity plan, ensuring that by 2014 female and HDSA participation in the workforce will have risen to 10 and 40 percent, respectively.

In June 2011, the South African government introduced the "Beneficiation Strategy for the Minerals Industry of South Africa." It is designed to develop mineral value chains and expand beneficiation projects in the country. Seven different value chains are being prioritized: iron and steel, energy, auto catalytic converters, jewelry, diesel filters, pigment, and titanium metal production.

box 4.2. In Indonesia a number of programs aimed at increasing the human capital in localities have had a strong impact on local development opportunities. One of the oldest (and most successful) of these endeavors, the Nemangwaki Mining Institute, is described in box 4.5. The situation with respect to targeting mining taxes to local communities is similar, from nonexistent in Chile to extremely high in Peru.

As shown in table 4.1, even in this small sample, countries followed quite varied paths to try to boost local development. The detailed case studies show that in the sample countries, the least public sector interventionist country, Chile, has had the best results, while Peru—the country that has spent the most fiscal resources—has had mixed results because the ability to manage the funds has

Box 4.5 Indonesia's Nemangkawi Mining Institute

The Nemangkawi Mining Institute (IPN) developed from Freeport Indonesia's (FI) commitment in 1996 to the Indonesian government to double the number of Papuans in its workforce by the year 2001 and again by 2006. It was launched in 2003 with the goal of providing pre-apprentice, apprenticeship, and advanced career opportunities, primarily for Papuans. FI granted the building and has since invested more than \$76 million to staff and operate the training institute. Approximately 1,500 apprentices are enrolled annually in the three-year apprenticeship program; they receive a monthly stipend of at least \$166. Courses range from basic math and writing skills to learning a trade like electrician or heavy equipment operator. The IPN also offers an MBA degree in association with the Bandung Institute of Technology and a business administration program in association with Semarang State Polytechnic.

To date, more than 2,000 students have passed through its doors; 90 percent of graduates and ongoing apprentices are Papuans. While almost all of the apprentices take an employment position with FI or one of FI's contractor companies, the participants are not required to do so.

often been inadequate. It is also clear that in countries where not much attention had been paid to local development, as in Ghana until recently, there is increasing pressure to change this development model and an increasing reliance on legislation.¹⁴

Human development and governance

Given the importance of the mining sector in all five countries, the last rows of table 4.1 briefly describe the trends in the HDI, inequality, and governance indices. No attempt is made to claim causality here, only to show that countries with large mining sectors can have overall varied performances with respect to these indicators, so there does not appear to be a deterministic path from mineral riches or dependence to low human development and governance.

All five countries have either relatively high HDIs (compared with neighboring countries) or strongly improving HDIs. The only country where the HDI is stagnant is South Africa, the only country where the mining sector has not shown strong growth in the past decade. The

¹⁴ See Sarkar et al. (2011) for a discussion of community development agreements in mining operations.

inequality trends are very diverse, from medium and improving in Peru to very high and worsening in South Africa. While rapid growth is normally associated with worsening inequality, inequality levels in Ghana and Peru, two of the fastest-growing economies since 2000, are moving in opposite directions from similar starting points. Clearly further analysis would be necessary to understand what is driving inequality measures in each country.

Similarly, the natural resource curse predicts that strong mineral dependence will result in deteriorating governance, but the sample countries demonstrate quite diverse results. Three of the five countries are above their regional averages, two of them well above, while the trend for two countries is stagnant, two are improving, and one is declining. As noted above, South Africa, where mining activity is declining, is the only one in the sample that did not have a large increase in its mining sector in the past decade. Again, similar to human development and inequality, there does not seem to be “path dependence” on governance for countries with large mineral endowments, at least since the turn of the century.

Lessons for other mining countries

What lessons can “newer” low- and middle-income mineral-rich countries take from the five countries in the sample about increasing the benefits from their mining sectors?

