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The potential of extractive industries as anchor investments for broader regional development

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Abstract: The paper reviews what we know about the possibilities of designing and implementing policy measures that raise the contribution of the extractive industries' production/consumption links to economic growth and wellbeing, and reviews how policies pursued by various governments have succeeded. It describes policies used in four areas: local content, employment, downstream processing, and infrastructure, and finds that the policies used have mostly not lived up to expectations. Finally, the outline of a broader, more coordinated approach is sketched out. Its main elements are those that have proved to work at least reasonably well in existing programmes, including (i) supplier identification and development schemes, (ii) government investment in technical and vocational education and training , (iii) elimination of obstacles to small enterprises, (iv) multiple use of infrastructure, (v) a strong role for local government, and (vi) accurate information and monitoring.

Key words: downstream processing, extractive industries, infrastructure, local content

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1 Introduction

The past several decades have seen a lively debate about how extractive industries[1] can support development. An important part of this debate has focused on non-fiscal types of linkages, particularly how the extractives sector interacts with other parts of the economy at the regional and local level and how this interaction can be strengthened and made to contribute more effectively to growth. The reason for focusing on these linkages has partly been the realization that the fiscal revenues from extractive industries sometimes fall short of expectations and that, even if large, they do not provide a guarantee of sustained, equitable, and stable growth. This has prompted the search for other ways in which extractive industry investment can be a force for development.

This being said, there is little doubt that, generally, the fiscal links have usually yielded greater returns than the production–consumption and other non-fiscal links. This is the case particularly for oil and gas projects, less so for mining projects, despite the fact that total spending on investment and operations is usually (for mining) or often (for oil and gas) larger than the sum of return on capital and government revenue.[2] The reason is mainly that imports account for a large part of spending on investment and operations. As pointed out in a report to the World Bank:

> The results of our analysis of economic links generated by the oil and gas sector across 48 countries confirms that financial links (that is, resource rents and returns on capital) are by far larger than productive links for most countries. This is an important consideration that helps to put the economic impact of LCPs [local content policies] in context when comparing to those of other government policies. (Tordo et al. 2013: xiii)

Nevertheless, circumstances vary from one country to another, and it is not difficult to find extractive sector operations where the direct payments to the workforce and suppliers exceed fiscal revenues. As already implied, it can also be argued that productive links are relatively more important in non-fuel mining than in the oil and gas sector. Finally, the difference in relative importance between fiscal and non-fiscal links may partly be due to the level of effort that has gone into optimizing fiscal outcomes relative to the outcomes from productive links as well as the relative difficulty of the two tasks.

The present paper aims to provide a review of what we know about precisely this question: Is it possible to design and implement policy measures that significantly raise the contribution of the productive links of an extractive industry to economic growth and wellbeing? Accordingly, the objective is to examine the potential for large extractive sector investments to be the basis for an expansion of *non-extractive* activity (e.g., agriculture, services, construction, manufacturing) in regions—or even whole countries—affected by those investments.

The paper sets out some general principles about the various policy interventions that might be needed to bring about such an outcome, including for some policies the feasibility and

[1] The term' extractive industries', or 'extractives' as used in this paper, includes oil and natural gas production as well as coal and non-fuel mining.

[2] There are different terminologies for links and impacts. Roe and Round (2018) divide effects between the *industry channel* (spending that stems from investment and operations activity, corresponding to the non-fiscal links mentioned above) and the *public channel* (spending tax and other government revenue generated by the activities, corresponding roughly to the fiscal links).

effectiveness of fiscal incentives and the impact on public revenues. In this context, it also highlights the associated governance challenges. It reviews some of the practical experiences from the extractives sector that evidence the potential of this approach but also indicate some of the factors that could limit, and have in practice, limited that potential.

Section 2 in what follows provides a background by relating and attempting to establish the historical differences between industrialization based on natural resources in different parts of the world. By doing so, the section also highlights the challenges facing countries that embark on such a process today as opposed to fifty or a hundred years ago.

Section 3 builds on that analysis to discuss the determinants and magnitude of productive linkages, thus providing a basis for a discussion of the feasibility of policy interventions.

Section 4 reviews practical experiences of policy measures over the past two decades (which have seen an increasing number of such attempts in a large number of countries). It focuses on developing country experiences, but uses experiences from developed countries where relevant to illustrate particular points.

Section 5 attempts to sketch the outlines of a wider approach, in which the totality of extractive spending in a host country is seen as an opportunity to spur broader developments in a range of non-extractive sectors, and to describe some of the main government policy levers that might be used to help promote such an approach. A case is made for host governments to consider policy approaches that are somewhat broader than those associated with traditional local content and downstream processing and that attempt to integrate actions in a number of different policy areas.

2 Has resource-based industrialization become more difficult today?

The case for policies aiming to promote local sourcing of inputs and downstream processing as a means to achieve natural resource-based industrialization and growth is often made by referring to historical experiences during the nineteenth and twentieth centuries—specifically to the histories of Northern European countries as well as those of Australia and Canada.

Some light can be thrown on the Nordic experience by comparing it to developments in Latin America during the post-World War II period. This comparison can also provide some pointers to the conditions that might favour developing countries today that aim to undertake resource-based industrialization. In 1950, the Nordic countries, including Finland, Norway, and Sweden, and several countries in Latin America, for instance Chile and Uruguay, had similar levels of GDP per capita. Both groups of countries were richly endowed with natural resources. Their development paths over the next decades, however, were very different and yielded very different results. A comparative analysis by Blomström and Meller (1991: 3–13), focusing on the four continental Nordic countries (Denmark, Finland, Norway, and Sweden, but not including Iceland) and four Latin American countries (Chile, Colombia, Ecuador, and Uruguay) identifies several differences, including the following.

Agriculture: While the Nordic countries (with the exception of Finland) undertook early and thorough land reform (mainly in the nineteenth century), resulting in increased agricultural productivity and a transfer of surplus farm labour into manufacturing, agrarian reform in Latin America did not happen until the 1960s or 1970s, if at all, with resulting low productivity growth.

Education: In the Nordic countries, the introduction of universal elementary education took place in the nineteenth century and illiteracy was practically eliminated by its end. In Latin America, illiteracy was still widespread in 1950. Another difference is the strong emphasis on applied science education in the Nordic countries, with technical universities being established in the late nineteenth and early twentieth centuries, while applied science did not receive more than little attention in Latin America until much later.

Natural resources, industrialization, and industrial policy: While industrialization in the Nordic countries proceeded gradually and diversified around the comparative advantage of their resource sectors, Latin American countries pursued import substitution policies with a strong emphasis on manufacturing:

> While the Scandinavian countries slowly and gradually filled in the empty slots in their input-output tables, the Latin American countries filled in all the numbers at the same time; and even worse, they tried to fill in the U.S. numbers! (Blomström and Meller 1991: 9).

Partly as a consequence, the Nordic countries were also better prepared to accept structural adaptation and rationalization, including the destruction of old capacities, for instance, in textiles and shipbuilding.

As a result of the conditions just outlined, mining in the Nordic countries led to the development of metals production and, eventually, manufactured goods exports. A large portion, sometimes most, of the production of raw materials such as timber and iron ore was exported, and exports expanded rapidly, fuelled by the needs of British industrialization in the late 1800s and early 1900s and facilitated by the decline in transport costs resulting from the introduction of steam engines.[3] Nevertheless, much of the mines' production was processed locally and so supplied the key raw materials for local manufactured goods production. This process in turn also allowed the build-up of skills, partly through the transfer of knowledge from foreign experts (Blomström and Meller 1991: 11), and so resulted in the creation of well-paid jobs both locally (near the mines) and in the countries as a whole. Linked industries were established, based either on local innovation or successful imports of technology,[4] and providers of mining equipment and services grew along with exports of manufactured products from engineering companies. In Latin America, by contrast, few competitive industries have been established on the base of natural resources. Both the import-substituting industrial policy and the fact that natural resource investment was mainly in the form of foreign direct investment (FDI) are likely to have played a role.

The result in terms of growth are eloquent. Between 1950 and 1985, when the long-term effects of the developments just described manifested themselves, GDP per capita in the four Latin American countries increased at an annual rate of 0.5 per cent (Uruguay) to 2.8 per cent (Ecuador), while it grew by 2.6 per cent (Sweden) to 3.5 per cent (Finland and Norway) during the same period (Blomström and Meller 1991: 2).

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[3] For example, Södersten (1991: 17) identifies two reasons for the rapid growth of Swedish timber exports to England in the period 1850 to 1880: first, the demand increase in the English market due to lower tariffs and a construction boom; second, the introduction of steamships, which made possible large-scale transport of timber and the exploitation of forests in northern Sweden.

[4] Södersten (1991: 23) notes the acquisition of the patent for the Bessemer steel process in 1857, which proved decisive for the competitiveness of the Swedish steel industry, particularly after the further refinement, in the form of the Thomas process, which made it possible to exploit very large but high phosphor Swedish iron ore deposits.

Developing countries with large extractive sectors today face a very different set of external conditions than did the Nordic countries fifty or a hundred years ago. Some of the most important differences are the consequence of globalization.[5] Links to other sectors are weaker and there is little innovation to exploit local comparative advantages. Transport costs have again proved decisive, but their influence is less unambiguously positive. The dramatic decline in these costs[6] has meant both that inputs can be imported more easily than was the case a hundred years ago and that processed products face more intense competition from imports. In addition, tariffs are considerably lower today than during the period from the 1930s to 1960s, when much of the industrial capacity in the Nordic countries was built, thus exposing infant industries in developing countries to strong international competition. Finally, access to state-of-the-art technology using standardized processes, which are also heavily mechanized, has meant that there is little room for using the advantage of low local labour costs or for narrowly local innovation. Consequently, both backward and forward production linkages may be more difficult to establish today than was the case when the Nordic countries industrialized.[7]

3 Linkages and multipliers

Not surprisingly, extractive industry projects normally raise the total and average income in the local areas where they are installed. The magnitude of the increase depends on how deeply the project is integrated with the rest of the economy in the area: how many local people find employment or experience increased income, how much local enterprises are able to supply the input needs of the extractive operation, and whether investments made because of the project, for instance in road infrastructure, also benefit local economic actors. These linkages between the project and the rest of the economy—initially only locally but eventually possibly nationally as well—are targeted by policies that aim to optimize the contribution of extractive industries to growth and development. The strength of the linkages are measured by *multipliers*. Multipliers are estimates of how an initial increase in economic activity, for instance an increase in the output of a particular commodity, reverberates throughout the economy and translates into more output.

It should be noted that multiplier effects can be offset by crowding-out effects, at least in the immediate neighbourhood of an extractive industry project and at specific stages of project development. De Haas and Poelhekke (2019) found that producers of tradeables that are close (less than 20 kilometres) to active mines report tighter business constraints as compared with similar firms that are not so close to mines. The constraints in question concern mainly access to transport infrastructure and educated workers. Beyond the immediate vicinity of the mine, both tradeable and non-tradeable producing firms reported an improvement in the provision of public goods. This improvement may reflect increased government spending or infrastructure investment by mining companies themselves (De Haas and Poelhekke 2019: 110)

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[5] The comparison is mainly focused on mining, given the very different circumstances of the oil and gas sector prior to the 1970s, with production dominated by a small number of transnational companies and severely limited possibilities for host country governments to formulate policies around it.

