

Beneficiation and Industrial Policy

INTRODUCTION

The draft Medium Term Development Plan for 2024 to 2029 sets increased beneficiation as an outcome. Specifically, it argues that government policy on the mining value chain should “Focus on processing our minerals so that we export finished products rather than raw commodities.” (DPME 2024:12)

This policy brief analyses progress to date in promoting beneficiation and indicates key issues in evaluating specific proposals going forward. Section 2 outlines the critical aspects of beneficiation and reviews relevant trends in South Africa to date. The third part briefly summarises the arguments for and against beneficiation as part of industrial strategy. The fourth outlines the obstacles to beneficiation and indicates strategic responses. The most immediate challenge is the extraordinarily high capital and energy intensity of metals and coal refineries. The conclusions suggest key issues to consider in evaluating the options for beneficiation. Critical elements include whether it is possible to build on South Africa’s comparative advantage in mining; consideration of the opportunity costs in terms of job creation opportunities and electricity use; and the scope for minimising carbon emissions.

BENEFICIATION SINCE 1994

Conceptualising beneficiation

The concept of beneficiation can be derived from the value chain methodology. From the standpoint of industrial policy, the key distinction is between initial refining of raw materials into crude inputs, and downstream manufacturing into final capital and consumer goods and components. The value chain methodology developed to identify key relations between upstream and downstream industries in the production of goods chain analysis. As such, the relationships identified through the phases in any value chain analysis reflect the problem being addressed, which varies depending on the aims of the analysis. The priority issues for industrial policy differ, for instance, from those of mining strategies. As a result, the two approaches may conceptualise very different value chains for mining.

At the broadest level, commodity value chains can be understood in terms of four basic phases: production of unrefined products such as ores or crops, with some initial processing (for instance, concentration in the case of mining; milling in agriculture); refining into useable raw materials; manufacture of final consumer and capital goods; and the sale as inputs for production or as consumer products. The Department of Mineral Resources and Energy (DMRE) adopted this definition in its 2011 beneficiation strategy. (DMR 2011:ii) The Mineral and Petroleum Resources Development Act No. 2 of 2002 breaks the initial-processing phase effectively into four stages: initial processing, including smelting and concentrating; refining into an intermediate process; further processing into an input for minerals-based industries, and manufacturing. Initial processing in this brief is treated as part of the mining complex, with the focus on the two manufacturing phases – refineries and downstream mining.

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Figure 1: Beneficiation in the mining value chain in South Africa

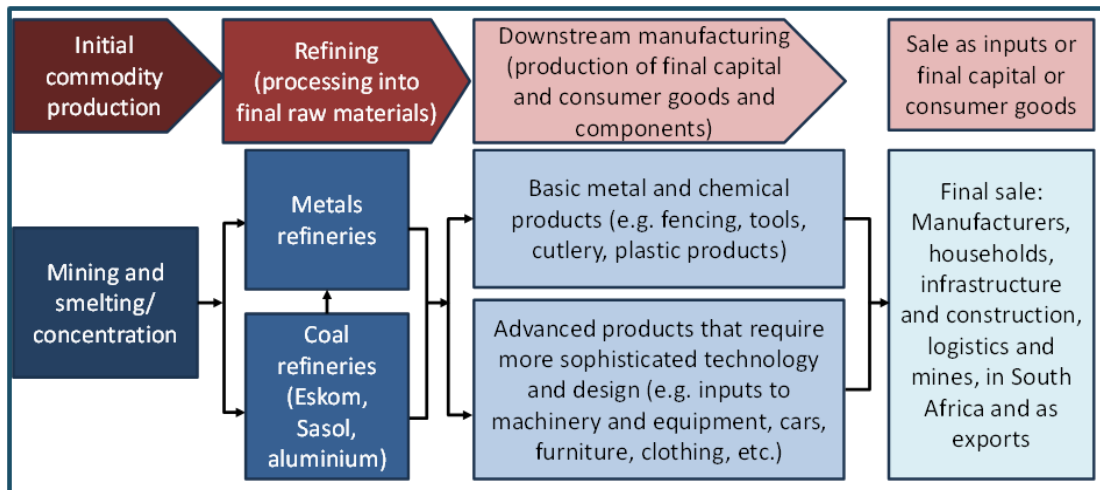


Figure 1 illustrates this conceptualisation of the value chain for mining in South Africa.

- The refineries process ores and coal to produce basic metals (mostly steel, ferro alloys, gold and platinum), petrochemicals and electricity. Coal is also processed into aluminium, with the ore (bauxite) imported from Australia. The quality of the refineries’ output – for instance, the grade of steel or reliability of electricity – is often critical in shaping opportunities for downstream manufacturing. So is the extent to which the domestic price reflects lower local mining costs.
- Downstream manufacturing is far more diverse than the refineries. It includes products that comprise mostly metals or chemicals, such as gates and fencing, tools and cutlery, and plastic products. But it also covers manufacturing of more advanced and complex goods, with advanced technologies and design contributing a large share of value added. Among others, these products include auto, capital equipment, appliances and electronic instruments, furniture, and clothing using synthetic textiles.