Perhaps the clearest lesson is that benefits will not appear on their own—that is, due solely to market forces. Nevertheless, the failed experience of many import-substitution plans suggests that linkages cannot be forced upon the mining sector without enabling business conditions. These include access to power and transport infrastructure, adequate human capital, access to financial capital, economies of scale, and outreach or technical assistance programs. The only one of the five cases where, for historical reasons, additional industrialization requirements has been forced upon the mining sector, is South Africa, and it has had mixed results at best. The second biggest lesson may well be that public-private cooperation is required to kick-start the process. The experience of Chile is perhaps the most appropriate, where a mature mining sector began to develop extensive domestic linkages only when a series of public-private programs were introduced, starting in the early 1990s. Third, not all mines require a large amount of infrastructure that has or could have externalities for other sectors, but when they do it is important that countries use the mines as base-load customers of more wide-ranging

infrastructure, albeit in a rational way, not with demands that will destroy the mines that are to support the infrastructure. Fourth, there must be investment in training—often at a regional level—to increase the capacity of nationals to work in the mines and, more importantly, to be able to supply the goods and services that the mines will want to buy. The private sector has an important role to play in the design and delivery of this training. The fifth lesson is that CSR- type local community development programs can have important local poverty-alleviation benefits and will make local development more sustainable in the long run, but they do not substitute for sector-oriented policies and programs to enhance the long-run benefits on a macro scale.

There is no standard format because the types of minerals, their geographic location (remote location with a hostile climate or near existing towns and cities), the dispersion of the mining operations, and the overall size of the sector at a global level all play important roles in determining optimal policies and programs. As noted previously, in smaller mineral-rich countries, extensive linkages are not likely to develop without a regional approach. In some cases, it must be stressed, maximizing the fiscal revenues generated from the mining operations will be the most important policy. The ability to use these revenues to further sustainable growth is an even bigger challenge, but that is beyond the scope of this paper.

Chapter 5

Conclusions and Recommendations

Since the turn of the century, most low-income and lower-middle-income mineral-rich countries have had high growth rates led by their mining sectors, despite the global financial crisis, and for most of these countries, the present decade will likely have more of the same. With respect to growth, the natural resource curse as it pertains to mineral-rich countries does not seem to have been widespread over the past two decades. The rapid growth of the mining sector was partly due to high mineral prices, but in many cases also due to the countries' major revisions to mining policies, institutions, and capacities. Moreover, many of the fast growers saw their mining sectors begin to grow rapidly even before the mineral price boom in the wake of comprehensive mining-sector reform; after 2000 these countries were the fastest-growing low- and lower-middle-income countries on average. Few of the mineral-rich countries, however, can be said to have gotten over the hump or definitively past some turning point where a decade of low mineral prices would not result in stagnation. In some cases, this might be due to the fact that a country's mineral-sector reform has outpaced its general socioeconomic reform, and there is still a danger that the latter may pull down the former. Nevertheless, many—if not most—mineral-dependent low-income and lower-middle-income countries are putting more emphasis on increasing benefits from the mining sector, particularly through spinoff industries and using higher levels of fiscal revenues to build infrastructure and develop human capital. This in turn will lead to the development or expansion of other industries not related to mining. While there has been substantial progress on fiscal issues in recent years, programs and policies to increase linkages and better manage large-scale infrastructure are just beginning in most of these countries.

For this same group of countries, the level of well-being, as measured by the Human Development Index, has shown strong improvement over the prolonged rapid growth period, faster than in countries that are not dependent on extractive (mining or oil) industries. This growth has been substantially greater over the past five years. These results hold when the HDI is decomposed into its education and health components. Success on meeting MDG goals has also been just as rapid for mineral-dependent as non-mining countries. The benefits of growth appear to be spreading to some degree despite the fact that growth was driven by the mineral sectors of these countries, in contrast to much of the evidence

(or arguments) from the last century for low-income and lower-middle-income countries.