[6] The introduction of very large dry bulk ships from the early 1960s resulted in a drastic decline in the cost of oceangoing shipment. For instance, the cost of shipping Brazilian iron ore to Europe fell from US$24 per tonne in 1960 to US$7 per tonne in the early 1990s (Lundgren 1996).

[7] Di Boscio (2010) identifies a turning point in the 1970s, when the 'regional model', characterized by mineral ventures usually aiming at satisfying regional demand, with most inputs normally supplied from within the region and the equipment needed during construction procured locally, was replaced by the 'global model' as a result mainly of lower transport costs.

In order to situate the discussion, it may be useful to present a brief classification of linkages (see also Roe and Round (2018) for a discussion of different types of linkages). The focus of this paper does not include fiscal linkages, that is, payments to governments by the extractive companies, but only production–consumption and certain other linkages which refer to the goods and services that can be developed as a result of extractive industry operations. These can be further divided into (CCSI 2016: 13):

- Backward linkages: relate to the procurement of goods and services that the extractive industry requires to operate;

- Forward linkages: relate to the beneficiation of extracted commodities through refining, smelting, and further downstream processing of the commodity before reaching the final consumer. Backward and forward linkages together give rise to *indirect incomes and employment*; and

- Consumption linkages: relate to the demand for goods and services resulting from the spending of earnings from the extractive industry sector, by its employees or by suppliers of goods and services to the sector. Consumption linkages result in *induced incomes and employment*.

Other types of linkages are sometimes identified, particularly horizontal (or lateral) linkages, which relate to the use by other industries of the capabilities in the extractive industries supply chain, and side-stream linkages (or enabling factors), which relate to the supporting services, know-how, and infrastructure necessary for the extractive industries' own value-chains to function. These latter linkages are sometimes sub-divided into knowledge linkages, relating to the transfer of knowledge and technological know-how, and spatial (infrastructure) linkages, relating to the benefits associated with the infrastructure developed for an extractive industry project. While it is clear that these types of linkages can contribute to economic growth in an area, they are less easy to define and quantify than are production–consumption linkages.

In the present paper, the focus is on production–consumption linkages and on infrastructure.

3.1 Empirical results

The measurement of backward and forward links was formalized by Rasmussen (1956) and Chenery and Watanabe (1958), based on the use of input–output tables. An important distinction is made between direct and indirect links, where the direct links include only the immediate inputs into a sector (direct backward links), while indirect links include inputs into the sector, the inputs into these inputs, and so on.

Before entering into some discussion about the size of linkages it should be noted that comparisons of linkages and multipliers are risky for a number of reasons, which often means that it is pointless to compare multipliers of one project to those of another. The more important pitfalls are briefly reviewed in the following.[8]

Risks in comparing linkages

Inclusion of consumption linkages: It is not always clear if a multiplier presented in a study takes into account consumption linkages. Sometimes, it may be considered expedient to only include the

[8] See Cordes et al. (2016: 20–23) for a more detailed discussion.

production multipliers, that is, the transactions between sectors, and leave out final consumption, since its inclusion requires a different type of data, in principle a household expenditure study. When talking about multipliers, a distinction is usually made between type I multipliers, which do not include consumption linkages, and type II multipliers, which do.

Statistical definitions: Since most analyses of linkages use official statistics, the definition of sectors is important. It is, however, not always the case that the classification used in official statistics is the most appropriate. For instance, mine workers may well be defined in statistics as employed in construction, since much of the earth moving that is involved in developing a mine is carried out by construction companies. Moreover, official statistics may not provide very reliable estimates of informal sector employment. However, in poor countries, many of the jobs created as a result of extractive industry investment are in the informal sector.

Procurement practices: As shown in a study comparing two mining companies in Chile's Antofagasta region, a mining company that outsources much of its activities will have high multipliers, while a company that keeps everything in house will have low multipliers (Aroca 2001). The difference in outsourcing practices between the oil and gas industry on the one hand and non-fuel mining on the other may explain some of the systematic difference in measured linkages between the two.[9]

Geographical scope: Studies may focus on different types of areas. For instance, a mining project will have larger multiplier effects for the entire country than for the area immediately surrounding the mine.

Income levels: The share of income that is spent locally is often related to income levels. People with lower incomes tend to spend more on locally produced goods. On the other hand, the range of choice of consumer goods is often more limited in low income countries and regions, meaning that more have to be brought in from elsewhere.

Population density: Other things equal, a densely populated area is likely to offer more opportunities for linkages than a sparsely populated one—although the latter may offer greater opportunity for linkages based on infrastructure investment.

Lack of counterfactual: Finally, a basic problem with all estimates of linkages is that we do not know what would have happened in the absence of the investment studied. Maybe the area in question would have had a positive spontaneous development even if the investment had not taken place (Östensson 2014).

Estimates

The degree of connectedness of the extractive sector is directly related to the diversity and complexity of the local and national economy. Generally speaking, the richer and larger the country or region, the larger is the share of extractive industry procurement that goes to local suppliers.[10]

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[9] Much of the work in the oil and gas industry takes place under engineering, procurement, and construction contracts with specialized companies rather than being carried out by the oil and gas companies themselves (AFDB and BMGF 2015b).

[10] Cosbey et al. (2016: vi) compare two similar case study mines, one in a high-income OECD country and the other in a lower-middle-income country. For the first mine, local procurement amounted to 58 per cent of total operational expenditures. The other operation, by contrast, procured only 12 per cent of its goods and services within the host country. Semykina (2017: 459) reports that in 2011, 1,000 roubles of investments in the Vankor oil and gas project in the Krasnoyarsk region in Russia were matched by only 40 roubles of investment in machinery, equipment, and vehicle production in the region. By 2015, as local production was ramped up, the ratio reached 110 roubles per 1,000.

However, again generally speaking, backward links from the extractives sector are lower than for other sectors. Tordo et al. (2013) estimated backward and forward links from the oil and gas sector for a large number of countries. In most of the countries, the oil and gas sector had among the lowest backward,[11] and the highest forward links.[12] In practical terms, this means that purchased inputs in one form or another accounted for a relatively small part of the value of oil and gas output, which is partly explained by the fact that value added within the sector is particularly high for oil and gas, with natural resource rents often making up more than half of the production value.[13] It is possible that a significant part of the difference between oil and gas and other sectors would disappear if the natural resource rents were to be deducted when calculating the links, since: (i) multipliers are calculated on the basis of the output of the target sector including rents; and (ii) rents are larger in oil and gas and in mining than in other sectors.[14] Moreover, as pointed out in Sadik-Zada et al. (2019: 228) concerning the oil and gas sector life-cycle, production from an oilfield first increases and then tapers off, leading to lower measured multipliers when production is increasing and higher multipliers once peak oil has passed. This effect is further reinforced by the fact that even where the industrial landscape and government policies favour the establishment of linkages, the typically large size of oil and gas projects and their rapid growth may overwhelm the local industry during the boom phase. This is particularly likely since for some inputs to the oil sector there are distinct economies of scale in production: small domestic suppliers cannot initially compete with international suppliers.

On the other hand, the relatively much larger forward links for oil and gas are explained by the fact that the sector contributes substantially to the output of almost all other sectors since oil and gas are utilized in virtually all parts of the economy and are sometimes the most important input to other activities. But clearly, the links are very weak if the oil and gas is exported without being processed or used directly in local production.

For minerals, backward linkages appear to be more important than for oil and gas, although again it should be emphasized that cross-country comparisons are difficult. A comprehensive review of a large number of studies measuring multipliers in mining projects (Schodde and Hronsky 2006: 86-87) showed regional/local output multipliers ranging from 1.02 to 2.85 (that is, linkages ranged from 0.02 to 1.85),[15] while national multipliers were between 1.77 and 2.64. Only in a small number of studies were both regional and national multipliers measured. Where they were measured, the

[11] Between 0.7 and 0.9 for almost all countries, which, with the method of calculation used in the source, means that a dollar in output in the oil and gas sector is linked to an output of 70 to 90 cents in all other sectors (Tordo et al. 2013: 168–169).

[12] Forward links showed a wider range of values, from 0.61 to 3.91.

[13] Tordo et al. (2013: 7) report figures for 48 oil and gas producing countries in a graph, where resource rent and returns to capital make up more than half of output value in 38.

[14] To clarify this, imagine two copper mines that produce the same ore volume, say, 1 million tonnes, per year. Production costs per tonne of ore are the same for the two mines and they each buy inputs worth US$20 million. However, ore from the first mine has a copper grade of 0.6 per cent, while ore from the second has a grade of 1.8 per cent. Assuming that the copper price is US$6,000 per tonne, the value of the total output from the first mine will be (1 million times 0.6 per cent times 6,000) US$36 million, while for the second it will be US$108 million. The backward link for the first mine is 0.56 (20 divided by 36), for the second, 0.19. The difference is entirely due to the difference in ore grade and the consequent larger resource rent for the second mine.

[15] Multipliers are normally expressed as the increase in total output, including the target sector, associated with an increase in output of the target sector by one monetary unit (dollar, say). Accordingly, the multiplier is always greater than 1. The linkage referred to in Tordo et al. (2013) does not include the output increase in the target sector.

national multipliers were, as expected, invariably greater than the regional ones.[16] A study on Chile found that regional output multipliers were 1.28 or 1.8 depending on the assumptions made concerning employees' spending (ICMM 2007a: 38).[17] The relatively low value reflects the limited industrial infrastructure in the region in question at the time. As already noted, forward links tend to be less important for minerals than for oil and gas, mainly because only a small portion of the output of mines is typically processed in the region, at least beyond the first stage of processing. Industry classification plays a large role here. For example, if the smelting of non-ferrous metals is included in the mining sector, measured forward links tend to be weak. If it is not, then forward links can be quite strong. Roe and Round (2018) contains an extensive discussion of empirical estimates of multipliers.

When analysing impacts on the economy of a local region rather than a whole nation, *employment* multipliers tend to carry more information and are often more relevant to policy than *output* multipliers. The reason for this is, first, that employment multipliers are not affected by resource rents: they measure the increase in employment in the entire economy associated with an increase in employment by one person in the target sector. Second, employment multipliers tend to be large simply because employees in the extractives sector tend to be better paid than those in other sectors. Consequently, when goods and services are bought from other sectors, the number of people engaged in producing those goods and services is often large compared to the number of people employed in the extractive sector itself. Accordingly, *indirect* employment effects are important. If consumption linkages are included, which, unfortunately from the point of view of accuracy when estimating impacts, is not always the case, employment multipliers, measuring also *induced* employment, are even higher. Again, the reason is that extractive sector employees tend to have higher than average wages. Therefore, spending by these employees can sometimes support the livelihoods of many other people. Third, from the point of view of policy formulation, the more important parameter is often employment rather than output. A simple output number can represent very different social outcomes, including ones where tangible effects on the regional economy are not noticeable, but employment numbers are directly relevant for the design of infrastructure, investment in businesses catering to individual consumers, and planning of social services such as health and education. Finally, employment is one major criterion that people in a community affected by an extractive industry project use to judge whether the project has improved their lives or not.

