MINING AND SUSTAINABLE DEVELOPMENT

MINING, REGIONAL DEVELOPMENT AND BENEFIT-SHARING

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Contents

Abstract

The objective of the report is to synthesize the existing empirical research on mining, regional development and benefit-sharing in developed countries. Specifically, the report presents a review of the literature addressing how the regional development impacts of mining ventures (e.g., employment multipliers) can be comprehended and assessed empirically, as well as the role of various benefit-sharing instruments in generating a more inclusive development. These issues are analyzed in the context of selected practical experiences in important developed mining countries such as Australia, Canada, Chile and the USA. Important issues and challenges that deserve increased attention in future research are identified and discussed. These include, for instance, the relationship between mining competitiveness and benefit-sharing as well as the efficient use of regional development investment funds. Moreover, the regional-economic impacts of mining ventures are overall highly context-specific, and there is a need for comparative research understanding important differences across countries and regions.

Preface

Minerals are essential for human welfare. However, their extraction is associated with both opportunities and challenges. Historical concerns around work conditions and the competitiveness of the mining sector have been complemented by a growing number of other issues. Today, an overarching goal is to find ways by which the mining sector can promote sustainable development.

Sustainable development is often defined as "development that meets the needs of the present without compromising the ability of future generations to meet their own needs." Furthermore, it is commonly agreed that this must incorporate economic, environmental and social concerns.

There is a growing literature that examines the relationship between extractive industries and sustainable development, yet much research is still conducted in a siloed fashion. For this reason, the Swedish state-owned iron ore mining company LKAB and Luleå University of Technology initiated a pre-study with the aim to establish a new multidisciplinary research programme on mining and sustainability.

The pre-study was conducted from January to October 2014[1]. One part of the pre-study was to review existing research attempting to address mining and sustainable development – the current state-of-the-art – with focus on the past, present, and future situation in Sweden, but also to put the Swedish case into a broader perspective by comparing several international examples.

One of the outcomes of the pre-study is this report. It reviews the literature addressing how the regional development impacts of mining ventures can be understood and assessed empirically, such as how many jobs are created locally. It also investigates the role of various benefit-sharing instruments in generating more inclusive mining development projects.

The report highlights a number of future research needs. Notably, the relationship between the competitiveness of mining companies and benefit-sharing should be investigated in more detail. Research should look at how regional development funds can be used efficiently in order to promote sustainable development. Lessons could also be identified from mining regions that have been successful in adapting and diversifying their economy, thereby remaining prosperous over time.

Four other review reports have also been undertaken as a part of this pre-study.

- *Making Mining Sustainable: Overview of Private and Public Responses,* by Petter Hojem from Luleå University of Technology.
- *Environmental Aspects of Mining,* by Anders Widerlund and Björn Öhlander from Luleå University of Technology and Frauke Ecke from the Swedish University of Agricultural Sciences.
- *Environmental Regulation and Mining-Sector Competitiveness,* by Kristina Söderholm, Patrik Söderholm, Maria Pettersson, Nanna Svahn and Roine Viklund from Luleå University of Technology and Heidi Helenius from the University of Lapland.
- *Gender, Diversity and Work Conditions in Mining*, by Lena Abrahamsson, Eugenia Segerstedt, Magnus Nygren, Jan Johansson, Bo Johansson, Ida Edman and Amanda Åkerlund from Luleå University of Technology.

Together these reports provide a broad picture of the challenges and opportunities created by mining.

The pre-study has been made possible through a generous contribution from LKAB. All errors and opinions expressed in this report belong solely to the authors.

Luleå, October 2014

Patrik Söderholm and Nanna Svahn

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1. Introduction

1.1 Background and Motivation

The way in which mining ventures contribute to economic development in the region where they take place is important for the mining industry's relations to the local community. In this report we address two related challenges for researchers, companies and policy makers: (a) how to assess and comprehend the regional and local impacts of mining ventures; as well as (b) understanding the role of various benefit-sharing mechanisms in generating more inclusive development.

Since the beginning of the 2000s the global mining industry has experienced a boom; it has witnessed soaring output prices and therefore also rising profit levels. Figure 1 exemplifies this by displaying the development of copper and gold prices over the time period 1991-2012. Overall metal and mineral prices were depressed during the 1990s, but increased significantly from the mid-2000s and onwards. The reason for the price soars has been high growth rates in the Asian economies, not the least China and India. The elevated output prices make exploration activities more attractive and the profitability of new mining ventures increases.

Figure 2 shows the number of new mines that have opened in different country categories worldwide over the time period 2000-2013. It displays that since the mid-2000s the number of new mines has increased significantly, and this has particularly been the case in high-income countries such as Australia, Canada, USA, Russia and Chile. These five countries alone have accounted for 38 percent of the new mining ventures over the period. The mining boom has also led to substantial mining investment in several upper middle-income countries, including Brazil, South Africa, Mexico, China, and Kazakhstan. In low-income developing countries, though, the soar in mineral prices has not led to a similar profound growth in mining investment. A few important exceptions include India, Ghana, and Congo where a number of new mines have opened since 2000.

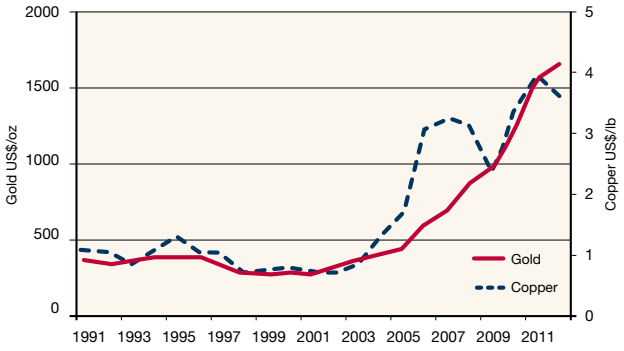


Figure 1: The Development of Gold and Copper Prices, 1991-2012 (current prices)

Source: British Columbia Ministry of Energy and Mines Statistics (2013).

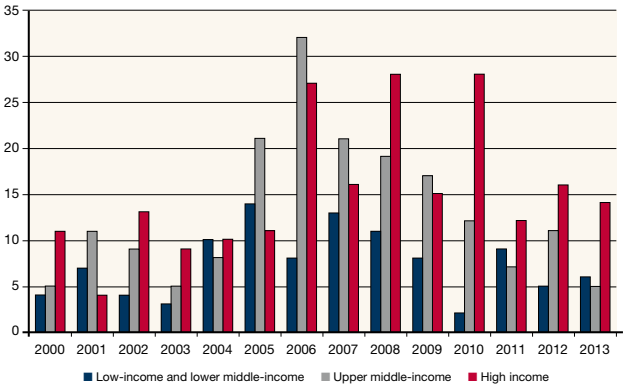


Figure 2: The Number of New Mine Openings in Different Country Categories Worldwide

Note: World Bank income classification of countries as of July 2013.

Source: Raw Materials Data.

However, in the developed world mining often takes place in relatively remote regions, and host communities in countries with substantial mining investment (e.g., Australia, Canada, etc.) have increasingly emphasized the need for a more even sharing of the benefits of mining ventures (e.g., O'Faircheallaigh, 2013). In addition, the environmental costs associated with mining ventures are largely of a local nature,[2] and may not be outweighed by the mines' contributions to economic development in the affected

[2] They can also continue to accrue long after the closure of the mine (e.g., IIED, 2002a; Widerlund et al., 2014).

regions. The focus on a more inclusive mining sector also stems from the growing assertion of the rights of people and demands for more direct participation in decision-making processes (Humphreys, 2000). Unless the above concerns are recognized in mineral development projects, community relations may become tense and lead to costly conflicts as well as to other types of business risks for the companies.

The World Economic Forum (2013) points towards an increasing number of conflicts and disagreements related to mining ventures during the last decade (see also Özkaynak et al., 2012). For these reasons several companies as well as governments in resource-rich countries have embraced the need for mineral ventures to gain a 'social license' to operate, i.e., a broad approval and acceptance of society towards these ventures that goes beyond the requirements of formal licenses. Regional development and benefit-sharing are often essential components of such an informal license (e.g., Williams, 2012; Prno, 2013).

The regional-economic impacts of mining ventures are far from straightforward to assess, not the least since falling transport costs and technological progress have led to projects that sometimes are increasingly economically detached from the regions in which they are located (e.g., Eggert, 2001). The mining ventures have over time grown substantially more capital-intensive (thus reducing the need for local labour). The inputs into the contemporary ventures must also satisfy very high technological standards, which cannot necessarily be supplied competitively by local firms. As a consequence, most of the returns to capital and to entrepreneurship may flow out of the affected regions (see further Section 3.1). This has in turn led to fears of so-called 'fly-in fly-out' work practices, i.e., where long distance commuting replaces immigration (World Bank, 2010). Still, in other instances mining has been shown to ignite significant economic development around technological innovation, new products, technology transfer etc. (e.g., Archibald and Ritter, 2001). The development of a cluster of economic activities surrounding mining ventures can be an important way of providing socio-economic benefits to a region since this allows for economic diversification.

As a response to the recent boom and with mining ventures sometimes lacking the appropriate regional linkages, different stakeholders (including local and regional governments) have pushed for more sustainable mining models (Di Boscio, 2010). Humphreys (2002) argues that sustainable mining development needs to depart from the regional and local level, and the new mining models include the implementation of various benefit-sharing mechanisms that can catalyse a broader-based development at the regional level. Some of these mechanisms and/or agreements have been initiated voluntarily by companies, but in several cases governments have enacted legislation to facilitate for affected regions and/or indigenous people to receive mining benefits. These policies involve, for instance, mineral taxes and royalties earmarked for local investment funds, joint ventures, local procurement, employment quotas, training of staff etc. (O'Faircheallaigh, 2013; Bocoum et al., 2012; World Bank, 2010).