It is clear that mineral-rich countries can get more out of their mining sector than mines—and it is no longer necessary to go back in history to cases like Australia, Canada, Sweden, and the United States. In many countries, substantial linkages have been developed from mining operations and tax revenues are increasing to build national and local capital, both physical and human. Mining firms have usually been partners in the attempt to move the industry from an enclave status to an engine of growth, sometimes voluntarily but at other times due to legal requirements. Many other countries are currently trying to do the same, although given that many of them are smaller in geographic size, with fewer mines, their success may depend on the ability to develop regional or subregional markets—which requires cooperation on trade barriers, infrastructure, and the development of regional training and educational institutions.¹⁵ These are strong challenges, and they are not likely to succeed without overall deepening of socioeconomic reforms. Still, it might be true that in some countries the success of the mining sector and related industries might lead the general reforms rather than the other way around.

Finally, this paper has shown that there are strong trends and patterns in the data indicating that mineral-rich countries as a group are doing well, and that the strength of the natural resource curse seems to have diminished in this century. At the most it can claim that, without further analysis, it is difficult to say that mineral-rich countries do worse than their counterparts and that there are no circumstances in which a low-income country can use minerals as the basis of long-run growth. Still, this paper is not an econometric analysis of these relationships and does not attempt to determine the underlying causal relationships in the low- and lower-middle-income countries.

¹⁵ A country with abundant mineral resources is often said to have “good geology,” but the reality is that 10 of the top 14 mining countries by value in the world are also among the 14 countries with the largest land masses. Major exceptions (in 2010) to this “land mass means mineral wealth rule” are Sweden, Ghana, and the Philippines, all of which are in the top 20 mineral producers by value but not in the top 50 countries by land mass.

References

- Auty, R. M. 1990. *Resource-Based Industrialization: Sowing the Oil in Eight Developing Countries*. Oxford, U.K.: Oxford University Press.
- Auty, Richard M., ed. 2001. *Resource Abundance and Economic Development*. World Institute for Development Economics Research. Oxford, U.K.: Oxford University Press.
- Auty, Richard M., and Indra de Soysa, eds. 2006. *Energy, Wealth and Governance in the Caucasus and Central Asia: Lessons Not Learned*. Routledge.
- Barma, Naazneen, Kai Kaiser, Tuan Minh Le, Lorena Vinuela. 2011. *Rents to Riches? The Political Economy of Natural Resource-led Development*. Washington, DC: World Bank Publications.
- Blattman, Christopher, Jason Hwang, and Jeffrey Williamson. 2007. “Winners and Losers in the Commodity Lottery: The Impact of Terms of Trade Growth and Volatility in the Periphery 1870–1939.” *Journal of Development Economics* 82(1) 156–79.
- Brunschweiler, C., and E. Bulte, E. 2008. “The Resource Curse Revisited and Revised: A Tale of Paradoxes and Red Herrings.” *Journal of Environmental Economics and Management* 55(3): 248–64.
- Collier, Paul. 2010. *The Plundered Planet: Why We Must—and How We Can—Manage Nature for Global Prosperity*. Oxford, U.K.: Oxford University Press.
- Collier, Paul, and Hanke Hoeffler. 2009. “Democracy’s Achilles Heel or How to Win an Election Without Really Trying.” CSAE WPS/2009–08. Oxford University.
- Culverwell, Malaika 2000. “The Mining Cluster in Antofagasta: Integrating Small and Medium Suppliers into the Productive Chain.” Part of Ph.D. thesis, University of Cambridge, U.K.
- Davis, Graham. 1995. “Learning to Love the Dutch Disease: Evidence from the Mineral Economies.” *World Development*. 23(10): 1765–79.
- Devarajan, Shantayanan, Tuan Minh Le, and Gael Raballand. 2010. “Increasing Public Expenditure Efficiency in Oil-Rich Economies—A Proposal.” Policy Research Working Paper 5287, World Bank, Washington, DC.
- Gelb, Alan. 1988. *Oil Windfalls: Blessing or Curse?* Oxford, U.K.: Oxford University Press.