3.2 Practical implications

To summarize, output multipliers and linkage analysis provide limited information, employment multipliers a bit more. All multipliers are context specific and it is very difficult to make any meaningful comparison—strictly speaking, each case can only be compared to itself. For policy formulation purposes, this implies that it is important to have detailed and accurate information about linkages and that this information should be interpreted on its own merits, without attempting to compare it to similar data from other countries, regions, or projects. Those analysing the information should also be aware of the pitfalls lurking among statistical classifications and industry-specific characteristics such as the large role played by rent in the extractive industry. Finally, any design of policies or supportive actions has to take into account the specific

[16] Except in one case, where the very low number for the national multiplier (1.19), along with some other oddities in the results (extremely high employment multipliers), appear to reflect measurement errors.

[17] The lower multiplier refers to the case where all spending by mining employees was assumed to take place outside the region, while in the case of the higher multiplier all employee spending was assumed to take place within the region.

characteristics of the area under study with respect to such aspects as incomes, economic structure, levels of education, infrastructure, and political organization.

4 Experience of policies for local content, infrastructure linkages, and downstream processing

The review in the following takes into account four ways in which various policies can be mobilized to establish or enhance linkages from the extractive sector and so raise its contribution to broader development:

- local content, focusing on backward linkages;
- employment, with reference both to production linkages (backward linkages, indirect employment), and consumption linkages (induced employment);
- downstream processing, that is, forward linkages; and
- infrastructure.

The policy measures used in practice to establish or enhance linkages range over a broad spectrum from very coercive policies based on detailed regulations to laissez-faire approaches relying on enterprises to act independently in accordance with what is deemed to be their long-term interest, and in between measures based on consultation. The measures included in the more active style of approach often include:

- quantitatively defined requirements for domestic procurement;
- preferential treatment for national or local suppliers in procurement;
- targets for employment of nationals and locals;
- targets for training of locals;
- subsidies to local enterprises;
- measures aimed at discouraging the export of unprocessed materials, including export bans, quotas, and taxes; and
- differentiated access to infrastructure.[18]

The less coercive policies include measures such as:

- improving the business climate, essentially the type of measures that result in a better score on the World Bank's Ease of Doing Business Index;

[18] For instance, iron ore miners in India have to pay railway tariffs that are 3.6 times as high when exporting as when selling to domestic customers (Creamer Media 2015).

- broad improvements to education, particularly technical education and TVET (technical and vocational education and training);

- provision of basic infrastructure; and

- ensuring that local enterprises get fair access to extractive sector procurement.

A general drawback with the more coercive policies is that they place greater demands on enforcement mechanisms. If they are easy to game, for instance, because local suppliers are defined in a vague manner that allows enterprises that normally would not be considered in need of support to enjoy the benefits of special measures, or if they require monitoring that is beyond the capacity of regulatory bodies, they easily lose effectiveness.[19] Moreover, sanctions to try to enforce compliance may be ineffective or counterproductive. For example, the withdrawal or non-renewal of operating licences or mining rights may be considered too drastic.[20] Fines might reduce the capacity of the investor to meet the policy objectives even further.

Less stringent policies on the other hand run the risk of not making sufficient demands on investors and thereby missing opportunities to strengthen linkages.

Defining clear and measurable objectives of policies is a challenge for governments but one that should be met. Tordo et al. (2013) observe:

> But when policy makers opt for establishing minimum targets, these should be clear, reasonable (that is, within the reach and capability of the country), and objectively measurable to avoid creating unrealistic expectations, introducing distortions and inefficiency, or creating conditions that may favor one investor over the other. To this end the first step would logically be to carry out an assessment of existing capacity and current and future demand, which in turn would provide the regulator with a better understanding of the nature and magnitude of the gaps, and serve as basis for deciding the need for and kind of regulatory intervention. (Tordo et al. 2013: 148)

A basic distinction is between general and sector- or even company-specific measures. Interventions directed towards a specific sector, while appearing more targeted and therefore possibly more economical, could entail 'picking winners', thereby increasing the risk of capture by special interests. Broader policy interventions that target areas of activity may be less subject to lobbying.

4.1 Backward linkages: local content

As has already been observed, local content polices range from coercive, with quantitative targets, to more accommodating, usually based on consultation. A relatively smaller number of countries

[19] According to Mjimba (2011), 'local' procurement by gold mines in Tanzania was mainly from foreign suppliers. Only less-demanding tasks were carried out by locally controlled companies, which, however, often had foreign interests involved.

[20] In Kazakhstan mining rights may be withdrawn if companies fail to meet the relatively strict local content requirements. However, no company has ever been subjected to this penalty.

now utilize quantitative targets,[21] probably because regulations containing such targets risk being in conflict with their WTO obligations.[22] Esteves, Coyne et al. (2013) note that:

> In line with this obligation, some country-level provisions do not specify any type of sanction for noncompliance, but instead only suggest that oil, gas and mining companies give preferential treatment to local suppliers and workers. When noncompliance arises, these provisions ultimately can rely only on moral suasion. (Esteves, Coyne et al. 2013: 8)

Quantitative targets are not necessarily applied in a mechanical manner, with only the percentage of local content being taken into account. In Indonesia, targets are set, but investors receive credit for actively contributing to developing local industry, for instance by helping suppliers to cooperate in small enterprises, achieving ISO 14000 certification, carrying out community development activities, or establishing an after-sales service facility in Indonesia.

Policies utilizing quantitative targets have had limited success. For instance, in Kazakhstan, average local content in goods in 2010–12 was constant at between 13 and 14 per cent, which is not significantly more than in other countries at a similar income level. Local content in services rose from 81.5 per cent in 2010, when targets were introduced, to 92.1 per cent in 2012, but while this is an impressive increase, the result is not markedly better than in other similar countries (Esteves, Ogorodnikova et al. 2013). Where quantitative targets are still used, they have been supplemented by other measures, including collaborative or industry initiatives (see, for instance, the description of the industry initiative in Angola in the following in this section).

More commonly, policies today aim to increase procurement from local suppliers without establishing legally binding national local content legislation and regulations. The legal provisions may be very simple and only specify that local goods and services should be used to the extent possible. Separate agreements, which might not be strictly enforceable in a court of law, then set out more specific commitments on the part of individual investors. These commitments are usually focused on the preparation of plans for local content, including training and supplier development programmes. The commitments obviously have to take into account the time horizon—there is no point in developing a supply chain if the natural resource will be exhausted in a few years' time.

All policies aiming to raise local content have to address the often-large discrepancies between extractive companies' requirements and the capacity of local enterprises. Since the institutional environment in developing countries is often weak and since potential local suppliers usually start from a low level of capability, linkages can often only be built through the development of suppliers' capacity. From the point of view of investors, it may be less costly to rely for their supplies on foreign partners with known capabilities or, failing this, to keep activities in house, in spite of the fact that using local suppliers reduces transport costs and waiting times and facilitates the development of long-term commercial relationships (Östensson 2018). Accordingly, with the exception of policies using quantitative targets, most local content policies aim to bridge the gap between the actual and required capacities of suppliers and to reduce the transaction costs associated with the identification of suitable suppliers by investors.

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[21] Esteves, Coyne et al. (2013a: 9) mention Angola, Equatorial Guinea, Indonesia, Kazakhstan, Nigeria, Russia, South Africa, and Zimbabwe.

[22] Members of the World Trade Organization (WTO) are bound technically by the national treatment obligation (NTO) clause under which foreign companies cannot be forced to buy from local suppliers or hire local service suppliers if a better alternative in terms of price or quality exists abroad. See Östensson (2018) for a more detailed discussion of the relationship between local content regulations and the international trading system rules.

The design and implementation of local content policies are influenced by social, political, and economic objectives. From the economic viewpoint, Tordo et al. (2013) propose certain criteria that a government should consider in designing a local content policy, specifically that this:

- Is consistent with its other economic development policies
- Addresses market deficiencies
- Promotes competition and the emergence of an efficient domestic economy
- Fosters technology and knowledge spillovers
- Supports the development of adequate local skills
- Minimizes compliance and administrative costs
- Develops economies of scales or localization. (Tordo et al. 2013: 95)

The first of these criteria is fairly self-evident but nevertheless is often overlooked. For instance, high barriers of entry to the formal economy are likely to make it much more difficult for small enterprises to qualify as suppliers to the extractive industry since most extractive companies avoid purchasing from informal enterprises as a matter of company policy. Similarly, Mjimba (2011) reports how Tanzanian legislation imposes a penalty on prospective local supplier firms because they, unlike foreign investors, have to pay import tariffs.

The second point should be even more self-evident—after all, the underlying presumption of most local content policies is that the market is not working as it should because if it were no intervening measures would be necessary. However, the precise market deficiencies are seldom identified explicitly. As just mentioned, a first step would logically be to carry out an assessment of existing capacity and current and future demand. In practice, this rarely happens.

The third, competition, criterion is commonly ignored in practice, often because of a lack of adequate resources to monitor compliance with regulations. Accordingly, there is often a risk that local content interventions are designed to be closely aligned with public officials' or investors' other local businesses; that single source sourcing is accepted without appropriate governance arrangements; or that bidders for contracts get away with collusion.

The fourth and fifth criteria are at the heart of supplier development programmes. Clearly, it is better if the know-how accumulated through working with the extractive sector is disseminated throughout the economy and if the skills developed are portable and appropriate for the needs of the rest of the local economy.

Compliance and administrative costs appear often to be less of a concern if these costs can be borne by the industry rather than by the government. However, the costs are nevertheless real and detract from the overall contribution of the sector to the economy.

The final criterion is often difficult to meet since the market will be the test of whether potential scale economies or local comparative advantage have been accurately assessed. Nevertheless, an attempt to make an assessment is better than doing nothing.

The role of governments with respect to local content programmes is increasingly to impose them as a condition and then to facilitate their implementation. If the programmes are well designed and implemented, governments can help by removing obstacles, for instance by making it easier for

small enterprises to pass from the informal to the formal sector, and by also providing public services such as education and administrative and physical infrastructure. As implied by the review of the criteria, the active oversight and monitoring by the government and its assistance with coordinating local suppliers (for instance by preparing lists of local firms that may have the necessary capacity), together with the regular evaluation of progress, can also enhance the prospects of success for the programmes.