During recent years several regional benefit-sharing mechanisms have been introduced in mining regions in, for instance, Australia, Canada, Chile and the USA. Our understanding of how well the new strategies have addressed long-term community concerns is, however, still limited, and best practices have only recently began to evolve. The above illustrates the societal importance of an improved understanding of mining projects' impacts on regional economic development, including the options, trade-offs and challenges associated with different types of benefit-sharing instruments and agreements.

1.2 Objective and Approach

The overall objective of this report is to provide a synthesis of the existing research on mining, regional development and benefit-sharing in developed countries. Specifically, we present a review of the literature addressing how the regional development impacts of mining ventures can be comprehended and assessed empirically, as well as how wider regional development concerns can be addressed through various types of benefit-sharing mechanisms. We analyze these issues in the context of some practical experiences in important mining countries such as Australia, Canada, Chile and the USA, and identify important issues and methodological challenges that deserve increased attention in future research.

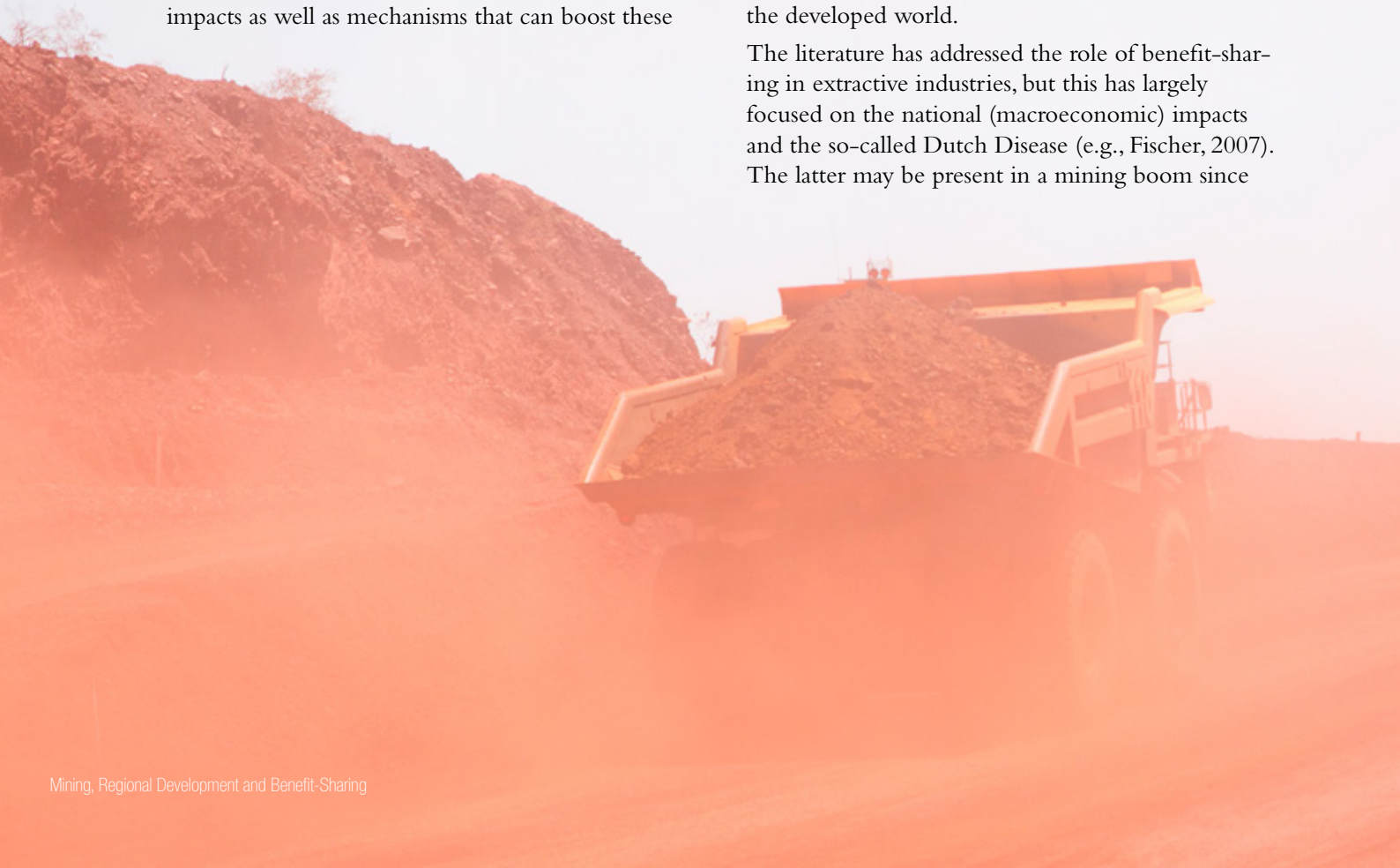
The search strategy comprised of searches in key bibliographic databases such as Web of Science, Scopus and Google Scholar using key words such as: mining benefit sharing; mining economic development; mining agreement; mining community development; mining regional development; mining revenue sharing; community development benefit sharing; community development mining; and mine benefit sharing. In order to avoid "the rigidity of 'mechanistic' searches" (Leusure et al., 2004, p. 172), additional key references were identified through a snowball technique. In addition, we mitigated reviewer bias by avoiding searches in specific journals or journal categories (e.g., Thorpe et al., 2005). In our assessment of benefit-sharing experiences we also rely on previous evaluations and reports addressing these issues.

A number of related reviews on the mining, regional development and/or benefit-sharing can be found in McMahon and Remy (2001), Eggert (2001), Fischer (2007) and Bocoum et al. (2012). Still, the present paper differs from earlier reviews in a number of respects. First, we provide an updated review of research addressing both the nature of the regional-economic impacts as well as mechanisms that can boost these impacts. Second, we highlight a number of generic challenges in attaining more inclusive mining ventures, and provide some key lessons based on recent practical examples in developed mining countries.

1.3 Scope and Limitations

Empirically the focus of this report is primarily on economic development at the regional and local levels, thus addressing employment opportunities and income growth. We therefore devote little explicit attention to the environmental and social impacts of mining. We also focus on mining development in developed (high-income) countries. A lion share of the mining and economic development literature has focused on the situation in developing countries (e.g., Tilton, 1992), often addressing nation-wide impacts due to the lower prevailing level of development for all layers of the population. In contrast, in developed countries, the benefit-sharing mechanisms have more often targeted specific groups, such as indigenous people (e.g., Browne and Robertson, 2009). Moreover, as shown Figure 2, the mining boom in terms of investment activity has been particularly prevalent in the developed world.

The literature has addressed the role of benefit-sharing in extractive industries, but this has largely focused on the national (macroeconomic) impacts and the so-called Dutch Disease (e.g., Fischer, 2007). The latter may be present in a mining boom since



an increase in exports causes the real exchange rate to appreciate, thus raising real wages and the price of non-tradable goods. This deteriorates the competitiveness of manufacturing and other tradable sectors. This is mainly a concern in countries in which the national economy is heavily dependent on natural resource extraction, although not necessarily in resource-rich and yet diversified economies (Gylfason, 2011). Still, while a lot of emphasis has been on exchange rate management and fiscal policy, less attention has been devoted to the micro-level issues. One should note, though, that following a mining boom high real wages and prices may emerge also at the regional level, thus potentially offsetting some of the positive impacts on regional output and employment (see also Section 2.1).

Over time there has also been an increased research interest in different political economy and governance issues, including corruption and rent-seeking behaviour following a boom in the minerals sector (e.g., Rodrik et al., 2002). This literature suggests that in the absence of good institutions (e.g., rule of law, lack of corruption, conflict management etc.) exploitation of natural resources could both harm the environment and provide meagre opportunities for public benefits. In such cases mineral wealth may be a curse rather than a blessing for the economy (e.g., Gylfason, 2011; Humphreys et al., 2007). This has been a major concern in a number of developing countries with limited democracy and weak governmental institutions. Our emphasis on developed countries means that we mainly address mining development and its impacts in the presence of well-functioning institutions. Such institutions imply, for instance, trust in government policy-making such as a rule-based process for granting resource concessions that reduces investor uncertainty and permits predictability. Nevertheless, our review shows that even in this group of countries we find examples of mining ventures with limited regional impacts as well as failing benefit-sharing initiatives. For this reason it is important to learn both from the good and the bad examples.

1.4 Outline of Report

In Section 2 we discuss the potential regional development impacts of mining. We address the nature of both direct and indirect development impacts, and provide an overview of the empirical research attempting to measure these in various geographical contexts. Some key methodological challenges are highlighted. Section 3 provides a conceptual discussion of the importance and the nature of benefit-sharing mechanisms. It also contains a discussion of key lessons for best-practice use of such mechanisms. In Section 4 these lessons are investigated in the empirical context of different benefit-sharing mechanisms in important developed mining countries such as Australia, Canada, Chile and the USA. Finally, Section 5 identifies some important avenues for future research on the relationship between regional development and mineral development, including efficient mechanisms to maintain the benefits of mining ventures within the regional boundaries.