- Gelb, Alan, and Sina Grasmann. 2010. "How Should Oil Exporters Spend their Rents?" Working Paper 221, Center for Global Development, Washington, DC.
- Global Business Reports. 2012. "Mining in Chile: The Engine That Moves Chile Forward." *Engineering and Mining Journal* (March): 49–82.
- Gylfason, Thorvaldur. 2001. "Natural Resources, Education and Economic Development." *European Economic Review* 45(4–6), 847–859.
- Gylfason, Thorvaldur. 2010. "Natural Endowment: A Mixed Blessing?" Natural Resources, Finance, and Development seminar in Algiers, November 4–5. Organized by the Central Bank of Algeria and the IMF Institute.
- Harvey, David I., Neil M. Kellard, Jakob B. Madsen, and Mark E. Wohar. 2010. "The Prebisch-Singer Hypothesis: Four Centuries of Evidence." *The Review of Economics and Statistics* 92(2) (May): 367–377.
- Hausmann, Ricardo, and Roberto Rigobon. 2003. "An Alternative Interpretation of the 'Resource Curse': Theory and Policy Implications." *Fiscal Policy Formulation and Implementation in Oil-Producing Countries*, 12–44. Jeffrey Davis, ed. International Monetary Fund.
- Isham, J., L. Pritchett, M. Woolcock, and G. Busby. 2003. *The Varieties of the Resource Experience: How Natural Resource Export Structures Affect the Political Economy of Economic Growth*. Washington, DC: World Bank.
- Jourdan, Paul. 2008. "Integrated Mineral-Based Growth and Development," presentation prepared for West African Regional Mining Forum, African Development Bank. February.
- Kapstein, Ethan, René Kim, Willem Ruster, and Hedda Eggeling. 2010. "The Socio-Economic Impact of Newmont Ghana Gold Limited." Haarlem, the Netherlands: Stewart Redqueen Consulting.
- Kaufmann, Daniel, Aart Kraay, and Massimo Mastruzzi. 2012. "Worldwide Governance Indicators." Washington, DC: World Bank and Brookings Institution. <http://info.worldbank.org/governance/wgi/index.asp>.
- Koppa, Randolph S. 2010. "Mongolia's Investment Needs and Opportunities." Trade and Development Bank of Mongolia. December 13.
- Krueger, Anne O. 1974. "The Political Economy of the Rent-Seeking Society," *American Economic Review* 64(3): 291–303.
- Lane, Philip R., and Aaron Tornell. 1996. "Power, Growth, and the Voracity Effect." *Journal of Economic Growth* 1(2) (June): 213–241.
- McMahon, Fred, and Miguel Cervantes. 2011 and 2012. Fraser Institute Annual Survey of Mining Companies. Fraser Institute, Vancouver, Canada.
- McMahon, Gary. 1997. "The Natural Resource Curse: Myth or Reality?" Economic Development Institute. World Bank, Washington, DC.

- Moore, Mick. 2001. "Political Underdevelopment. What Causes 'Bad Governance'?" *Public Management Review* 3(3): 385–418.
- Nankani, Gobind. 1979. "Developmental Problems of Mineral Exporting Countries." World Bank Background Paper for the 1979 World Development Report.
- Poelhekke, Steven, and Frederick van der Ploeg. 2007. "Volatility, Financial Development and the Natural Resource Curse." CEPR DP6513. CEPR. October.
- Prebisch, Raul. 1950. *The Economic Development of Latin America and Its Principal Problem*. UN E/CN.12/89/Rev.1. Lake Success, N.Y.: United Nations.
- Rosser, Andrew. 2006. "Escaping the Resource Curse" *New Political Economy* 11(4) (December).
- Rosser, Andrew. 2006. "The Political Economy of the Resource Curse: A Literature Survey." IDS Working Paper 268, Institute of Development Studies. University of Sussex, Sussex, U.K.
- Sachs, Jeffrey D., and Andrew M. Warner. 1995. "Natural Resource Abundance and Economic Growth." NBER Working Paper 5398, Boston, Massachusetts.
- Sachs, Jeffrey D., and Andrew M. Warner. 1997. "Natural Resource Abundance and Economic Growth." Harvard University, Cambridge, Massachusetts.
- Sala-i-Martin, Xavier, and Arvind Subramanian. 2003. "Addressing the Natural Resource Curse: An Illustration from Nigeria." Working Paper 9804. National Bureau of Economic Research.
- Sarkar, Sunrita, Alastair Gow-Smith, and Anna Sundby. 2011. "Mining Community Development Agreements—Guidance Manual." Oil, Gas, and Mining Division, World Bank, Washington, DC.
- Singer, Hans. 1949. "Economic Progress in Underdeveloped Countries." *Social Research: An International Quarterly of Political and Social Science* 16(1): 1–11.
- Solomon, Michael, ed. 2012. "The Rise of Resource Nationalism: A Resurgence of State Control in an Era of Free Markets or the Legitimate Search for a New Equilibrium?" Southern African Institute of Mining and Metallurgy, Johannesburg, South Africa.
- Stevens, Paul. 2003. "Resource Impact: A Curse or a Blessing?" Working Paper, University of Dundee, Dundee, Scotland.
- The Economist*. 1977. "The Dutch Disease." November 26: 82–83.
- UNDP. Various years. *Human Development Report*. New York: UNDP. <http://hdr.undp.org/en/reports/>.
- World Bank. 2012. "World Development Indicators." World Bank, Washington, DC.