Although governments establish the overall framework for local content programmes, investors are generally responsible for the practical design of the programmes (in response to the general conditions laid down by governments) and an increasing number of companies, both in the oil and gas and in the mining industries, are integrating supplier development programmes in their project design.[23]

The experience of Oman described by IPIECA (2016: 7–8) in designing its 'In-Country Value (ICV) Blueprint Strategy' for the oil and gas sector provides one good example of collaborative strategies. A committee was set up to guide the strategy by preparing a diagnosis of the market and identifying gaps in the supply of goods, services, and employment. The study which it commissioned developed a gap analysis that identified areas for local content, ranging from supply chain development and local employment opportunities to cross-industry development opportunities. Specific initiatives following from this analysis included, inter alia, 53 local business opportunities and a local workforce development programme for the training and creation of 50,000 jobs. The strategy that evolved from the analysis had as an objective a rise in in-country value in the oil and gas sector from 18 per cent in 2013 to 32 per cent by 2020.

The oil sector in Angola provides a second example of a collaborative industry initiative aiming to both enable investors to meet local content requirements and local suppliers to meet the requirements of investors. Local content regulations for the oil and gas sector in Angola are relatively stringent. However, local supply capacity is scarce, and the oil companies were finding it difficult to implement local content requirements while maintaining the efficiency of their operations. To address the problem, a gap analysis of existing small and medium-sized enterprises was carried out in 2003, and several measures were identified, including training programmes; consulting to assist businesses to develop and implement quality improvement plans as well as technology transfers; the creation of a database listing local companies; and the development of improved credit facilities for local businesses. The *Centro de Apoio Empresarial* (CAE) was established with the support and funding of a number of oil companies, including the national oil company, Sonangol, British Petroleum, Exxon Mobil, Total, and Chevron. Since its inception, the CAE has generated approximately 2,700 jobs and certified 132 companies in various sectors. Participating SMEs have won over 300 contracts, mostly in tenders issued by international oil companies (Tordo et al. 2013: 128–30).

Finally, the Anglo Zimele (AZ) scheme is worth mentioning since it is probably the most comprehensive and one of the oldest initiatives within the mining sector. The scheme, which is described in Östensson (2018), was set up in 1989 by Anglo American with the objective of supporting enterprise development in response to the emerging Black Economic Empowerment policy in South Africa. The initiative includes a 'supply chain' fund which supports SMEs with financing (debt and equity), advisory services (technical and business advice), and implementation (mentoring during project delivery). AZ is a commercial operation with funding expected to

[23] According to Morris et al. (2011), a survey of the Nigerian oil industry found that three-quarters of the companies had supplier development programmes.

generate a commercial return. During the 15 years until 2016, AZ funded no fewer than 1,885 companies. AZ is in regular touch with Anglo American business units in South Africa to understand their future demand and perceived constraints on supply, thereby informing the approach to targeting SMEs for enterprise development. It also responds to applications for funding submitted by entrepreneurs who approach AZ with a business idea or proposal, including in areas of economic potential that are not part of the mining supply chain (Östensson 2018).

Supplier development schemes, such as the three just described, are generally considered to be successful. However, some caution may be in order. There is agreement that a lack of management capacity is the most significant internal factor inhibiting SME growth. Poor management and lack of training and experience were found to be considerable impediments to SME growth in Nigeria (Okpara 2011), while a skills gap and the scarcity of management talent in the region as a whole were dominant factors in the failure of SMEs (Abor and Quartey 2010).[24] The question is to what extent these shortcomings can be alleviated through training of the kind offered in supplier development programmes. In a study of the connection between management training and small firm performance in OECD countries, Storey (2004) found ambiguity in the evidence connecting management training to performance. The views expressed by trainees demonstrated that public training programmes were well received but econometric methods linking training participation to small firm performance seemed to contradict this, producing weak evidence of a connection. Similarly, in a paper looking at the relationship between SME growth and external business advice in the developed world, Robson and Bennett (2000) found that the relationship of external business advice to SME performance was statistically significant in only a small number of cases. Based on evidence of SME growth in the OECD countries, a working paper by OECD (1998) argued that it is at the earliest stages in SME development that management capabilities are most crucial to survival. The paper found that the failures in SMEs are the result of both internal and external factors, but that when the business is less than five years old internal management capabilities play a more critical role.

In conclusion, the experience of local content policies appears to show that policies which are based on consultation and that set targets in terms of processes rather than quantitative outcomes are more attractive to investors and at least as likely to succeed as those based on numerical targeting. The latter type of policies run the risk of being reduced to 'ticking the boxes' and are sometimes gamed by investors as well as by suppliers. Enforcement of coercive policies is complicated and may be costly, while more consultative approaches attempt to avoid the enforcement dilemma by building trust and cooperation. Finally, it is also evident that local content policies should include supplier development and capacity building of local firms as prominent elements. This clearly involves training, a subject that is dealt with in the following section.

4.2 Employment

For the local populations in any region where there is activity in mining and/or oil investment, employment is central in their expectations of benefit. While these expectations may sometimes be unrealistic, and while only a small part of those who would be interested may actually be employed in the project, employment prospects and incomes can usually be expected to improve for a large part of the population, due mainly to indirect and induced employment and increased overall demand for labour, which will tend to push up incomes. Extractive industry projects may, however, also impact negatively on livelihoods. Mining, for example, may use land that was used for farming or otherwise provided employment for people in the local community. Although these

[24] I am indebted to Machal Karim for preparing a review of the literature on the relationship between training and capacity in the context of a consultancy in which we both worked. I have borrowed liberally from her conclusions.

negative impacts are usually much smaller than the positive effect of the extractive industry investment, leaving the community with a net increase in employment opportunities, they may cause injustices resulting in conflict if those concerned are not fairly compensated for their loss. In addition, the special case of displaced artisanal mining, where compensation may be more problematic,[25] deserves particular attention.

In areas where artisanal mining has been an important economic activity, thousands of jobs may be lost because an industrial mining company obtains formal mining rights (artisanal miners often do not have any formal rights): rights that bar any further access by artisanal miners to the deposit. While the artisanal miners would often like to be employed by the mining investor, the mine will not need all of them and in any case, the vast majority of them are likely to lack the requisite qualifications. As a result, the artisanal miners will often attempt to continue mining on land that is now covered by the formal mine's title, with consequent conflict. Since formal and artisanal miners often do not mine the same type of deposits (artisanal miners typically work small, high-grade surface deposits that sometimes cannot be economically mined by industrial methods), a co-habitation agreement is sometimes a possible solution. However, in many cases, the conclusion of such agreements has met with complications, principally concerning responsibility for environmental damage and compliance with occupational health and safety regulations (Carstens 2017: 12–13). Nevertheless, some best practice examples of co-habitation do exist (see case studies in World Bank 2009) alongside many examples of ongoing conflict.

Direct employment

Most countries that host extractive industry projects see employment of their nationals and of local people as one of the main benefits of any extractive investment. Two kinds of policy objectives can be distinguished. The first is to maximize the number of 'local' people, however defined, that obtain employment with the extractive company, since this raises incomes. The second is to capture 'spillover' effects from the investment in terms of a rise in the general skills levels in the area concerned, which it is hoped would lead to more rapid economic development. Regulations requiring employers to give preference to locals are common, as are quantitative targets, where the proportion of local employees is often required to increase over time. General quantitative targets respond to the first objective, while their breakdown in targets for different types of jobs reflects the second, particularly when they are combined with targets concerning training (see, for instance, the Nigerian Oil and Gas Industry Content Development Act, 2010 (Federal Republic of Nigeria 2010)).

While a requirement to give priority to a local applicant where qualifications are equal may not cause a company major problems, it may be more difficult to meet quantitative targets, particularly concerning critical positions that require specialized training and/or long professional experience.[26] Nevertheless, most extractive industry companies today expect to be asked to recruit mainly local people and usually succeed in doing so except for the most specialized positions. The additional expenditure for training is generally small compared to the total investment. But this does not mean that local recruitment is without challenges.

[25] Artisanal miners may find it difficult to present evidence of their losses since they often lack mining titles and since they can usually offer no proof of past earnings.

[26] In the case of Ghana, for example, some companies have found it easier to relocate company divisions outside the country than to recruit enough nationals to meet regulations on local employment. Gold Fields relocated its West African Head Office from Ghana to South Africa (SDSG 2012).

The extractive industries are capital intensive (for each job in mining the capital investment is typically US$300,000, and in oil ten times as much (African Development Bank et al. 2013), with high labour productivity and on average well-remunerated jobs. The two industries have slightly different skill profiles, with oil and gas characterized by having mainly high- and medium-skilled jobs while mining spans a broader range of skills.

For the past ten to fifteen years, productivity growth in the extractive sector has been weak and even negative. Part of the explanation for this may be a decline in the quality of the resources available to the industry: lower grade mineral deposits and deeper, less accessible oilfields. But other factors are likely to have been more important (Ernst and Young 2014; PetroLMI 2017; Tilton 2013). In particular, the very rapid growth in demand for extractive industry products during the first decade and a half of this century and the resulting high prices made it possible to exploit marginal resources and encouraged scaling up and addition of labour and capital to existing operations. This resulted in diminishing returns to scale and lower productivity in volume terms, although not necessarily in terms of value. As prices have fallen, however, the need to raise productivity has returned. A trend towards increased automation and digitization has emerged, leading to higher requirements in terms of employee qualifications and skills. In the long term, the continuation of this trend could lead to reduced demand for labour in oil and gas as well as in mining (Cosbey et al. 2016).

In the medium term, however, the evolution of the skills profile means that skills shortages and skills mismatches are emerging as even more serious challenges for the extractive industries than before (ILO 2012: 2; PetroLMI 2017: 3–4;). This is so since automation and digitization are making skills increasingly specialized. The range of skills needed is in any case quite narrow and local labour markets are usually unable to meet many of the extractive industries' labour demands. However, local labour tends to be cheaper than a reliance on international workers, even when training costs are taken into account, and higher local recruitment also reduces the risk of conflicts with local communities.

Even where skilled local labour exists, the skills may not be the right ones—or at an adequate level. For example, it has been reported that while 35,000 people hold a welding qualification in Kenya, employers have difficulties finding a welder who is adequately trained (AFDB and BMGF 2015b: 13). In many developing countries TVET does not equip those trained with skills that are adequate for the extractive sector (see, for instance, Ayonmike 2015).

Accordingly, most large extractive projects have to devote considerable and growing resources to targeted training efforts. Training is crucial in order to enable companies to satisfy stringent requirements concerning the use of local labour. Obviously, the time available to provide training is important and oil companies differ from mining companies in this respect. Direct employment in the oil and gas industry happens mainly through engineering, procurement, and construction contracts. These contracts tend to be awarded with short periods of notice and contractors therefore usually have little time to train staff. Accordingly, they find it difficult to set up the kind of long-term training programmes that would be required to train entry-level workers for skilled positions. However, the difficulty is reduced if semi-skilled workers are available. Contracting by mining companies is usually for smaller, more specific tasks, and a higher proportion of work is typically carried out by their own employees. They therefore prefer to carry out training themselves, which means that they face less important challenges in hiring locals (AFDB and BMGF 2015b).