2. The Regional Development Impacts of Mining Ventures

2.1 The Nature of the Impacts

Mining ventures have a variety of impacts on the regional development process, and these can be direct or indirect (Rolfe et al., 2003). The direct contribution to economic development comprises the value added generated by the mining venture, and spent to compensate labour, capital, the entrepreneurial efforts etc., and/or to satisfy the fiscal agent. The sizes of the indirect (or induced) impacts are instead affected by the so-called linkages to other economic activities in the region (Radetzki, 1982; Eggert, 2001). These linkages exist in various different forms:[3]

- *Backward linkages:* the local and/or regional purchases of different required inputs. The prospects for the production of capital goods, supplies and services needed for investments and operations (e.g., transportation services) will be enhanced through the mineral venture's demand for these inputs.
- *Forward linkages:* downstream activities, such as processing, refining and fabricating the crude ores and concentrates. Since the extracted ores often have to pass a number of transformation stages before final use, the forward linkages can be significant.
- *Final-demand linkages:* the incomes that employees at the mine and their households spend on goods and services in the local community or the adjacent region.
- *Fiscal linkages:* the tax and royalty revenues used by regional governments to develop infrastructure and/or to purchase goods and services. The benefits of infrastructure investments (e.g., roads, electricity grids etc.) will typically not only be appropriated by the mining company but will also spill over to other companies as well as to households.

While these linkages primarily address the increased induced demand for products and services in a region, there may also exist different supply constraints offsetting these impacts. First, if the factors of production engaged by the mining venture were already employed elsewhere in the regional economy, there will be a loss of value-added in this old activity. The increased demand for labor may also bid up wage levels, thus potentially diminishing the competitiveness of other private sectors and/or raise the cost of providing public services. Any negative environmental impacts caused by the mining venture may also increase costs and/or decrease demand for other companies (e.g., agriculture, tourism etc.) and households (Radetzki, 1982).

From the above it should be clear that the regional development impacts of mining ventures will depend on the specific circumstances related to each case, such as the size of the mine and the community, geographical location, the presence of mining cluster activities etc. (e.g., Archibald and Ritter, 2001). The indirect impacts of mining ventures are often expressed through so-called *multiplier effects,* which embody the effects of changes in demand for various goods and services (e.g., overall output) as well as inputs (e.g., labour) caused by the initial change in economic activity in mining (Fleming and Measham, 2014). For instance, an employment multiplier of 3 would imply that for every job created in the mining industry, there will be an additional two jobs created in other sectors in the region. A corresponding multiplier can be estimated to assess total region-wide output following the increase in sales from mining (i.e., the output multiplier). The sizes of these multipliers will be higher the more of the money injected in a region that is spent within the region, and this will in turn be affected by a number of different factors (Eggert, 2001). For instance, the larger the region is, the more likely that it will have the capacity and the skills to capture the expenditures. The extent to which the inputs for the mining activities will be purchased in the region will also be determined by the region's industrial structure, and where more diversified economies will be able to meet the new demands for goods and services (see also Rolfe et al., 2007a). In other words,

[3] The linkage concept was introduced more systematically by Hirschman (1956) and Watkins (1963).

large and more diversified regions will generally be better at preventing leakage of expenditure to other regions, and thus at retaining the money within their areas of influence.

In diversified regions, mining could also spur innovative activities among suppliers, in turn giving rise to know-how that spill over to other sectors. Such dynamic effects can be difficult to assess empirically (see also Section 2.2). One may note, though, that labor productivity in modern economies is largely dependent on the use that is made of factor inputs (apart from capital expenditures as such) (Humphreys, 2002). This should provide scope for innovative industries (e.g., ICT) to add to regional mining clusters since such spillover effects are likely to be most easily appropriated when activities are in reasonably close proximity to one another. Auty (2005) notes that the quality of legal institutions and the social capital in the host country, could also play an integral role in the development process. Although he emphasizes that this should pertain especially to low-income and/or distorted economies, one should note that the administrative competence and institutional environment may differ a lot also across remote regions and provinces in developed countries.

2.2 Empirical Assessments: Results and Methodological Challenges

A common method in regional impact analyses is to employ the so-called input-output (I/O) modelling, pioneered by Leontief (1936) and developed for regional analysis by Isard (1951). This approach formalizes the backward and forward linkages between various sectors in an economy, and empirically it has typically been applied to specific mining regions or ventures.

I/O studies on the regional-economic impacts of mining include Aroca (2001) who estimates the impacts of mining in the Chilean Region II. The results show that the employment multiplier for private mining firms ranged from 4 to 6, whereas it was 2-3 in the case of public mining companies.[4] Lagos

[4] An important reason for this difference in the size of the estimated multiplier effects is that under Chilean law public and private companies do not operate under the same conditions. Specifically, the public companies pay higher taxes, but the revenues are transferred to the central government and do generally not have any direct positive impact on the mining region. The private companies pay lower taxes, but on the other hand they have to pay annual fees to obtain mining rights. The latter revenues stay within the region (Aroca, 2001).

and Blanco (2010) also address the role of mining in Chile. Eggert (2001) notes that previous analyses of mining impacts in Western Australia, indicate an employment multiplier of 2. Important I/O studies on Australian regions include Ivanova and Rolfe (2011), Tonts (2010) and Rolfe et al. (2011), the last of these concluding that in Queensland the indirect impacts from the mining industry have been distributed widely in the regional economy. Tonts (2010), though, points to the presence of long-distance commuting in Western Australia leading to limited local benefits. In British Columbia in Canada, the employment multiplier has also been estimated at around 2 (PwC, 2011). Moreover, Archibald and Ritter (2001) find significant positive impacts of mining in Ontario, Canada. The above results, although somewhat parsimonious, illustrate how the regional-economic impacts of mining tend to vary depending on the specific characteristics of the affected area.[5]

Most of the above studies focus on the presence of mining activity and its role in the regional economy. Other studies instead investigate the regional development impacts of specific mining projects. For instance, case studies of selected mining ventures in Latin America (e.g., Pasco-Font et al., 2001; Castillo et al., 2001) have estimated the indirect regional effects of mining on total employment ranging from approximately a 1:1 ratio between new jobs in mining and jobs created elsewhere to a ratio of nearly six jobs created elsewhere per job in mining. Leaming (2007) calculates the direct and indirect benefits of the Rosemont copper mine in Arizona, USA, while Ejdemo and Söderholm (2011) as well as Ejdemo (2013) both address the regional-economic impacts of iron ore projects in northern Sweden. For instance, Ejdemo and Söderholm (2011) employ regional I/O analysis to arrive at an employment multiplier of around 2 at the county level, although this estimate is sensitive to assumptions made about the immigration rate.

There is also evidence of communities and regions unable to retain consumer spending within the region. For instance, Rolfe et al. (2003) investigate the impacts of an Australian Mine in the Bowen Basin (the Coppabella Mine), and report a regional multiplier of 0.6 and an even lower multiplier at the local level.[6] In Australia there have been concerns that the local governments receive smaller economic benefits than expected from mining (Petkova et al., 2009). Since, it is argued, the majority of mining jobs are created in larger urban centers and regions, consumer spending tends to take place outside of the mining towns resulting in low multiplier effects. This has led to an increased demand for improved benefit-sharing instruments in Australia (see also Section 4.1). Again, the empirical evidence suggests that mining will typically have positive employment impacts, but the magnitude of these impacts can differ from modest to sometimes substantial depending on the geographical scope of the assessment as well as on other context-specific factors.

The use of I/O modelling has however been criticized for building on restrictive assumptions, which may bias the results presented in the above work (Fleming and Measham, 2014; Eggert, 2001). First, these models assume that factor supplies (including labour and capital) at the regional level are perfectly own-price elastic (i.e., easily available). This means in turn that these analyses always generate positive job multipliers, and that there is no crowding-out effects from, for instance, higher wages etc. Second, the I/O models will in most cases neglect the employment effects in the non-tradable goods sector as well as potential gains such as agglomeration effects (Moretti, 2010). Finally, the I/O models are also static, thus typically neglecting changes in technology, innovation as well as the often lengthy adjustments to the economic injections provided by mining ventures.

[5] Estimates of national impacts of mining using input-output techniques are presented in, for instance, Stillwell et al. (2000) in which the role of mining for the South African economy is assessed. In San Cristobal and Biezma (2006) the authors study inter-industry linkages in the European mining sector. Some studies also combine the use of economic indicators with biophysical indicators addressing environmental footprints (e.g., Schandl et al. (2008) on the resource use trajectories in Australia).

[6] Still, in spite of the relatively modest economic impacts of mining in the Bowen Basin, most local stakeholders have held a favorable attitude towards the mining industry. This is in part because they perceive that benefits in the form of improved infrastructure, improved service levels, and town development initiatives accrue to the local community (Rolfe et al., 2007b).

For these reasons there has also been an increased interest in other assessment methods, such as: (a) computable general equilibrium (CGE) models; and (b) ex post econometric modelling. The CGE models are extensively used for scenario analysis of the implementation of different economic policy measures (e.g., taxes), and although they build on input-output matrixes they do also address the relative price changes following changes in the economy. For instance, Clements et al. (1996) use both traditional I/O-based multiplier techniques and a regional CGE model (WAM) to estimate how 35 new mining and mineral-processing projects in Western Australia have affected employment rates and the entire regional economy (see also Ahammad and Clements, 1999; Clements and Johnson, 2000, for similar CGE approaches). Simple multiplier analysis indicated that these projects would generate an employment multiplier of about 2. In contrast, the CGE model suggested an impact twice as high in spite of the relative price effects, and due to the more extensive economic linkages included in WAM.[7] However, although CGE models typically contain fairly sophisticated representations of economic linkages, they are more often than not designed for national and international settings, whilst the assessment of the regional impacts of mining requires a narrower geographical scope.