Annex 1

Full Case Studies

For the full case studies in section 4, go to <http://www.worldbank.org/en/topic/extractiveindustries>.

Annex 2

Natural Resources and Socioeconomic Growth

For the full case studies in section 4, go to <http://www.worldbank.org/en/topic/extractiveindustries>.

Annex 3

Additional or Expanded Tables

Table A3.1 Expanded Table 3.4 Education and Health Indices, % Change

Countries	1990–2000		1990–2010		2000–10		2007–11	
	Education	Health	Education	Health	Education	Health	Education	Health
Burkina Faso	NA	6.2	NA	22.7	NA	15.5	2	5.7
Central African Republic	21.5	-17.8	46.6	-4.2	20.7	16.6	5.9	11.2
Congo, Dem. Rep.	-1.5	-4.5	13.9	4.5	15.7	9.4	5.3	4.4
Ghana	13.1	4.3	41.4	19.1	25.1	14.2	6.9	4.6
Guinea	NA	18.8	NA	42.4	NA	19.9	1.2	5.9
Kyrgyz Republic	6.7	-0.1	9.8	2.5	2.9	2.6	0.3	0.3
Laos	23.2	20.7	42.1	37.1	14.9	13.6	3.1	3.9
Liberia	25.9	16.8	38.9	62.7	10.3	39.3	4.5	8.4
Mali	95.1	12.8	229.3	28	68.8	13.5	10.7	5.5
Mauritania	53.6	2.8	88.7	6.2	22.8	3.3	3.7	2.9
Mozambique	31	17.4	91.4	28.1	46.1	9	3.7	5.5
Niger	38	32	124.1	59.8	62.4	21.1	14.2	5.8
Rwanda	23	107.4	87.6	174.3	52.4	32.2	8.2	5.1
Sierra Leone	44	5.4	67	45.9	16	38.5	3.4	7.6
Tanzania	11.4	-0.6	52.9	22.2	37.2	22.9	2	9.2
Zambia	12.3	-20	18.2	3.7	5.3	29.7	1.1	10.6
Zimbabwe	13.1	-39.1	25.5	-26.1	11	21.6	2.2	21
Armenia	9.2	6.9	14.3	13	4.7	5.7	0.5	1.2
Bolivia	11.4	10.8	24	19.3	11.3	7.7	3	2.7
Mongolia	1	6.3	24.5	18.9	23.2	11.9	3.4	3.1
Namibia	11.8	-7.6	17.7	3.4	5.3	11.9	1.5	5.3
Papua New Guinea	33.8	8.9	50.9	19.3	12.8	9.5	3.4	3.7
Low-income mining	17.7	4.4	32.9	21.9	12.9	16.6	3.6	6.0
Low and lower-middle-income mining	16.9	5.2	32	21.1	12.9	15.1	3.4	5.4