From a government's point of view, policies aiming to establish a high proportion of local staff have generally worked well. Companies have found it to be in their interest to hire local people, even if skills levels are low initially, and many companies in poor areas have met targets by hiring

larger numbers of security guards and janitorial staff than they might have in a high wage area. Recruiting locals is certainly one important way of obtaining a social licence to operate. It can also be seen as a way for the country and region to appropriate a larger share of resource rent. Companies also readily accept the obligation to train locals except for the most specialized posts. There are several examples of companies establishing local TVET institutions to this end.[27] With respect to higher education, it is quite common for extractive industry companies to finance university scholarships for local young people, partly in the hope of thereby building a cadre of qualified staff for the future. As competition for highly skilled employees sharpens, as is likely given the trend towards automated systems, companies will probably have to invest ever more in this and in other forms of training.

The role of government policy extends well beyond that of setting targets for local hiring by companies. The most important choice facing governments is how much they should contribute to the training of extractive industry employees and if it should be part of their responsibility to provide the specialized training necessary. The answer to this question depends on what role the extractive industry plays or is likely to play in the future in the country's economy. As seen from Section 2 above, building technical competence for the long term requires major investment at all levels. Norway is an illustrative example. When it became clear that North Sea oil would be a major factor for the country's economy for decades to come:

> R&D and transfer of technology were made key components of Norway's local content policy. The operators' commitment and strategies for technology transfers were made a crucial and determining factor in the licensing processes. By the late 1970s the government also required the international majors to fund research and technology development at Norwegian institutions. Companies were required to conduct at least 50 per cent of the research for technology needed to develop prospects in Norway at local institutions. (AFDB and BMGF 2015a: 30)

The striving for mastery of the technology of course included a strengthening of university education in the relevant disciplines.

However, where it is less certain that the extractive industry is going to play a major role in the economic development of a country over the long term, the most important opportunity to leverage extractive sector investment into skills improvement is probably for governments to emphasize skills transferable to other economic sectors. Examples of such transferable skills include mechanical, process, and electrical engineering skills. In extractive industries, these skills are mainly used during construction. When the skills are no longer needed in the extractive industries the people who have acquired them are relatively easily employed in other sectors. Accordingly, TVET and engineering competences are most likely to yield results over the longer term and for the entire economy, and are more likely to prove useful even if extractive sector activity turns out to be less important than expected.

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[27] One of the more well-known examples is the CEIM (*Centro de Entrenamiento Industrial y Minero*, the Industrial and Mining Training Centre), which was founded in 1999 by Minera Escondida in Chile's Antofagasta region. The Centre has developed several programmes on specific subjects to improve employment opportunities for local workers within the region. It has been reinforced through an alliance between Escondida and 20 other companies and 350 technicians in electronics, electrical engineering, heavy machinery and industrial machinery graduates every year (ICMM 2007a). The Escondida Foundation handed over the Centre to local educational authorities after 2007.

Indirect employment

Since indirect employment takes place in enterprises supplying the extractive industry, most of the aspects have already been discussed in the section above on local content. Obviously, the crucial role of investment in TVET that has been highlighted in the preceding section applies equally well to indirect employment, since the dividing line between direct and indirect employment is usually not fixed and depends on the outsourcing practices of extractive industry companies. This means that many of the indirect jobs concerned require similar qualifications as the direct ones[28] and that TVET is just as important in order to maximize the benefits of indirect employment as it is for direct employment. Again, the practical policy recommendation would be for governments to prioritize skills that are transferable to other economic sectors, including, in particular, TVET competences.

Induced employment

Induced employment is in some ways the poor relative in the policy debate about the extractive industries. Little attention is paid to it compared to policies focusing on the industry itself or on indirect employment arising from local content policies. This is somewhat surprising in view of the fact that induced employment in the context of the extractive industries is usually substantially more important in terms of numbers of people than the direct or indirect. For instance, according to AFDB and BMGF (2015a), over 1 million jobs are expected to be created across Mozambique, Uganda, Kenya, and Tanzania as a result of planned oil and natural gas projects. For every direct job, four indirect and ten induced jobs would be created.[29]

Jobs resulting from induced employment are created mainly in services, including hospitality, and transport. Skills requirements are usually relatively low, and the jobs are not very well paid. Often, they are in the informal sector involving large numbers of SMEs and MSMEs. All of this means, first, that these jobs are accessible to most local people and that therefore they may provide the most important impact in terms of livelihoods for local communities, and, second, that they may contribute significantly to poverty reduction. Even if the skills requirements are low, service sector jobs may offer opportunities for gradual acquisition of skills, thus raising the overall skills level. The impacts are likely to be different for men and women. A paper by Kotsodam and Tolonen (2015) matched 109 openings and 84 closings of industrial mines to survey data for 800,000 individuals. When mines opened, women living within 20 kilometres of the mine switched from self-employment in agriculture to working in services or they left the work force. Men switched from agriculture to skilled manual labour.

The skills acquired through induced employment are likely to be non-specialized and transferable. Since average incomes are usually considerably improved as a result of induced employment, demand for more expensive goods and services is also likely to increase, creating opportunities for further new businesses and possibly providing a platform for local economic growth, particularly if infrastructure is improved as a consequence of the extractive industry investment.

The reason why little policy attention has been brought to bear on induced employment, may be partly because there are no apparent easy policy solutions available that would allow governments

[28] The practice of classifying jobs into direct and indirect jobs, depending on the formal employer, can lead to confusion and complicate intercompany comparisons. A more consistent, but not infallible, practice is to classify jobs on the production site as direct and those carried out offsite as indirect, as in the Resource Endowment studies commissioned by the International Council for Mining and Meals (see, for instance, ICMM 2014).

[29] See also Östensson (2014) for more examples.

to address the problem by imposing obligations on companies, unlike the case with local content or direct employment. Actions in favour of induced employment are more likely to involve government authorities, including local ones, often in cooperation with extractive industry investors. A complicating factor is that much of the potential actions would involve other parts of the government machinery than those dealing with extractive industry investment.

Most of the possible policy actions needed to promote induced employment come under the heading of conventional SME policies and especially efforts to improve the ease of doing business. Facilitating the passage of small businesses from the informal to the formal sector is one important element (ICMM 2007b). Governments may also support induced employment creation by providing social infrastructure such as schools or health services. Such infrastructure provides incentives for extractives employees to settle in the neighbourhood and adds further to local demand for commercial goods and services. Actions by companies can have similar effects.[30]

4.3 Forward linkages: downstream processing

One might think that worries over the export of unprocessed products is a recent phenomenon that arises solely out of frustration with inequitable trade relationships in the twentieth and twenty-first centuries. But the issue is clearly not that recent—in 1604, the Swedish Parliament decided that iron exports should predominantly be in the shape of bars rather than unshaped lumps of iron in order to increase export income (Harrison and Eriksson 2010: 555). It is not known to what extent this attempted ban was successful or if it contributed to the industrialization process described in Section 2. Nevertheless, the example shows that the subject occupied minds well before the industrial era and that the intuitive opinion that a country should aim to export its products in the most processed form possible is not new. Indeed, much of the policy discussion around downstream processing is characterized by deceptively self-evident statements to the effect that more value added is always good, or that downstream processing will create large numbers of jobs and massive increases in government and export revenues. These statements rarely make reference to any economic analysis and are often seen by politicians as not requiring proof.

However, more recent thinking about industrial policy advocates a more nuanced approach, where transaction costs are the focus. Dietsche (2017) states:

> The general case for industrial policy is built on the argument that there are situations in which markets rely on the public sector to achieve broadly desirable economic and social outcomes. These situations are, but are not limited to, those cases where clear 'market failures' can be identified. Therefore, industrial policy sits at the heart of the relationship between markets and states, and it also shapes economies and the social outcomes they produce. (Dietsche 2017: 5)

Government efforts to reduce transaction costs could, among other results, improve conditions for downstream processing and render investment in such facilities profitable. However, when it comes to downstream processing, the market failure explanation of the lack of downstream integration rests on an assumed asymmetry of market power, where the later stages of the supply chain are able to impose prices and other conditions on the earlier stages. However, as shown for copper and iron ore in Östensson and Löf, (2017), processing margins are often thin and very

[30] A study of the Sepon mine in Lao PDR describes how corporate social responsibility policies enhanced the supply response to the increase in income in the mining area and thereby facilitated the creation of induced employment (ICMM 2011).

variable, which implies that processors in these two industries are price takers.[31] In the oil and gas industry, refinery margins are also thin and vary considerably. From 2008 to 2019, average margins in different regions varied from slightly negative to above US$15/barrel (BP 2019). In short, neither the value-added gains from further processing nor the stability of any such gains are assured.

It is possible to imagine other arguments for making further processing an industrial policy objective: examples include:[32]

- prices of the processed products may be more stable and further processing would therefore provide some insurance against revenue variations;
- processing raw materials may result in important learning effects and technology transfers; and
- the processed products may be of strategic importance as inputs for domestic industries and may not be freely available on competitive terms otherwise.

It is difficult to find examples of commodities where the first argument applies, unless one goes far enough towards the end of the supply chain to arrive at manufactured products. The supply chain for most economically important minerals and metals is characterized by transparent and competitive trading conditions, with prices being established on commodity exchanges and the prices of products at earlier and later stages in the supply chain being based on the exchange price.[33] Only at the stage where disaggregation into a multitude of different specialized semi-fabricated products occurs do market conditions become less transparent and sellers acquire the ability to set more stable producer prices. Of course, most of these markets are also fiercely competitive.

The second argument is clearly valid in principle. However, the learning effects from a copper smelter, say, are usually not substantial, both because of the very small number of employees involved and the limited transferability outside copper metallurgy of the know-how acquired.

The third argument would appear to have some merit, particularly with respect to oil and gas and to some fertilizer minerals such as phosphates. Economies of scale are often the major obstacle to

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[31] Processing margins for copper are represented by the payment to processors—in the form of deductions from the price of the processed product to obtain the raw material, or as payment directly to processors for the processing service—of treatment charges (TC), from concentrate to blister copper) and refining charges (RC), from blister to refined copper). TC is normally expressed in US$/tonne copper and RC as US cents/lb copper. On 21 November 2019, it was reported that Freeport McMoRan, which produces copper at a mine in Indonesia, had concluded contracts with two Chinese copper processors, in which TC and RC were set at respectively US$62/tonne and 6.2 c/lb for 2020, down from US$80.80/tonne and 8.08 c/lb in 2019, for a total of US$198.56/tonne, or 3.3 per cent of the copper price the same day. The spot TC/RC at the same time was US$59.50/tonne, or 1 per cent of the copper price (Creamer Media 2019a).

[32] Actions to promote downstream processing through restrictions on exports may be incompatible with WTO rules, although export taxes are allowed. Restrictions are often not challenged in the WTO because no other country suffers any significant damage. However, in many cases, export taxes or restrictions can be challenged under bilateral trade deals or investment treaties, for instance, the EU Economic Partnership Agreements (European Union 2012; Östensson 2019).