Considering the limitations of I/O and CGE modelling, scholars have increasingly employed *ex post* econometric models of mining impacts (Moretti, 2010; Marchand, 2012). This approach avoids the above model rigidities and use of strong assumptions. Specifically, data on changes in sectoral employment across regions over a certain time period are collected. In the econometric specification these data are regressed on changes in mining employment and different control variables (e.g., size of region, political power etc.), and a key output is the elasticity of employment change in a particular sector with respect to changes in mining employment. Based on this information, the employment multiplier can be calculated. This analysis indicates thus how particular sectors may be more benefited (or hurt) than others due to the presence of mining employment. In a recent study, Fleming and Measham (2014) employ this approach on Australian regions and find evidence of significant indirect employment impacts for some local services (e.g., transport, rental and accommodation services), but insignificant impacts in the tradable goods sectors (e.g., manufacturing, agriculture etc.).

In sum, the empirical research finds heterogeneous impacts of mining ventures on the regional economies, and the results are therefore highly context-specific and may also be due to the use of different assessment methods. This calls for increased attention to comparisons of different methods in future research, and further developments of the econometric approaches. Moreover, since a large part of the economic value of mining is nowadays tied up with the manner of how mining operations are performed rather than with the initial investment itself, greater attention should also be devoted to how regional economies can supply the necessary competence to support modern mining ventures (see also Section 3.1).

[7] Another application of CGE-modeling to mining development is found in Ye (2008), who studied the impacts of the booming iron ore sector in Australia using the CGE model MMRF-Green. Moreover, in a related report by the Australian Department of Treasury and Finance (2006), MMRF-Green is employed to study the regional and national impacts of the mineral resource boom during the early 21st century.

3. The Importance and the Nature of Benefit-sharing Mechanisms

3.1 Towards a More Global Market with a Stronger Regional Focus

During the last five decades the global mining industry has undergone significant changes, which together have made regional development an increasingly important issue. The mining ventures during the mid-1900s were not very capital intensive, and the capital needs could typically be satisfied within the region. This strong local involvement was supported by high transport costs as well as by the relative simplicity of the required inputs (Radetzki, 1982). The high transport costs for the extracted ores also led to a comparative advantage to local processing of the mines' output. Moreover, the already strong regional linkages gave primacy to the mining sector's contribution to national income and export earnings, and any tax and royalty payments typically accrued to the national rather than to the regional governments. Community consultation with affected citizens at the local level was limited or non-existent (Eggert, 2001).

One important factor altering the industry's relationship with the regional economy has been technological change in turn affecting mining operations. For instance, a combination of scale economies and increased capital intensity has profoundly increased the investment capital requirements of typical mining ventures. Although mining investments coming in large lumps often was viewed as initial boosts to economic development in the 1960s and the 1970s, little attention was devoted to what would happen after the initial investment (Humphreys, 2002). Some host countries (especially in the developing world) did not have a comparative advantage in neither upstream nor downstream activities. One reason for this was that the inputs into modern mining increasingly had to satisfy high standards in terms of know-how, and these inputs could therefore not always be supplied by local firms (Radetzki, 1982).

Overall the above implies that the size of the regional-economic impacts exerted by modern mining may be modest. Moreover, a large part of the rent has been appropriated by the national governments, and the financial benefits that local communities could expect to receive have been those that eventually have reached the community through central government spending. At the same time the development effects have been spread across ever wider geographical areas. Over time, however, these structural changes have led to increased demands for a more inclusive mining development, and this has also been spurred by other important trends. The increased emphasis on the distributional effects of mining benefits during the last decade can also be attributed to (World Bank, 2010; Humphreys, 2000):

- an increased concern over the negative environmental effects of large-scale mining, which are often most acutely felt at the local level;
- a stronger pressure on mining companies to make social and economic contributions to communities, as well as to involve local people in relevant decision-making processes;
- improved communication, which has facilitated the sharing of experiences between communities;
- the high mineral prices since the early 2000s have turned attention to the profits made by the industry and the often existing lack of regional benefits from the industry.

Ignoring the distributional effects of mining may create disruptive social tensions, thereby increasing business risks for mining companies. These risks may come in many forms. For instance, reliability in supply has become increasingly important, and customers will generally not be very forgiving in the presence of disruptions following tense community relations. Moreover, customers, fund managers, banks and prospective employees do not only care about the industry's output, but increasingly also about how the products have been produced (e.g., Humphreys, 2000).

This has provoked the emergence of a new model of sustainable mining, attempting to address concerns associated with the lack of significant regional linkages; sustainability issues as a mine ceases to operate; lack of appropriate compensation for the social and environmental costs borne by mining regions; insufficient benefit-sharing and a lack of stakeholder involvement in decision-making (Eggert, 2001).[8]

This model encourages tripartite discussions among communities, governments and companies. It has induced a shift in power and responsibility to the regional level (Di Boscio, 2010), and has put pressure on central governments to share tax revenues with the regional governments. The mining industry has responded by increasingly engaging in, and developing, its Corporate Social Responsibility (CSR) practices. It has also joined forces in industry-wide sustainability initiatives, such as the Global Mining Initiative that was launched in 1999 (ICMM, 2012). Benefit-sharing schemes have remained important components of the above-mentioned initiatives, as well as the industry's ambitions to gain a social license to operate (O'Faircheallaigh, 2013).

3.2 Different Types of Benefit-sharing Mechanisms

The purpose of benefit-sharing mechanisms is to ensure that a significant part of the economic benefits is retained in the region in which the rent is generated. Usually, the government either imposes these mechanisms in the form of explicit law, or alternatively, companies engage in benefit-sharing voluntarily within the framework of their CSR policy (Godden et al., 2008). Specifically, benefit-sharing refers to the distribution of the monetary and non-monetary benefits that are generated through the implementation of a mining project (e.g., Pham et al., 2013). The monetary benefits include, for instance, development and investment funds, equity-sharing and tax-sharing with governments. The non-monetary benefits include education facilities, medical facilities, employment goals, local procurement, training of staff and improved service access (Centre for Science and Environment, 2011; Bocoum et al., 2012). These non-monetary benefits can be particularly important, and IIED (2002a) stresses the importance of providing jobs to local people, training and education of staff as well as local procurement.

Mining has since long been subject to taxation, and there is an extensive literature on efficient taxation regimes (e.g., Tilton, 2004; Lund, 2009). This research compares different options to capture the rents from mining operations,[9] and how these differ in their distribution of risks and rewards as well as in their incentives for efficient investment and extraction. However, related work on the trade-offs associated with different benefit-sharing mechanisms is meager. One exception is O'Faircheallaigh (2013) who compares six different financial models, and investigates how each of these may generate varying outcomes for the community and the company, respectively. These models include a single up-front payment, fixed annual payments, royalties based on output, royalties based on the value of mineral output, profit-based royalties, and equity participation or shareholding.

Still, benefit-sharing also involves the management and the allocation of the revenues across different priorities as well as over time. Both these tasks are associated with difficult choices and trade-offs. In the next section we discuss these challenges in the context of investment funds, the most commonly used strategy to transfer mining benefits to regional stakeholders.

3.3 Best-practice Implementation of Investment Funds

One widely used instrument to deal with the financial benefits resulting from revenue sharing is to allocate part of (or all) the revenues to a fund.[10] An investment fund is a fund that invests its money in assets that earn income, or that due to other strategies is able to increase its capital stock (Eggert, 2001). The aim of the fund is to make the wealth created by mining permanent, and thus generate a financial source to support sustainable regional economic development for the future.

[8] According to Ernst & Young Global Mining and Metals Center (2012), the lack of benefit-sharing represents one of the top ten business risks in the global mining industry.

[9] The mineral rent is defined as the value of the product of a mineral resource minus all the costs of production, including the minimum returns to capital that are necessary to induce investment, including exploration investment (Garnaut and Clunies Ross, 1983).

[10] The term fund is here used to refer to funds, foundations and trusts. These three all share a common framework but they differ in operating and legal conditions and requirements (World Bank, 2010).

Over time experiences have been gained about the use of national resource funds (e.g., the Norwegian oil fund), but with a strong emphasis on macroeconomic impacts and fiscal policy concerns (e.g., Humphreys, 2007). Still, some lessons apply to the regional level as well. According to the World Bank (2010), Fischer (2007) as well as Drysdale (2008), the leading practice regarding the use of investment funds in the mining industry hinges on, for instance:

- a clearly defined strategic vision, outlining its role as a development actor in the local environment;
- a single purpose, i.e., either community investment, compensation or government transfers, but not a combination;
- a representative multi-stakeholder governing body;
- high levels of co-financing and collaboration;
- the incorporation of transparent practices and associated accountability, including how the revenues are used;
- avoiding excessive expenditures beyond the regional economy's ability to absorb them productively;
- efficient administrative structures to maximize development delivery;
- flexibility to adapt to changing development practices and operating conditions;
- the design of taxation regimes that allow the regional government to capture a share of the mineral rents without discouraging investments.

Clearly it is also imperative that the revenues are invested wisely with a long-term perspective (and are not squandered for short-term consumption purposes). This may include using the expenditures to invest in, for instance, public infrastructure, health, and education as foundations for future economic development. Moreover, the more dependent the region or community is on mining, the larger the need may be for investments that enhance the diversification of the economy. However, this diversification process should, according to Eggert (2001), be led by the business society and not the government. The government's role should rather be to facilitate other economic activities through investments in human capital and infrastructure.

Funds also provide an opportunity to save resource wealth for future use (Fischer, 2007). This may be an important issue in a regional context as the local community's ability to absorb revenues may be limited in the short-run. Regional governments that increase investment spending in response to a boom in minerals prices are likely to quickly exhaust their portfolio of high-yielding projects and to face domestic capacity constraints in construction, transportation etc. (Garnaut and Clunies Ross, 1983).