Countries	1990–2000		1990–2010		2000–10		2007–11	
	Education	Health	Education	Health	Education	Health	Education	Health
Low and lower-middle-income non-mining/oil ¹	17.2	4.5	35.8	13	15.8	8.1	0.5	3.4
Low-income non-mining ¹	16.2	0	32.7	17.9	14.2	12	0.1	4.8
Low & lower-middle-income SSA mining	27.6	8.4	70	30.8	30.2	19.9	4.9	7.4
Low & lower-middle-income SSA non-mining/oil	31.6	1.7	61	15.4	23.6	13	5.1	6.2
Pre-boom mining sector reform	15.5	6.0	33.2	18.5	15.4	11.9	4.4	5.3
World	12.5	6.3	24.9	11.7	11.1	5.1	2.2	1.8

1 Using World Bank's 2010 classification, excluding countries with populations less than 1 million plus the West Bank, Somalia, Iraq, and Afghanistan due to persistent political instability.

Source: UNDP.

Table A3.2 Expanded Table 3.5 Average Loss in the HDI Due to Inequality (%)

Countries	2010	2011
Burkina Faso	36.2	35.1
Central African Republic	42	40.6
Congo, Dem. Rep.	36.2	39.9
Ghana	25.4	32.2
Guinea	38.4	38.8
Kyrgyz Republic	15.1	14.4
Laos	24.8	22.8
Liberia	37.3	35.3
Mali	38.3	NA
Mauritania	35.1	34.2
Mozambique	45.3	28.9
Niger	33.9	34.2
Rwanda	37	35.7
Sierra Leone	39.3	41.6
Tanzania	28.4	28.8
Zambia	31.5	29.5
Zimbabwe	29.9	28.7
Armenia	11	10.8
Bolivia	38	34.1
Mongolia	15.2	13.8
Namibia	44.3	43.5
Papua New Guinea	NA	NA
Low-income mining	33.8	32.6
Low- and lower-middle-income mining	32.5	31.1
Low- and lower-middle-income non-mining	28.8	28
Low- and lower-middle-income non-mining/oil	27.9	27.2
Low-income non-mining	33.6	33
Lower-middle-income non-mining	26.3	25.6
Low- and lower-middle-income SSA mining	34.4	33.2
Low- and lower-middle-income SSA non-mining	35.5	35.1
Low- and lower-middle-income SSA non-mining/oil	34.8	34.8
World	21.7	23

Source: UNDP.

Table A3.3 MDG Indices, 1990, 2000, 2010, Part 1

Countries	% of Population Below \$1.25/day (ppp)			Net enrollment ratio in primary education			Under 5 mortality rate (deaths/1,000 births)		
	1990	2000	2010	1990	2000	2010	1990	2000	2010
Low- and lower-middle-income mining	57.4	48.1	45.8	62.9	67.1	81.5	163.3	134.4	91.8
Low- and lower-middle-income non-mining/oil *	41.0	31.6	27.2	77.9	77.2	87.3	105.1	83.7	56.1
Low-income mining	66.1	60.4	51.3	54.7	60.1	77.5	185.8	154.7	107.1
Low-income non-mining/oil	63.6	63.0	46.3	67.8	65.4	81.5	154.1	124.1	88.0

*Using World Bank's 2010 classification, excluding countries with populations less than 1 million plus the West Bank, Somalia, Iraq, and Afghanistan due to persistent political instability.

Table A3.3 MDG Indices, 1990, 2000, 2010, Part 2

Countries	% of Population with Improved Drinking Source			% of Population with Improved Sanitation Facility			% of Population with Access to Power ¹		
	1990	2000	2010	1990	2000	2010	1990	2000	2010
Low- and lower-middle-income mining	51.4	59.8	67.2	23.3	29.6	32.2	24.4	29.3	37.1
Low- and lower-middle-income non-mining/oil	65.8	73.3	80.4	43.6	49.9	56.4	48.5	56.2	66.4
Low-income mining	47.7	56.4	63.4	16.8	24.6	27.2	17.8	21.1	27.4
Low-income non-mining/oil	49.4	58.5	67.8	27.9	31.6	36.9	18.8	21.1	27.4

¹ Not an official MDG but a commonly used measure of improved living standards.