[33] Among metals, commodity exchange contracts exist for aluminium, cobalt, copper, gold, iron ore, lead, molybdenum, nickel, palladium, platinum, silver, steel scrap, tin, and zinc. Of major commodities, only chromium, manganese, phosphate, and potash are not traded under any such contracts. Oil and natural gas are of course also traded on commodity exchanges, as are some refined oil products.

realizing processing ambitions for these commodities since domestic or even regional markets may not be large enough to justify investment in downstream processing.

In the case of oil, economies of scale are particularly important. A refinery needs to have a large capacity to be profitable, in the order of half a million barrels of crude oil per day. Avoiding the problem by building a smaller refinery clearly would not be satisfactory since it would be difficult to achieve competitiveness with supplies from abroad. In Africa, only four out of seventeen oil producing countries (Algeria, Angola, Libya, and Nigeria) have a production higher than half a million barrels of crude oil per day (Wikipedia 2019). There are several refineries in West Africa alone that have a much smaller capacity. Some of these are quite old and have amortized the initial investment. However, they have problems meeting maintenance costs and achieving full capacity utilization.[34] Moreover, even if a country produces enough oil to support a modern refinery, the country is likely to encounter another problem of scale: the domestic market may not be large enough to absorb the entire output of the refinery. This means that part of the production has to be exported,[35] which can be problematic. First, many developing countries are disadvantaged by long transport distances to main product markets. Second, it may be difficult to find shipping capacity that corresponds to the needs, particularly if several different products have to be shipped to different markets. All of this raises costs and undermines profitability. It is perhaps illustrative that the only independent privately owned oil refinery in Africa is in Nigeria (the Dangote refinery, which is at present under construction and is expected to be opened in late 2020).

Policy interventions to promote downstream processing have usually followed one of two directions: constraints to exports of unprocessed products[36] or subsidies to producers increasing the degree of processing. The experience of both types of interventions is predominantly that they are ineffective and lead to economic inefficiencies. It is difficult to find any example of a successful intervention, in the sense that it has achieved its objectives and not been unreasonably costly (see Östensson and Löf (2017) for a few examples).

One particular case of government incentives for downstream processing that has attracted considerable attention in recent years is the ban on exports of unprocessed minerals in Indonesia. The ban was introduced in 2014. A number of fiscal incentives complemented the ban. They included (Bellefleur, 2014*)*: exemption from import duties on capital goods and materials for processing; a taxable income reduction of up to 30 per cent of the realized investment, spread over six years; exemption from corporate income tax for 5 to 10 years; and a two-year 50 per cent reduction in corporate income tax after the tax holiday period. These incentives attracted investors, particularly from China, and a few processing projects have been completed, possibly to be followed by many others.

As intended, the ban led to a severe downturn in unprocessed mineral exports. It was expected that this decline would be offset by an increase in production and exports of processed products.

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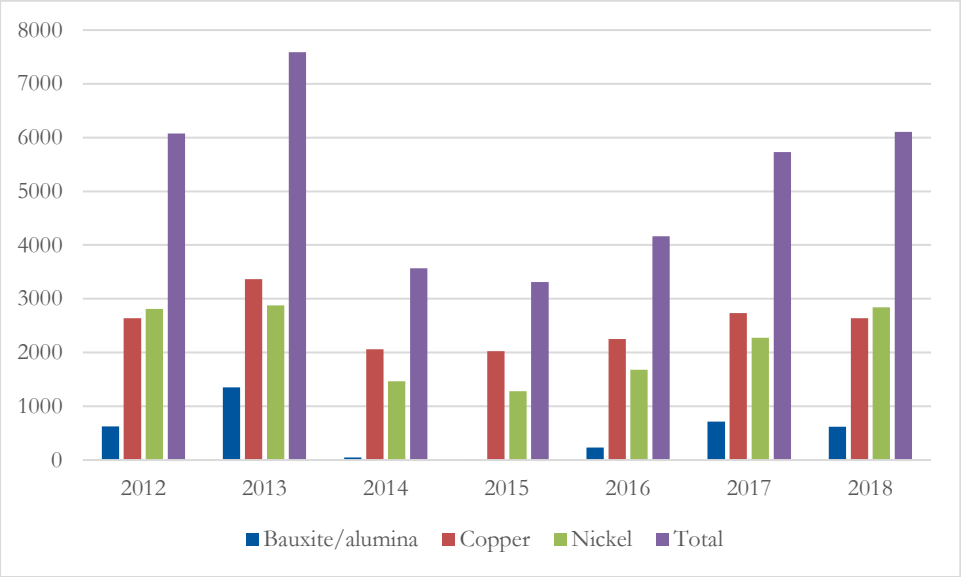
[34] Capacity utilization in African refineries has been below 70 per cent since 2011 and below 60 per cent since 2017, as compared to 80–90 per cent in most of the rest of the world (BP 2019: 25).

[35] Even if the refinery output were to be exactly as large as the domestic demand for oil products, it is still unlikely that the composition of its output would correspond exactly to the composition of demand (the shares of different products in the output is determined by the composition of the crude oil and can only be changed within very narrow margins). Specifically, diesel accounts for a large portion of oil product consumption in many developing countries, particularly in Africa, much higher than the proportion of the output of the refineries. Accordingly, some products would have to be exported and others would have to be imported.

[36] While obstacles to exports are against WTO rules, export taxes are not. However, export taxes are prohibited under some bilateral and regional trade agreements (Östensson 2019).

However, as Figure 1 shows, total exports of all products have not yet reached the same level as in 2013, the last year before the ban.

Figure 1: Total Indonesian exports of bauxite/alumina, copper, and nickel, million US$



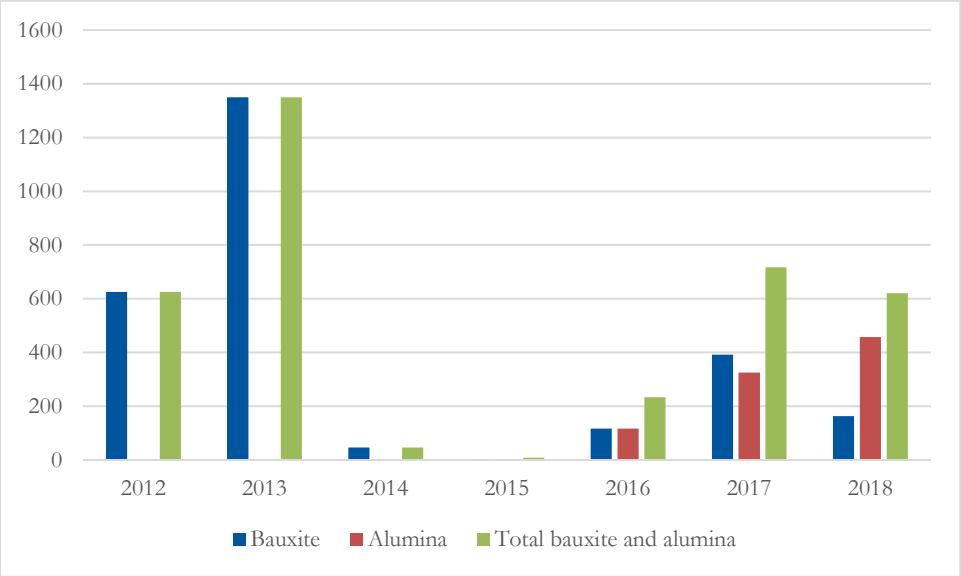
Source: author's calculations based on Comtrade data (UN Comtrade n.d.).

It is useful to look in a little more detail at the results of the ban on some individual metals.

Figure 2 shows the developments for bauxite and alumina. Production of bauxite has declined dramatically, and it practically disappeared in 2014 and 2015. Some exports, although on a very modest scale, took place in 2016–18. Two alumina refineries have been built, one that produces metallurgical alumina, that is, alumina used in aluminium smelters (Aluminium Insider 2018) and one that produces chemical grade alumina (Reuters 2015). Both refineries export most of their production. However, their total bauxite use is about 5 million tonnes per year, whereas in 2013, the last year before the export ban entered into force, bauxite exports were 57 million tonnes. Moreover, the country's only aluminium smelter, owned by the state-owned company PT Indonesia Asahan Aluminium (Inalum), still imports almost all of the alumina it consumes from Australia, with volumes having declined by only about 15 per cent since the ban.[37] Inalum also plans to build an alumina refinery, at a cost of US$850 million (Aluminium Insider 2018).

[37] Bauxite, which consists mainly of aluminium hydrates and iron oxide, is the mined product. It is converted to aluminium oxide or alumina in alumina refineries. Alumina is used to produce aluminium metal in aluminium smelters.

Figure 2: Indonesian exports of bauxite and alumina, million US$



Source: author's calculations based on Comtrade data (UN Comtrade n.d.).

By contrast, and as can be seen from Figure 3, relatively little has happened to copper production and exports. This is mainly because the largest producer, Freeport McMoRan Copper and Gold, was allowed to postpone any investment in processing capacity. In fact, copper concentrate exports have increased somewhat.

Figure 3: Indonesian exports of copper, million US$

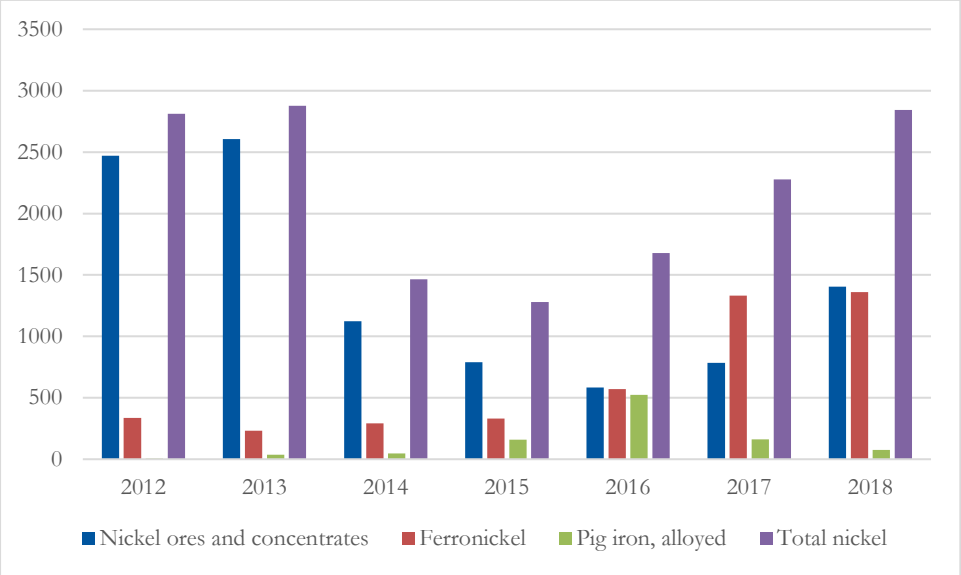
Source: author's calculations based on Comtrade data (UN Comtrade n.d.).