While these lessons provide a benchmark towards which different investment fund strategies can be compared, they are also general and tend to neglect some of the difficult trade-offs that will have to be addressed. They also rely heavily on the existence of well-functioning public institutions, including the efficient regulation and enforcement of environmental policies. In the remainder of this report we highlight and discuss some important benefit-sharing experiences (Section 4), while also scrutinizing a number of important yet difficult and partly unresolved trade-offs and challenges (Section 5).

4. Experiences and Challenges Faced in Developed Countries

In this section we review the practical experiences of a number of selected benefit-sharing initiatives in significant, developed mining countries. The focus lies on Australia (Section 4.1) and Canada (Section 4.2), and on a few benefit-sharing lessons from Chile and the USA (Alaska), respectively (Sections 4.3-4.4). Table 1 provides a brief overview of these initiatives and summarizes their key components. Our aim is not to provide a comprehensive and representative synthesis of all benefit-sharing initiatives in developed countries, but rather to address a number of important challenges in designing and implementing such instruments.

4.1 Australia: Learning from Past Experiences

In Australia extra state revenues are collected from the mining sector in the form of royalties, in most cases based on output.[11] Since mining in Australia frequently takes place on Aboriginal lands, practically all benefit-sharing agreements have been established between mining companies and indigenous landowners (Altman, 2009). According to the Land Rights Act (in the Northern Territories) mining companies have to pay royalties for operations located on Aboriginal land.[12] The experiences from these agreements have been mixed, and evaluations show that many of the early agreements lacked both a clear policy framework and transparent practices (e.g., Altman and Smith, 1994; Aboriginal Project Committee, 1997).

One of the earliest examples of benefit-sharing is the Nabarlek uranium mine operated by the Queensland Mines Ltd in northern Australia. In 1979 an agreement was signed that stipulated the payment of mining moneys first to a number of Aboriginal associations in the area until 1982, then to the Kunwinjku Association (1982-1988), and finally to the Nabarlek Traditional Owners Association (NTOA) from 1988 and onwards. The allocation of the funds was however a problem from the start; the beneficiaries had not created an appropriate policy for this, and there was a complete lack of institutional checks and balances (Altman and Smith, 1994). Moreover, the money was either handed out as cash payments or in the form of consumer goods, and it was therefore unable to promote long-term economic development.

The creation of the Kunwinjku Association did little to change this, and it primarily resulted in temporary income increases for selected individuals. The new association had a complex structure and constitution, and the financial reporting and performance were poor. Moreover, the administrative costs represented 34 percent of the association's income, and membership was widespread (Altman and Smith, 1994). With the establishment of NTOA in 1988, membership became more specified and the administrative costs went down to about 8 percent of income. However, also the new constitution was poorly adapted to the needs it was supposed to serve. There was no financial policy and the financial outcomes were poor. In addition, a lack of specific guidelines for how to invest the revenues led to very modest impacts on long-term economic development. Up until 1994, 85 percent of the incomes had been spent on vehicles, vehicle maintenance, a house, boats and cash distributions. In general, the expenditure activities of NTOA had a short-term focus, and were oriented towards cash

[11] In addition to the mining revenues collected by the state governments, the central (federal) government has also collected extra revenue through the so-called Mineral Resources Rent Tax that was introduced in 2012. This tax on profits was however abandoned in 2014.

[12] This Act was enacted in 1976 granting land in the Northern Territory to its traditional Aboriginal owners. It provides the Aboriginals with effective control over activities on the land granted, establishing land councils to administer the Act. These have the right to veto exploration, and mining companies must therefore negotiate contracts with the traditional land owners. The Act also establishes a financial regime whereby the Aboriginal population in the country receives a share of the mining royalties.

Table 1: Selection of Benefit-sharing Mechanisms in Different Developed Mining Countries and Regions

Country/Region/ Mine	Description of benefit-sharing mechanisms	Investment funds (tax)	Joint venture type	Local procurement	Training of staff	Employment of locals
Australia						
Nabarlek uranium mine (Northern Territory)	Investment funds transferred to the Aboriginals through the Kunwinjku Association (1982-1988) and the Nabarlek Traditional Owners Association (from 1988).	X				
Ranger uranium mine (Northern Territory)	Investment funds transferred to the Aboriginals through the Gagudju Association (from 1981). Ambition to employ Aboriginal people at the mine and training of staff	X			X	X
Argyle diamond mine (Western Australia)	ILUA with the Aboriginals channeling financial support to local projects through two trusts fonds. Related economic agreements on employrnent and local procurement.	X	X	X	X	X
Weipa bauxite mine (Queensland)	ILUA with the Aboriginals and the state government (as well as other partners), including a trust fond. Company funds infrastructure and employs indigenous people.	X		X	X	X
Royalties for Regions in Western Australia	25 percent of the royalties arising from mining and petroleum activities within the state are distributed to three different funds supporting capacity building and service.	X				
Royalties for Regions in Queensland	A certain proportion of the state royalties is distributed to three different funds with the aim of securing long-termn benefits for the regional communities in Queensland.	X				
Canada						
Northern Saskatchewan region	Joint venture-type process incorporating government, industry and local communities focusing on, for instance, local employment and procurement and staff training.	X	X	X	X	X
Raglan nickel mine (Quebec)	Bilateral agreement between the company and an Inuit organization with payments to a fund. Local procurement and employment of Inuit people. including staff training.	X		X	X	X
Diavik diamond mine (Northwest Territories)	Socio-Economic Agreement negotiated between the regional government, the mining company, and the Aboriginal communities. Focus on employment and local procurement.	X		X	X	X
British Columbia tax policy and regional trust	The Resource Revenue Sharing Policy (2008) sets a framework for Aboriginal groups io obtain a share of the mineral tax revenues. Also regional trusts benefiting diversification.	X			X	
Quebec mining tax policy	All mining companies will pay a minimum mining tax as of 2014. as well as a progressive tax on profit. The aim is to encourage forward linkages from mining operations.	X		X		
Chile						
Antofagasta region: FNDR	The revenues from private company mining rights are transferred to the National Fund of Regional Development (FNDR). which finances various public projects in the region.	X				
Escondida copper mine (Antofagasta region)	Escondida Foundation aims at improving the quality of education, strengthen the civil society, and develop productive capacities. Also focus on training, and procurement .	X	X	X	X	X
Antofagasta region: The Cluster Program	Public-private collaboration with Codelco. BHP Billiion. the Ministry of Mining and mining suppliers (2009). Main aim is to strengthen the quality of mining sector suppliers.		X	X	X	
USA						
Red Dog zinc and lead mine (Alaska)	Agreement between the company and the Northwest Arctic Natives Association (NANA). Funds used to finance education, prioritized construction projects, and job-creation.	X	X	X	X	X

distribution and consumer goods (Altman and Smith, 1994). In contrast to the aims of the constitution, little money was spent on, for instance, the establishment of enterprises and educational scholarships.

In another early case, an agreement was reached between the Ranger uranium mine and the Aboriginals in the Northern territory. In order to handle the royalty payments, the so-called Gagudju Association was created in 1981 (Aboriginal Project Committee, 1997). Early on the Association aimed at financial self-reliance. During the 1980s, it started to provide a whole range of services such as construction of infrastructure, provision of school lunches, provision of mechanical maintenance, and scheduling of medical visits. However, the quality and the stability in the provision of these services have fluctuated. There is also evidence of some cost shifting from the government (Aboriginal Project Committee, 1997), i.e., Aboriginals in the region were allocated less public means as they were deemed to be so wealthy as a result of the mining royalties. In addition, who had right to membership in the Association and not as a constant source of conflict. This is because there were several ambiguities related to the definition of the affected area, and in turn which specific groups should be included.

The Aboriginals were not always the beneficiaries as the single largest expenditure post was wages to a mostly non-Aboriginal work force. While the mining agreement also involved Aboriginal employment targets and training of staff, these initiatives were overall not successful (Aboriginal Project Committee, 1997). For instance, the majority of the people employed at the mine have been non-local and Aboriginals have accounted for only around 4-8 percent of the work force. As a result, the unemployment rate, the level of welfare dependence and the level of educational achievement saw little improvement during the first 10-15 years of the Association.

The above experiences provide apt illustrations of how benefit-sharing mechanisms need not lead to positive long-term effects and may fail to comply with best-practice. For instance, it is important to specify which groups are the beneficiaries of an agreement as this will avoid conflicts and controversies. There also needs to be a focus on long-term economic commitments by promoting capacity-building that can sustain economic development beyond the closure of the mine. Rules and sanctions that specify a financial policy for the use of the money so as to avoid misuse and waste of funds are also imperative. While these components were largely lacking in the above agreements, the more recent Australian experiences indicate more positive benefit-sharing outcomes.

In 2004, a so-called Indigenous Land Use Agreement (ILUA) was signed between the Argyle diamond mine and the Aboriginal owners of the lease area. As a result of the ILUA, two trust funds were created (the Gelganyem Trust and the Kilkayi Trust). A plan for how the mining company and the Aboriginals would cooperate and implement the agreement was specified. The trusts provide financial support to local projects that target the different priority areas: partnering in the community; supporting education and training; improving health; building economic independence; and sustaining law and culture. One part of the agreement has been to create lasting benefits for the region from the economic potential of the mine. Around 65 percent of the work force is local, and around 25 percent is from the indigenous community. Various partnerships have also been established to develop business activities in the region.

There is little empirical evaluation of the effects of the initiatives under this ILUA. Still, the experience suggests that employment at the Argyle Mine has allowed to increase the pool of Aboriginal workers in the area and given them an overall positive experience of employment at the mine (Brereton and Parmenter, 2008). Furthermore, the agreement seems to have been able to increase the employability and the mobility of the local population.