Indonesia is the world's largest producer of nickel. Before 2014, most of the production was exported as concentrates or raw ore (see Figure 4). After the ban, nickel mines changed their output in order to comply. They increased production and exports of nickel pig iron (NPI, classified as ferronickel or alloyed pig iron in trade statistics) instead of nickel concentrates. NPI is used to produce stainless steel and most of Indonesia's exports go to China, where NPI was first used as a raw material. The upgrading from concentrate to NPI is relatively simple and the price per unit of nickel is only marginally higher. A large number of nickel smelters (technically, blast furnaces)

producing NPI have been built or are under construction. The result of these various adjustments has been that the total value of nickel exports in all forms in 2018 reached only the same level as in 2013. A number of challenges remain. In order to give companies time to construct smelters, the government has allowed exports of nickel ore with a content of less than 1.7 per cent nickel since 2017, using a quota system. These exports were intended to continue until 2022. However, in 2019, the government announced that the exports would be banned from the beginning of 2020. This led to a surge in concentrate exports and it was alleged that some producers exported concentrate with higher nickel grade than 1.7 per cent (Creamer Media 2019b).

There are also plans for the construction of plants producing nickel for electric vehicle batteries (Creamer Media 2019c). These plans should maybe be met with some scepticism, since producing nickel sulphate (the form in which nickel is used for battery production) from either sulphide ores such as the ones exploited in Canada or Russia, or magnesium laterites, such as the ones in New Caledonia, is considerably cheaper than starting from the iron laterites in Indonesia, which, on the other hand, are very suitable for the production of stainless steel.

Figure 4: Indonesian exports of nickel, million US$



Source: author's calculations based on Comtrade data (UN Comtrade n.d.).

Overall, the costs of the reforms designed to stimulate more downstream processing have been considerable. Assuming that exports of unprocessed products in the absence of the ban would have continued at the level of 2013, the losses of export income amount to US$8,300 million for nickel and US$5,100 million for bauxite over the period 2014–18.

Maybe more relevant, the loss of tax revenues, if 2013 is taken as a base year, amounted to US$3,082 million for the years 2014–17 (data on tax revenues from World Bank 2018), a significant amount even for a large country like Indonesia. The loss does not include losses due to lower royalties. The government has also incurred major costs of its own due to substantial investments in processing capacity. Indeed, the alumina refinery, which produces smelter grade alumina (by far the largest one), was 80 per cent financed by the state-owned mining and metals company Aneka Tambang Persero Tbk PT (Antam) (Reuters 2015) to the tune of around US$1,000 million, and Antam has also invested heavily in NPI production. In November 2019, it announced that it would acquire 20 per cent of PT Vale Indonesia, a nickel company owned by the Brazilian company Vale, for between US$400 and US$500 million (Creamer Media 2019d).

There is also likely to have been some loss of employment, although some of the loss in mining employment would have been offset by increased employment in processing (which is, however, normally less labour intensive). According to the World Bank (2018), mining employment declined from 1.6 million in 2012 to just over 1.3 million in 2015. The loss in indirect and induced employment was probably significant.

In return for these high initial costs, the Indonesian economy has achieved the establishment of a number of plants that may continue to depend on fiscal advantages to survive. The surge in exports of nickel concentrates in 2019, after the government announced that the permission to export would expire two years earlier than planned and the closure of 11 nickel smelters after the export ban was relaxed in 2017 (The Jakarta Post 2017), both suggest that nickel mining for export is a considerably more profitable business than NPI production and that the NPI producers could be in a precarious financial position once tax holidays end. They could continue to be a burden to Indonesian taxpayers long after that. With the export ban, however, some of the cost of smelter construction has been pushed back to the miners, resulting in losses at that end of the supply chain. In order for mining companies to survive, the government has introduced a floor price for nickel concentrates, applying the benchmark price used as a basis for royalty calculations (The Jakarta Post 2020).

The plants in question consume large quantities of oil and so may also depend on preferential oil prices to survive (Indonesia is nowadays a net oil importer). They are very unlikely to make a significant contribution to any increase in technical know-how. NPI technology was already used in the country and is in any case a relatively simple technology, while alumina refining is a process industry with little application of the technology outside the industry itself. As for battery nickel and the batteries themselves, the prospects of the investment plans being realized are contingent on the companies in question overcoming the inherent disadvantage of using a raw material that is more costly to process into battery nickel and, in the case of batteries, of being able to compete with other plants that have access to cheaper electric power (battery production uses large amounts of electricity) and/or are closer to vehicle manufacturers.

Perhaps because the costs of the policy have escalated, in May 2020, when a new mining code was passed by the parliament, mining companies, except those mining nickel, were given an additional period of three years during which they can continue exporting unprocessed minerals. It remains to be seen if this reprieve is temporary.

Conclusions

It is difficult to find any evidence of the kind of market failure that would justify government intervention to promote downstream processing in extractive industries. As for the hoped-for learning effects that would follow from the establishment of processing facilities, interventions in other, less capital-intensive industries would probably be more cost effective. Efforts to promote downstream processing because the processed product occupies a strategic position in the economy have mostly encountered problems of attaining necessary economies of scale. As shown by the Indonesian example of a ban on unprocessed mineral products, interventions can be very costly in terms of both reduced production and exports and government revenues.

4.4 Infrastructure

Infrastructure that is built mainly for extractive industries can often be used by local populations and other economic activities and can thereby help to position a region for more rapid economic development and diversification. There are many examples of regions experiencing periods of rapid economic growth due to the infrastructure improvements associated with extractive industry

investment. Mining has probably been more important than oil and gas in this respect, since mining tends to have greater needs for road or rail transport and for electric power.

It is maybe not surprising that many developing country governments, particularly in Africa where the 'infrastructure deficit' is generally agreed to be most serious and to constitute an important constraint on growth, are tempted to promote extractive industry projects as a way of improving infrastructure—adding conditions on the use of the new infrastructure by other activities—instead of waiting for extractive investments to create the infrastructure. For example, extractive industry investments in transport and logistics might be seen as opportunities to improve infrastructure for multiple uses rather than as costs that have to be borne narrowly by a project—an approach that enables the positive effects on other sectors to be added to the plus side of the project evaluation. From the extractive industry's point of view, anything that mobilizes political support for its projects is welcome, and industry players are often happy to engage with other stakeholders in the hope that this will help to mobilize funds for the necessary infrastructure investment.

The fact that developing country governments are looking for alternative sources of finance for infrastructure investment should be seen partly against the background that they are at present shouldering a large share of the costs. For example, total investment in transport infrastructure in Africa in 2017 was US$34,041 million. African governments accounted for 59 per cent of this total, the 'ICA' group of donors (the African Development Bank, the European Investment Bank, the International Finance Corporation, and the World Bank) for 24 per cent, and China for 10 per cent. The private sector, including the extractive industry, accounted for only 1 per cent. Similarly, for energy investment, which was US$24,777 million, the corresponding shares were 23 per cent, 23 per cent, 37 per cent, and 8 per cent (ICA 2018: 16).

From the point of view of governments, infrastructure investment that is justified by extractive industry projects has the advantage of being large and conceptually simple: ports or long roads and railways that connect the interior with the coast. As Nugent (2018: 25) puts it: 'There is a certain structural logic that favours big infrastructure, for the reason that it is often easier for African governments to access external funds to cover large investments than to find money for more modest projects'.

The concept of resource corridors provides a neat label for infrastructure investment around extractive industry projects. The Maputo Development Corridor (MDC) which was officially launched in 1996, is probably the most well-known example of resource corridor development: 'The MDC represents the shortest road and rail connection between the Gauteng, Northwest, Limpopo and Mpumalanga provinces of South Africa and Gaborone in Botswana and a deep water port in Maputo' (World Bank 2012: 17). It was built around the MOZAL aluminium smelter near Maputo. Despite the fact that the MDC is widely regarded as a success, there have been setbacks relating to the functioning of the corridor. These include delayed provision of rail services, lack of community engagement, environmental issues, legal matters, governance issues, and investments (World Bank 2012: 22).

Public–private partnerships (PPPs) are central to the resource corridor concept since it is rests on two assumptions: that the government can take responsibility for a regulatory framework and the private sector for contributing finance. As pointed out by the International Finance Corporation (IFC 2013), there are, however, very few examples of successful greenfield multi-client/multi-user mining-related infrastructure PPPs in the world—and none of them are in sub-Saharan Africa. According to a report by Deloitte (2015), which deals only with newly activated projects, the number of public investment projects in Africa, all sectors included, increased from 181 to 205 between 2013 and 2015, while the number of private projects declined from 127 to 57 and PPPs

increased from 14 to 39. The increase in PPPs appears to have relieved the private sector rather than governments of the burden of financing infrastructure.

The enthusiasm for resource corridors appears to have abated somewhat, probably because it is difficult to identify any successful examples. In fact, a number of projects that were regarded as promising have stalled without being completed. Projects are sensitive both to world market prices and to political shifts. The economic foundation for a resource corridor can disappear rapidly if commodity prices fall. Political factors can also compromise or even eliminate completely the viability of a resource corridor project. The political risk is particularly high if the corridor passes through more than one country. Deals intended to reinforce friendships may not withstand scrutiny when the moment comes to invest in concrete projects.

Two iron ore projects can serve as illustrations of the importance of price changes. The Simandou project in Guinea, which included a 625-kilometre railway, was eventually abandoned by Rio Tinto in 2016 when iron ore prices fell from their previous high levels (Creamer Media 2016). Similarly, the Mbalam-Nabeba project promoted by the Australian mining company Sundance, which includes mines in Cameroon and the Republic of Congo with a 510-kilometre rail line for the transport of iron ore through Cameroon and a 70-kilometre spur line connecting to the Nabeba mines in Congo, was at least much delayed, apparently mainly because of the decline in iron ore prices. According to the Cameroon Ministry of Mines, it was planned to start operation in 2017 (Ministry of Mines n.d.). The deep seaport and railway would account for 80 per cent of the total investment costs (Sundance Resources n.d.). In late 2019, it appears that work had started on the railway while the port had opened.

The rail investments in both Cameroon and Guinea would essentially have to be paid out of the proceeds from iron ore exports. It is therefore of interest to compare the projects to the situation elsewhere. Production at Mbalam would have been 40 million tonnes per year and at Simandou it would have been 110 million tonnes. There are some similarities with the iron ore mining complex in the Pilbara region in Western Australia. Sales from BHP's mines in that region, which are served by a 426-kilometre railway, were 274 million tonnes in 2018, while sales from Rio Tinto's mines, which are served by a railway of similar length, were 338 million tonnes (Government of Western Australia 2019). It should also be kept in mind that both railway systems were developed and built up over a long time, so it was not necessary to mobilize funds for the entire investment at one time. By comparison, the investment costs in both Cameroon and Guinea would be expected to be large in relation to the relatively modest export volumes expected to finance them. The challenges in getting the projects underway seem to confirm their marginal nature and sensitivity to price changes.