Another successful ILUA was signed in 2001 between the Weipa bauxite mine (Rio Tinto Alcan), the Aboriginal community, four Shire Councils, the Queensland state government and the Cape York Land Council. It is known as the Western Cape Communities Co-Existence Agreement (WCCCA), and it led to the creation of the Western Cape Communities Trust (WCCT). The WCCT puts emphasis on local capacity building and business development, and is entitled to receive a minimum payment of AU$ 2.5 million annually (Rio Tinto Alcan, 2001). The mining company has also committed to undertake various employment, training and infrastructure initiatives. In addition to the

contributions made by the mining company, the state government provides another AU$ 1.5 million per year. The latter contributions are supposed to promote local community development projects (IIED, 2002b). This implies that the government and the company jointly are recognizing their responsibilities under the Agreement, and it provides the WCCT with a more diversified source of income.

The impacts of this agreement have not been evaluated in any detail. One can note, though, that the employment targets have not been met. In 2012, for instance, 24 percent of the total workforce was indigenous, which was below target and also represented a decrease compared to the figures from 2011 (Rio Tinto Alcan Weipa, 2012). On the other hand, infrastructure development has been relatively successful. During 2012, a AU$ 2.5 million renovation of the airport in Weipa to upgrade it and ensure compliance with federal government security requirements was completed. The mining company has also undertaken an upgrade of the electricity network in the area. This, the company argues, is in line with the goals to promote long-term economic and social development.

In sum, the broader scope of the more recent mining agreements with Aboriginal land owners compared to previous arrangements, such as the ones at Nabarlek and Kakadu, demonstrate that important lessons from the past have been learnt. The sole focus on monetary transfer has been abandoned and replaced by a broader approach, which emphasizes a clearer definition of beneficiaries, co-funding, capacity building and long-term economic and social development.

The mining boom of the early 2000s has however led to increased tensions in Australia concerning the allocation of mining benefits, including mining benefits associated with operations on non-Aboriginal lands. For instance, Western Australia mining regions perceive that they do not get their fair share of mining moneys, and that too large part of the royalties accrue to the state capital Perth (e.g., Storey, 2001; Schandl and Darbas, 2008). Another reason is the increasingly common practice of commute mining with fly-in fly-out practices, which allow for employees to live permanently in Perth and commute to shift-work at remotely located mines around the state. Moreover, as noted in Section 2.2, in the state of Queensland the economic stimulus from mining has mainly affected the region and the state as a whole, rather than the smaller mining towns in, for instance, the Bowen Basin (Rolfe et al., 2007b).

One initiative to address these concerns is the Royalties for Regions Program, which was initiated in 2008 by the government of Western Australia (Government of Western Australia, 2011). The main idea is to return a larger share of the revenues generated by resource exports to the local communities where the mining occurs (Tonts et al., 2013). The Program promotes long-term investments (e.g., in infrastructure) to develop the state's regional areas. All regional areas except Perth qualify for the Program (Daley and Lancy, 2011). The funding of the Program is provided by an annual reinvestment of 25 percent of the royalties arising from mining activities within the state. This money is then distributed to three different funds.

The majority of the funding from Royalties for Regions is assigned to specific projects, rather than being assigned as general funding. In order for the responsible department to get independent advice and recommendations on how to distribute the funds, the Western Australian Regional Development Trust was also created. Learning from previous experiences it has also been pointed out from the start that the funds from the Program are meant to complement, and not substitute for, existing funding provided to the regions from the state and national governments.

This relatively new program has so far not been subject to any evaluation. Still, it has been noted by observers that the 25 percent allocation of mining royalties to the Program was not fulfilled during the first four years (Burrell, 2013). It has also been questioned whether the Program has been able to meet the concerns of the regions and support economic diversification (Tonts et al., 2013). The reason for this is that significant funds have been spent on improving the infrastructure used by the mining industry, something that tends to reinforce the economic dependence on the resource sector. Furthermore, even though the Program is supposed to support strategic regional projects, the initial grants were often directed to inland areas that could not be expected to experience significant population growth in any case (Daley and Lancy, 2011).

In 2012, the state of Queensland initiated a very similar program. A certain proportion of the state royalties

is returned to the regions where the resources are extracted to help address issues needed to support the growth of the resource industry, such as investment in community infrastructure, but also long-term economic development and resilience (State of Queensland, 2013). The Program, just like the one in Western Australia, consists of three different funds. Examples of supported projects include flood mitigation capital works, and projects improving the capacity, safety and connectivity of roads that service resource communities in Queensland. Also this program has not yet been evaluated.

4.2 Canada: Negotiated Agreements with Employment and Local Procurement Focus

In Canada, extra revenues from mining ventures are mainly collected through mining taxes and royalties charged by the provinces (ENTRANS Policy Research Group, 2011). In most provinces, this takes the form of a tax on mining profits. The federal government only collects revenue from mining activity through regular income taxation. The mining tax revenues in Canada therefore tend to accrue to the provincial governments. However, in addition to the fiscal revenues from mining, community development agreements have also been frequently used since the 1980s (Bocoum et al., 2012). These are commonly referred to as Impact and Benefit Agreements (IBAs). Even though they are not regulated in law, more than 150 community development agreements have been signed in the country. Overall they have helped to increase the local capture of benefits, and the involvement of indigenous peoples.

The Canadian experience of such agreements suggests that mining can contribute to the socio-economic well-being of communities, as well as to the establishment of industrial clusters centered on activities related to mining. A key factor laying the

foundation for sustainable development in many mining communities has been the tripartite process adopted to negotiate the different IBAs (McMahon and Rémy, 2001). This approach implies that communities, companies and governments come together to discuss the projected mine to establish responsibilities, costs and benefits. In the remainder of this section we present a selection of these agreements in the context of different Canadian regions as well as specific mines, and discuss their impacts since their introduction in the 1990s.

Since the 1930s, uranium mining has been undertaken in the sparsely populated and relatively poor northern parts of the Saskatchewan province in Canada, largely inhabited by indigenous people (Parsons and Barsi, 2001). In the 1990s, a tripartite process incorporating government, industry and local communities was adopted aiming at increasing the mining benefits for the region and the community, as well as to engage the local community in the regulation of the industry. This process resulted in a regulatory framework that included, among other things: a royalty agreement; environmental assessment, management and decommissioning; labor market planning; procurement planning; community planning; regional development planning; communications and taxation. In northern Saskatchewan, resource extraction also requires a so-called Surface and Lease Agreement (SLA). This is a two-party agreement between the land user and the provincial government, which initially mainly regulated land rental but in the 1990s these were expanded to address also social, economic and community concerns. An important component of the SLAs has been human resource development programs, which aim at encouraging the hiring, training and promotion of local people at all levels in the mine operations.

Parsons and Barsi (2001) argue that joint ventures between native people, private-sector enterprises and the northern community have (in combination with other initiatives) played an important role in increasing the benefits accruing to natives and the communities around the mines in the province. A recent evaluation of the impact of uranium mining on northern Saskatchewan found that most economic conditions had improved in the area since the start of uranium mining (InterGroup Consultants Ltd., 2013). The mining industry has contributed with substantial royalties to the provincial government, and due to the promotion of local procurement, businesses in the region have managed to expand to other sectors. However, the average real income of residents in northern Saskatchewan decreased between 1981 and 2006, also implying that the income gap between the north and the rest of the province is increasing.

The use of IBAs has been common also in other Canadian provinces. For instance, in 1995 the Raglan nickel mine in Quebec and the Makivik Corporation, an Inuit organization, signed an agreement that aimed at securing that the local people receive parts of the benefits generated by the mine (ICME, 1999; Lewis et al., 2009). This agreement required the mining company to make compensatory payments to the Makivik Corporation as well as to a trust fund established for the local Inuit people. Further provisions of this agreement include: priority of local procurement; priority of employment of Inuit people; training initiatives and the establishment of a Committee to monitor compliance with the agreement and discuss environmental issues. It does not, however, consider the monitoring of social and environmental impacts (Knotsch and Warda, 2009). Instead, the agreement maintains an industry focus, and most provisions are centered on components that are of importance to smooth work at the mine (e.g. skills and cross cultural training).

Overall, the signatories of the Raglan Agreement have been satisfied with how it has been implemented (e.g., Keeping, 1998). In 2007 about 16 percent of the employees at the mine were Inuit (Natural Resources Canada, 2007). Due to the lack of roads in the area, the mining company has undertaken efforts to make it easier for people from surrounding communities to work at the mine by flying them to the site. When it comes to achievements in terms of local procurement, one can note that in 2007 about 17 percent of the mine's annual procurement budget was spent on Inuit businesses and services (Lewis et al., 2009). Still, a number of challenges remain. For instance, it has been difficult for the mining company to fulfill the employment goals set up in the Agreement, and the quality of Inuit jobs have mostly been entry-level jobs.

A more recent community development agreement is the one involving the Diavik diamond mine in the Northwest Territories. Since the area is inhabited by various groups of indigenous people, a so-called Socio-Economic Agreement was negotiated between the mining company and the regional government, and this was later ratified by the local Aboriginal communities prior to the start of the mining operations. This agreement also individualized the commitments via so-called Participation Agreements with five indigenous communities in the area. However, the latter were negotiated separately with the different indigenous groups (and thus not on behalf of the government). For this reason they were not made public, and have not been closely scrutinized (Archibald and Ritter, 2001).

According to the company's reports, during recent years the employment of Northerners and indigenous peoples has exceeded initial predictions. In 2011, out of 1137 employees the employment of people from the region averaged 642 people whereas employment of indigenous peoples amounted to 313 (Diavik Diamond Mine, 2012). Moreover, business spending from the mine site directed towards the region has managed to stay at around 70 percent (Diavik Diamond Mine, 2013). In order to monitor and keep track of real outcomes, the Government of the Northwest Territories performs annual evaluations to assess the accuracy of the predictions established in the Socio-Economic Agreements within its area of influence (this also includes mines operated by BHP Billiton and De Beers). The reports address indicators covering the following areas: community, family and individual well-being; cultural well-being and the traditional economy; the non-traditional economy; net effects on government; and sustainable develop-

ment. Overall these reports confirm the picture of relatively favorable economic impacts of mining on the communities.

The 2012 annual report (Government of the Northwest Territories, 2013) reveal positive impacts on jobs, wages, incomes and education level (the latter also directly supported by some of the mining companies). However, the impacts on social development appear to have been less favorable. For instance, the number of suicides has increased since the start of mining activities, and other salient features are the increase in the number of single-parent families as well as in the occurrence of family violence. The evaluation report suggests that this could in part be a result of employment at the mines, which often involves spending a lot of time away from home and thereby putting a stress on families.

As in Australia, the mining boom in the early 2000s has led to increased pressure on province governments to implement additional, mandatory benefit-sharing mechanisms. In Canada, British Columbia is the first province to share direct revenues generated by mining with the indigenous people (Clark, 2009). This was stipulated in the Resource Revenue Sharing Policy that was announced in 2008; the policy sets a framework for Aboriginal groups to be able to obtain a negotiated share of the mineral tax revenues arising from new mining projects.[13] According to the provincial government, the new policy is not a substitution for the IBAs. The aim is to use the policy to develop agreements between aboriginal groups and the Province (while the IBAs involve project developers).

Another benefit-sharing strategy in British Columbia has been the establishment of regional trusts. These are allocated funding from the provincial government, and then use the profits from their investments to support initiatives that focus on community development. The Northern Development Initiative Trust was established in 2004, and it has aimed at sustaining diversified economies and high-class industries. Since its start, this trust has created more than 5000 jobs, new investments and provided extensive training to employees (Laurie, 2013).

Browne and Robertson (2009) argue that following the increased involvement of indigenous peoples in the negotiations there has been a shift away from job commitments toward contracting opportunities, equity participation and revenue sharing in the province. This shift allows for indigenous people to build capacity, and apply the revenues to their own priority areas in order to create business opportunities. As one interviewee providing the perspective of aboriginals on mining and benefits puts it:

> *"We started negotiating mining IBAs over 10 years ago. At first we were really focused on jobs. […] Looking back now I don't think you can really force jobs or hiring despite the best intentions of all the parties. The trend now is contracting and equity. […] Now instead of pushing for jobs we push for royalties and equity to generate funds that we can invest for the best benefit of our members. Even though we focus on equity and contracting now, we still go after community benefits." (Browne and Robertson, 2009, p. III-6)*

Québec is another example where the province government has proposed a new mining regime to make sure that the region benefits from mining operations to be introduced as of January 1, 2014. According to this proposal all mining companies will be required to pay a minimum mining tax (Gouvernement du Québec, 2013). In addition, a progressive tax on profit is also proposed. The tax schedule will be adapted to provide lower rates (including preferential electricity rates) for mining companies choosing to perform processing operations in Québec (PwC, 2013). These initiatives are intended to promote the forward linkages related to mining in the province.

Since the new tax policy has so recently been introduced, it has not been evaluated. However, the Federation of the Chambers of Commerce of Québec (FCCQ) has expressed concerns that it will have negative impacts on the competitiveness of the mining industry in Québec. For instance, mining operations in the province have geographical disadvantages in terms of long distances to major markets in India and China, their mineral concentration is relatively low (e.g., in iron ore), and the harsh winter season

[13] From 1978 up until 1995 there was a similar Revenue Sharing Act in British Columbia, which included a legal requirement for the provincial government to annually transfer a certain amount of revenues to local governments (UBCM, 2004). There have also been other agreements between the provincial government and mining companies (Laurie, 2013). One example is the so-called Elk Valley Property Tax-sharing Agreement (the first signed in 1982), regulating the sharing of property taxes imposed on industrial coal mining properties.

raises the cost of mining (FCCQ, 2013). All in all, the competitiveness impacts of benefit-sharing initiatives have not been addressed much in previous work, and we return to this issue in Section 5.

4.3 Chile: Developing Backward Linkages through Private-Public Initiatives

Mining is a significant contributor to the Chilean economy, and mining operations are mainly centered in the north of the country and most notably in the Antofagasta region (Castillo et al., 2001). In Antofagasta mining represents about 60 percent of the gross regional product. Chile has seen a soar in mining investment since the early 1990s, but has at the same time managed to achieve broad-based economic and social development. Average income has increased, economic growth has been higher than in the rest of the country, and poverty levels have decreased substantially (ICMM, 2007). The region has also achieved a diversification of its export trade, notably into agricultural and timber-based products (Humphreys, 2002). Similar positive effects on related sectors of the economy (e.g., construction and services) can be seen also in the Antofagasta region (Gobierno Regional de Antofagasta, 2009). Most of the sectors that have experienced growth are, however, sectors that perform activities that either directly or indirectly supply the mining industry. In order to sustain and further promote the economic development that has taken place during the last decades, the regional government launched a Regional Strategy for Development in 2009. This strategy aims at strengthening the promotion of sustainable development, and making sure that the benefits of economic growth experienced by the region benefit all of its citizens.

Even before the launch of this new strategy, though, several benefit-sharing initiatives have been in place in Antofagasta, some launched by the regional government and other by mining companies. Private mining companies in Chile pay an annual fee for mining rights (see also Section 2.2), and the revenues from these are distributed between the municipalities of the region and the National Fund of Regional Development (FNDR) (Aroca, 2001). FNDR finances various projects aimed at fostering regional development. According to the regional government, FNDR has continuously increased its role in the region; in 2007 it contributed with 40 percent of the public funds invested in the Antofagasta region (Gobierno Regional de Antofagasta, 2009). According to the ICMM (2007), the linkages to the regional and local economy are "unusually strong" in Chile. However, this view has also been challenged in recent research. Arias et al. (2014) argue that during the last two decades local firms have had weak linkages to mining, and they have not managed to diversify into other sectors.

In addition to mining rights payments, several mining companies have also adopted plans aimed at ensuring that benefits accrue to the communities in the region (Aroca, 2001). Most of the initiatives targeted at the region have come from private mining companies, such as the creation of the Escondida Foundation in 1996 at the Escondida Mine.[14] The Escondida Mine is the world's third largest copper deposit, and the construction of the mining project was initiated in 1989. The aim of the Escondida Foundation is to develop people's and communities' capacities through innovative, efficient and replicable models (FME, 2013). The objectives are to: improve the quality of education; strengthen civil society; and develop productive capacities.

In order to implement and further these objectives, the Foundation operates through strategic alliances with private and public organizations, and attempts to promote co-financing of its projects in order to engage various parts of society (FME, 2013). One example is the effort made to foster joint public-private efforts by tying the regional development strategy to large companies and universities, and thereby promoting local procurement. Moreover, the Foundation has created a network for leading schools in the region and a regional network for female entrepreneurship. The focus on education is explained in part by the meager results for the region's students at educational tests (e.g., Lagos and Blanco, 2010).

[14] Efforts undertaken by the public mining company Codelco have instead tended to have a nation-wide focus. Both private and public companies have, though, included the provision of subsidized housing to workers as an important element in their policies to provide benefits to the community (Aroca, 2001).

Few evaluations of Escondida's initiatives have been performed. ICMM (2007) notes, though, that these initiatives have contributed to increasing employment and incomes in Antofagasta. This has been made possible both through direct employment at the mine, but also through the purchase of goods and services from local suppliers.

In recent years, the government of Chile has also begun to play a more active role in trying to promote the development of industries that provide supplies and services to the mining sector, although also in this case the mining companies have been the main initiators. In order to further develop and encourage the emergence of a cluster around mining in the region of Antofagasta, a public-private collaboration with, among others, Codelco, BHP Billiton, the Ministry of Mining and various mining suppliers was initiated in 2009 (World Economic Forum, 2013). The aim has been to develop the backward and forward linkages related to mining in the region (Fundación Chile, 2012a). The Program is primarily viewed as a way to strengthen supplier capacity through innovation and research. The mining companies have a strategic interest in the initiative, since the productivity of the mining sector in Chile to a large extent depends on the quality of its suppliers (Fundación Chile, 2012b). The long-term goal of the Cluster Program has been to create 250 world-class suppliers by the year 2020 (BHP Billiton, 2012). In 2012, a total of 55 suppliers were taking part in the program and had improved on issues such as growth, exports, safety, environmental standards and labor conditions. According to World Economic Forum (2013), the Program has therefore overall been successful.

4.4 USA (Alaska): Bilateral Long-term Cooperative Partnerships

The major oil fields in the state of Alaska have provided a steady stream of royalties to the state government since the late 1960s, and in 1976 the Alaska Permanent Fund was established (Fischer, 2007). Similar large-scale benefit-sharing mechanisms have not existed in the mining industry, but the royalties from mining ventures have sometimes been earmarked for specific uses based on bilateral agreements.

One example of this is the Red Dog mine (extracting zinc and lead). Since it opened in 1989, the operating company (Alaska Teck Cominco) has paid royalties to the Northwest Arctic Natives Association (NANA) as a part of a long-term cooperative partnership. This agreement stipulates that the mine should be a source of regional-economic benefits, and establishes the forms of cooperation (ICME, 1999). NANA is as the land owner supposed to receive an increasing percentage of the royalties, and Cominco is committed to protecting the lifestyle and environment of the area while also providing NANA shareholders with employment opportunities. The funds received by NANA are used to finance education, essential services and prioritized construction projects, as well as promoting job-creation and advancement opportunities (NANA Regional Corporation, 2010).