The LAPSSET (the Lamu Port-South Sudan-Ethiopia Transport Corridor) provides an example of how changing political priorities can affect large infrastructure projects and how apparent political commitments do not suffice to bring a project to a successful conclusion. This Corridor is supposed to consist of rail, road, air, and fibre optic cable links designed to promote development in Ethiopia, South Sudan, and Uganda, as well as in northern Kenya. The port at Lamu in Kenya is under construction. However, Ethiopia is instead prioritizing a railway to Djibouti. The planned pipeline from Uganda to Lamu has been replaced by one going to Tanzania (Nugent 2018: 36), which has also built a port at Tanga about 200 kilometres north of Dar es Salaam. A report by Ugandan experts recommended the Tanga plan. Among the reasons were the more rugged terrain in Kenya compared with Tanzania, which is flatter. In addition, it takes about two years to compensate landowners in Kenya. In Tanzania, the government owns all the land, making it easier to access. Security was also an issue. As Lamu is closer to Somalia on the Indian Ocean, there were fears that a pipeline could be a target for al-Shabaab militants. Finally, Tanga port is already operational, while Lamu would only become available in 2022 (The Guardian 2016).

Several more examples could be cited, but the picture that emerges is clear: putting together agreements around a resource corridor involves a high degree of uncertainty, and success requires an alignment of interests that is unusual and unlikely to be realized successfully under any but the most favourable circumstances. The probability of reaching a durable and equitable agreement is further lowered by the difference in capabilities between the parties: for instance, a large international oil company that needs to reach agreement with a set of inexperienced government agencies with limited capacity to implement arrangements. It is also possible to note that where multiple uses of transport corridors have been successfully managed, the initial investment has been based only on the commercial viability of the extractive project and financed on that basis.

5 Features of a possible broader approach

The review of policies in the previous section has shown that narrow policies focusing on only one aspect of the extractive industry's interaction with the rest of the economy have often encountered difficulties.

Local content policies that disregard training and capacity building and focus on quantitative targets are often ineffective because they can be easily gamed by firms with a weak commitment to development in order to save costs and because they open up possibilities for corruption, particularly since enforcement requires administrative capacity and financial resources that are beyond the means of many developing countries. Collaborative approaches that attempt to initially build capacity among suppliers to the extractive industry and that assist extractive companies in supplier development efforts have a greater chance of success, especially if they are complemented by training.

Many governments establish targets for direct employment by extractive industry companies. This policy can have positive results, but the probability of success increases if governments introduce supporting policies such as identifying both skills needs and existing qualifications and closing the gap between the two, including through investment in TVET. By raising overall skill levels, such policies can succeed in increasing direct employment, and are also likely to have positive effects on indirect employment.

Induced employment is often overlooked as a contributor to local economic growth and poverty reduction, although it often is more important in terms of absolute numbers than direct or indirect employment. Since much of induced employment occurs in the service sectors in very small enterprises, policies aiming to eliminate obstacles in the way of general SMEs growth can yield positive results.

Incentives for downstream processing come in two flavours: subsidies to processing and constraints on exports of unprocessed products. The first may become a burden on the government budget, often without an end in sight. The second is less of a direct burden on the budget, but just as costly to the wider economy in terms of opportunity costs stemming from lost export income as seen from the example of Indonesia described in this paper. Moreover, policies that promote downstream processing may detract attention from more complex industrial policy challenges and opportunities.

Trying to make infrastructure the engine of development by adding up several different economic activities that will use the same piece of infrastructure in the hope that they will together provide sufficient economic justification for the investment runs the risk of dispersing responsibilities and complicating financing. It is also usually less likely to succeed than if there is an anchoring activity

that can carry the entire financial burden and take full responsibility, with access by other users being added on agreed conditions once the anchor project is completed.

The solution would seem to be to design and apply broad policies that consist of several mutually supporting elements. However, before going into the details of what such policies could look like, it is worth asking why broad policies for resource-based development are not already being implemented.

One problem with resource-based development policies of a broader nature is that extractive sector policies are handled by a limited set of sectoral authorities such as ministries of mines or energy. Even very competent and well-run technical ministries may encounter difficulties if they attempt to direct the general thrust of development policy. On the other hand, the ministries that are responsible for general economic policy often have very limited understanding of the extractive sector, or interest in it. Finance ministries, for example, traditionally look at mining and energy production narrowly as sources of government revenue and take a sceptical view of resource-based development. The fact that extractive industry policy is sometimes made by, or at least through, state-owned companies and in direct negotiations with investors under conditions of little transparency does not make the process of reconciliation of sectoral and general objectives any easier. When the two sides—industry and government—do manage to open a dialogue, the common ground is narrow and often the result is a one-dimensional policy such as mandatory local content targets or export taxes on unprocessed minerals. Another way that is often used to bridge the difference in viewpoints between the general and the sector specific is to set overly ambitious objectives and build up expectations in the hope that declaring the objectives will create the momentum necessary.[38]

Moreover, governments do not operate in a vacuum. If policies are to be effective, they have to be at least understood and ideally supported by the general population, local communities in areas affected by extractive activities, investors, and donors. Concentrating on a few big issues makes it easier to put the message across and mobilize support. It also relieves governments of doing the hard work of explaining complex policies and getting all interested parties to engage in making them work.

Nevertheless, the constraints on real-world policy-making are not always absolute and it is not futile to speculate about the contours of a broader than normal approach.

The objective of such a broad approach could be to build a diversified economy in the region, create more employment, and reduce poverty. The main elements could be those that have proved to work at least reasonably well in existing programmes. In order to maintain coherence between policies, it is important to prepare an overarching narrative that makes it clear to all concerned how the various pieces fit together. This may also require a particular governance structure that balances different interests and ensures transparency in decision-making.

Supplier identification and development schemes: The best supplier development schemes include mechanisms to identify potential suppliers, preferably in cooperation with national and local authorities and with local industry associations. They also have strong training schemes based on thorough skills and needs assessments, both with respect to specific extractive industry

[38] Governments are often helped in this respect by various think tanks and institutes that are anxious to provide support. For instance, a 2015 report by a well-known Indonesian think tank forecast that Indonesia's ban on unprocessed mineral exports would lead to an increase in the value of mineral exports by US$268 billion (Mergermarket and IRESS 2015).

competencies (workplace safety regulations) and general management qualifications, and they address access to credit. In parallel with the supplier development scheme, the extractive company should review its own practices and adapt them to facilitate relationships with small suppliers, for instance, by reducing payment delays and by unbundling large tasks into smaller ones for which SMEs can realistically bid. Finally, assistance with quality certification can both help suppliers conform to the extractive company's own internal procedures and make them more competitive when bidding for business with other clients, including outside the extractive industry.

Government investment in TVET: The national government needs to invest in improved TVET so as to reduce the skills gap in relation to the extractive industry's needs and to enable local people to profit more fully from direct and indirect employment opportunities. Because of the budgetary constraints of governments, the extractive sector should contribute to funding investment in TVET but in close collaboration both with the government's own initiatives and with other sectoral programmes if there are any of significance. It should also assist with advice on curricula and with teaching and apprenticeships.

Elimination of obstacles to small enterprises: Regulatory obstacles to the integration of small informal enterprises into the formal sector should be removed. The enterprises should be assisted with moving into the formal economy, both to make them eligible for work with extractive sector companies and in order to facilitate their future growth and benefit from opportunities provided by the acceleration of local economic growth. These measures should be combined with traditional SME policies focused on access to credit, acquisition of land, and management training.

Multiple use of infrastructure: When preparing long-term national infrastructure plans, governments should of course take planned extractive industry investments into account. They may wish to structure their plans so as to facilitate extractive investments and, if possible, thereby enhance the country's attractiveness for investors. Governments should, however, limit their exposure to investment in infrastructure directly needed by the extractive sector. The cost of such infrastructure should be borne predominantly by the sector itself. But governments should use their best efforts to facilitate the use of the infrastructure by other economic activities and should seek to devise arrangements that provide incentives for the extractive companies to cooperate with other interests, including by facilitating connections and by investing in smaller projects that complement the extractive industry investment. Such investment could add to the attractiveness of the area surrounding the extractive industry project and support local economic diversification, particularly if combined with other contributions by government and third parties to the 'backbone' infrastructure, in the form of shared responsibility for maintenance and road security.

A strong role for local/regional government: National governments cannot take all the necessary responsibilities associated with promoting and nurturing local economic development based on natural resources. Local government, which often lacks the necessary capacity, has to be a credible and capable partner to the extractive sector. This means that it has to have sufficient resources to be able to facilitate solutions by making its own contributions and that it has to have the technical competence to engage with extractive companies on issues concerning public investment and financial partnerships. An under-resourced local government that lacks technical competence is unable to act as an (at least) equal counterpart to extractive companies and the deficiencies cannot be made up by the national government without risking the loss of credibility vis-à-vis local communities. In some cases, particularly in federal states, regional political entities may have sufficient resources and autonomy to take on considerable responsibilities. In other countries, local government may only be able to assume its responsibilities through the creation of new administrative entities and perhaps merger of administrative subdivisions, where several such divisions are within the extractive industry's area of influence. The entities created should serve to integrate decision-making in all relevant areas such as local taxation, transport and infrastructure,

housing, health care and social services, and education and training. In order for local government to take on this demanding role, it needs the support of central government in the form of a direct line into central decision-making without always having to pass through individual ministry channels, although while observing overall strategic directions in areas such as housing, health, and education. Local government also needs a source of funds. The allocation of part of licence fees or royalties to local government, as is common in many countries, should be pursued and if needed expanded. Adequate auditing procedures should be put in place to ensure that the funds are properly spent as should appropriate support to training for improved administrative capacity where it is lacking. Finally, care must be taken in general to ensure transparency and popular oversight so as to avoid corruption.

Accurate information and monitoring: It is of fundamental importance that all decisions on how to foster the development of a resource-dependent region be grounded in comprehensive and accurate information. Extractive companies are now required in almost all jurisdictions to carry out socio-economic impact assessments. These assessments often provide an excellent basis for analyses of impacts not only of the extractive investment but also for other socio-economic changes. If these assessments are regularly updated, they offer the possibility to monitor changes in the area under influence by the investment.[39] Unfortunately, this is all too rarely the case. It may also be advisable to anchor the monitoring activity in a recognized schematic such as the United Nations Sustainable Development Goals (SDGs).[40]

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[39] At the Sepon mine in Lao PDR, detailed household surveys were carried out every two years in the area surrounding the mine. These surveys were useful to alert the company of ongoing social change and also provided it with a solid factual base whenever discussing with local authorities what the mine could do to further development (ICMM 2011).

[40] The Columbia Center on Sustainable Investment (CCSI) has carried out assessments and sketched monitoring procedures based on the SDGs. See for instance Maennling et al. (2019) and Provincia del Huasco (2019).

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