According to ICME (1999), the single largest economic impact of the Red Dog mine on the region has occurred through the employment that it has stimulated. For instance, in 2009 the mine contributed with 550 full-time family-supporting jobs locally and regionally (Red Dog Mine, 2009). The experience at the Red Dog mine highlights the potential of establishing a partnership between the mining company and the community in the presence of well-defined property rights for the land. The state of Alaska did contribute with infrastructure (e.g., seaport facility, roads etc.) that made the mine possible (ICME, 1999), but then left the rest of the negotiations to the parties themselves.

Also in Alaska the recent mining boom has led to an increased attention on further benefit-sharing initiatives. Recently the issue was raised by the Alaska Minerals Commission (2013). According to its report, the tax policy in Alaska needs to be reformed in order to return a certain share of tax revenues (from the State of Alaska Mining License Tax) back to the communities affected by the mineral activities. This type of revenue sharing is already in place for the Alaska fishing industry, and the authors suggest that it should be the case also for the minerals industry. This would also, the Commission argues, be a way of reducing the need for local governments to impose their own taxes targeted at the industry, and thereby make the tax framework more predictable for mining companies.

5. Conclusion and Directions for Future Research

This report has addressed the relationship between mining and regional development, including the use of benefit-sharing mechanisms to promote more inclusive mining ventures. This has involved a review of the research literature, as well as case studies of benefit-sharing initiatives in four different developed mining countries. In this final section we briefly sum up some of the main lessons from the existing research, and make an attempt to identify some important research gaps.

The research investigating the regional development impacts of mining has mostly employed I/O models of the regional economy. These impacts (i.e., the employment multiplier) tend to be context-specific and determined, for instance, by the geographical scope of the assessment. Clearly, if the production function for the mineral product is closely related to factor availability in the producing region (e.g., of skilled engineers), and if there is a wide range of actual or potential input-output relations, the benefits through linkage effects will be more profound. However, it can be questioned if these linkages are always well-described in the I/O models used. In general the I/O models do not adequately address the employment effects in the non-tradable goods sector, job losses in the tradable goods sector due to increases in wages, as well as any positive agglomeration effects. In addition, even in the absence of any explicit benefit-sharing initiatives, countries and regions have different company tax regimes that may be of great significance in determining the local impacts of a mining investment. For instance, local governments may have the competence to impose industrial property taxes (e.g., Norway), and in others the legislation imposes a requirement to transfer a certain share of mining rights fees and/or taxes to the local community (e.g., British Columbia during the 1970s and 1980s and Chile). The role of existing institutions and tax policies deserve further scrutiny in future research. Finally, there is also a lack of research explicitly modelling the implementation of different benefit-sharing mechanisms on regional employment multipliers.

Our overview of the different mining-related benefit-sharing mechanisms in Australia, Canada, Chile and the USA confirms many of the best-practice recommendations presented in, for instance, World Bank (2010) (often focusing on challenges facing developing countries). We find examples of both well-functioning and less effective initiatives, and the experiences for the use of investment funds illustrate the importance of a clearly defined strategic vision for the fund, co-financing and collaboration among different actors, transparent practices, and sound financial policies. Still, there are remaining challenges, such as the need to address social problems arising in mining communities such as crime, alcohol abuse, gender inequality, diversity of life styles etc. (e.g., Abrahamsson et al., 2014). Moreover, in several company-community agreements the targets for employment of locals (including indigenous people) have been difficult to meet. Increasingly communities are also demanding broader benefit-sharing initiatives that go beyond employment at the mines, and encourage other types of local capacity-building (e.g., Browne and Robertson, 2009).

However, while the World Bank (2010) and others have identified relevant lessons and best-practice for the use of benefit-sharing mechanisms (investment funds), they typically do not address some of the difficult trade-offs and challenges involved in implementing these. In the remainder of this section we discuss two important challenges, which both involve difficult trade-offs that need further scrutiny in future research. These are: (a) the relationship between mining competitiveness and benefit-sharing; and (b) the efficient use of regional development investment funds. It should be noted, though, that the ways to address these challenges are likely to differ from case to case.

First, Fischer (2007) points out the importance of designing benefit-sharing instruments that capture significant mining benefits without discouraging further mining investment. However, this is not easily solved in practice. Taxes and royalties on mining production raise extraction costs and alter utilization incentives, reducing the extraction rates early on.[15] To avoid this incentive problem many scholars and governments have been arguing for a resource rent tax. With such a tax, companies pay regular corporate income taxes until their rate of return on invested capital exceeds some prescribed level representing a competitive rate of return on capital. All revenues above that level are taxed. This should therefore permit governments to capture a large share of the realized mineral rents without greatly altering the extent, pace, or nature of exploitation. However, the above neglects the impacts on *ex ante* investment incentives. Ultimately, mining-induced regional development is generated by the discovery of rich deposits or technological developments that permit the profitable exploitation of known but previously uneconomic resources. Rent-based taxes discourage exploration and exploitation behaviour and, as pointed out by Tilton (2004), in the long-run there are no true rents in the mining sector.[16]

During mining booms the rate-of-return requirements of mining companies may also be raised since they will come under pressure from local governments to share profits with the community as well as to make up for any shortcomings of the central government in terms of housing, infrastructure etc. (Fischer, 2007). The difficulty with mining ventures does not always arise from tough entry conditions, but equally much from the likelihood that policies and institutional conditions can be challenged by different stakeholders once the project is up and running. Thus, large uncertainties about the potential implementation of benefit-sharing mechanisms may have significant impact on the investment activity, and in turn lead to limited positive regional impacts.

This suggests therefore that it is imperative to investigate in more detail the trade-offs involved in taxing

[15] Any efforts to replace national employees with locals or to require mining firms to acquire supplies from local firms may also raise the costs of mining (e.g., if the local know-how is less sophisticated).

[16] Another way to address the incentive problems associated with mining taxes could be to offset the adverse effect of the rent-based tax by directly subsidizing exploration (e.g., Roine and Spiro, 2013). However, although this could neutralize some of the negative effects of the tax, there are other concerns with this policy mix. First, it shifts more of the risk associated with exploration from companies to the state. However, the level of risk-taking required in the mining industry may often be better recognized, incentivized and rewarded in the private sector. In addition, over the long-run, the state presumably may not get additional profits other than those earned by assuming more of the risk. While the combination of a tax and subsidy therefore could be more appropriate from efficiency points of view, this can only be achieved at the expense of less benefits being shared by the mining regions.

and regulating mining on the one hand and encouraging regional development on the other. Regional governments that impose high taxes on mining risk witnessing their mineral sector slowly decline due to a lack of investment. An active and expanding mineral production activity encourages exploration, and increases the likelihood that reserves will grow over time. A policy environment that discourages the exploitation of mineral deposits also leads to less exploration for new mines and appreciation of existing deposits, and in turn to less opportunity for society to benefit from the resource base. However, we have also seen that mining activities are becoming increasingly detached from the regions in which they take place. Accordingly, regions that do nothing or little about this situation may miss out on important mining benefits. Striking this balance is not likely to be easy, and the appropriate solutions are deemed to be highly context-specific.

The *second* challenge to be commented on concerns the allocation of regional funds across different priorities. The literature generally points at the need for using the mining benefits to invest in public infrastructure, health, and education, involving also investments that promote economic diversification. However, also these recommendations involve difficult trade-offs. For instance, public investment in physical infrastructure amounts to investment in the hope of generating future traded activities. Future infrastructure needs, though, may be difficult to anticipate *ex ante,* and are usually identified as a consequence of productive activities rather than in advance of them (Daniel, 1992). Many benefit-sharing initiatives specifically encourage investing in mining-related infrastructure (e.g., roads etc.), and also this could carry risks and be limited by the exhaustibility of the resource. On this account investment in education health may merit particular emphasis.[17]

Another important challenge related to the use of regional development funds is that concerning mining development and economic diversification, respectively. Fischer (2007) notes that by targeting public investments to local industries, the regional economy is boosted and will become less dependent on mining. However, the regional economy may lack the capacity to absorb these investments productively and the returns reaped may be relatively low (compared to regions with a more diverse portfolio). This may be particularly prevalent in mining booms, where governments may quickly exhaust their range of high-yielding projects and face local capacity constraints in construction, transportation, engineering etc. (Garnaut and Clunies Ross, 1983).

Moreover, economic diversification is not a good thing by definition, at least if we do not only adopt a very long-run perspective. Some regions in the developed world are likely to have a long-run competitive advantage in large-scale mining, and in these regions one must consider the risk of a too early diversification of the economy at the expense of mining benefits. Again, a competitive mining industry raises the likelihood of further investments in exploration and operations in the region, and in such a region mining taxes (with associated benefit-sharing mechanisms) may do good in the short-run but harm the sector's (and the region's) long-term prospects. Of course, though, in mining regions with limited future mineral resource availability, economic diversification strategies must remain an important goal.

The allocation-of-funds challenge also warrants additional research efforts. This includes, for instance, learning from how some mining regions have adapted over time and managed to remain prosperous in the presence of changing global commodity markets, while some instead have managed to diversify into other economic activities without creating too much economic and social tension in the short-run (in part through the use of different benefit-sharing instruments). Of course, understanding the development of regions that have failed to achieve anything of the above should also be important. The policy challenge lies not in determining whether mining and regional development can be combined, but rather in which regions to promote mining and how we can ensure that it contributes as much as possible to economic and social development at the local and regional level.

[17] The political economy of investment funds may also complicate the picture, especially if central governments become less inclined to devote resources to economic development in mining regions.

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