Figure 2 indicates some of the key differences between the refineries and downstream manufacturing. Above all, the refineries are extraordinarily resource and energy intensive. Their main costs are mineral inputs and energy, mostly electricity. By comparison, downstream manufacturing is more diverse, ranging from clothing producers using synthetic materials, on the one hand, to auto producers using high quality steel and machined components, on the other. For more sophisticated products, the complexity of the technologies involved sets high barriers to entry, which helps stabilise prices. These barriers, however, also mean that South African producers can often only enter production if they partner with foreign companies that control key technological inputs, branding and marketing networks.

Figure 2: Comparison of refining and downstream manufacturing in the mining value chain

Refining	Downstream manufacturing
Production of raw materials that usually require additional processing for final use (exception is petroleum)	Production of relatively advanced consumer and capital goods, although level of technological sophistication varies greatly
Relatively limited barriers to entry and easy substitution, leading to long-term downward pressure on global price	Harder to produce competitively or substitute, so less downward pressure on world prices
Extremely capital intensive, with very limited direct job creation	Labour intensity varies significantly by product and technology
Highly electricity intensive, which stresses the national grid, may lead to trade barriers unless shift to renewables, and increases effects of Eskom price hikes since 2008	Not very electricity intensive, but requires reliable, high quality energy
Exports primarily to China and the global North	Exports primarily to SADC and the global North
Dominated former state-owned companies (AMSA, Eskom, Sasol) plus some big domestic and foreign commodity producers (aluminium, ferro alloys); mini mills in steel are a new disruption	Very diverse ownership, from small independent companies producing clothing or furniture to large-scale manufacturing plants owned by foreign or local mixed conglomerates and OEMs

Local processing in mining varies substantially by commodity, but has mostly remained stable for the past 30 years. The exception is iron ore, where the share used locally fell sharply from the late 1980s until 2015 due to an extraordinary jump in exports and declining local steel production.

Beneficiation is not the only path from mining to more advanced industrialisation. Mining has been critical as a source of demand for capital goods manufacturing as well as some consumer products such as protective clothing. It also uses a range of advanced services, notably engineering and metallurgy; infrastructure (electricity, water and freight); finance and insurance; and healthcare. For the past 150 years, the development of capabilities in these upstream industries has provided a vital platform for increasing value added, job creation and exports in South Africa.

The extent of beneficiation in South Africa

The extent of local processing in mining varies substantially by commodity, but has remained stable for most products over the past 30 years. The exception is iron ore, where the share used locally fell sharply from the late 1980s until 2015 due to an extraordinary jump in exports combined with declining local steel production.

South Africa's leading industrial mining commodities by value are coal, iron ore, platinum, chromium and manganese. Figures for manganese export and domestic sales by weight are not available. The other major minerals are reviewed here in turn.

By volume, exports of iron ore vastly outpaced local sales over the past 30 years. From 1990 to 2023, exports climbed 230%, but local sales fell 45%. As a result, local processors' share in total iron ore sales dropped from almost 50% in 1980 to 10% from 2015 to 2023. In the early 2020s, exports were around 10 times domestic sales, by weight.

The growth in foreign iron ore sales was due almost entirely to China, whose share in South African iron ore exports climbed from a fifth in 1994 to over half in 2023. At the same time, ArcelorMittal South Africa (AMSA) saw a 60% decline in its production by weight from 2005 to 2023. The main reasons were stagnant domestic demand due mostly to falling steel intensity of growth; a sharp contraction in overseas exports from 2006, when the company was acquired by ArcelorMittal; and increased competition from emerging local mini mills and (mostly Chinese) imports of flat steel. (See Makgetla 2024)

Platinum also saw falling local beneficiation from 2015 to 2023, the earliest available data. In this period, both domestic and export sales declined by volume, but processing (mostly for catalytic converters) dropped over 55% while exports shrank under 20%. The share of platinum sold locally fell from 11% in the mid-2010s to 6% in the early 2020s.

Platinum group metals saw falling sales mostly for catalytic converters, most of which had been exported to Europe. This trend reflected two factors. First, the share of electric vehicles and hybrids in worldwide car sales climbed from near zero in the mid-2010s to nearly 20% in 2023. They exceeded 20% in the EU and 35% in China. (IEA 2024:20) Electric cars do not use catalytic converters, so their growing share in new-car sales depressed demand for platinum. Second, because of the high price of platinum, from the 2010s manufacturers increasingly found ways to reduce the amount used in new converters and to recycle older material. The energy transition could, however, boost platinum use in the medium to long term because the metal can be used in battery storage and the production of green hydrogen. Since the relevant technologies are still in flux, the long-run impact on demand for specific minerals remains difficult to ascertain.

In contrast to iron ore and platinum, most coal is processed in South Africa. By weight, from the late 2010s to 2023 local coal sales doubled while exports dropped by almost half. From 2018 to 2023, local sales by weight climbed to 80% of the total, after fluctuating around 70% for most of the previous 25 years. In value terms, however, local sales accounted for less than half of the total, because most high-grade coal was exported.

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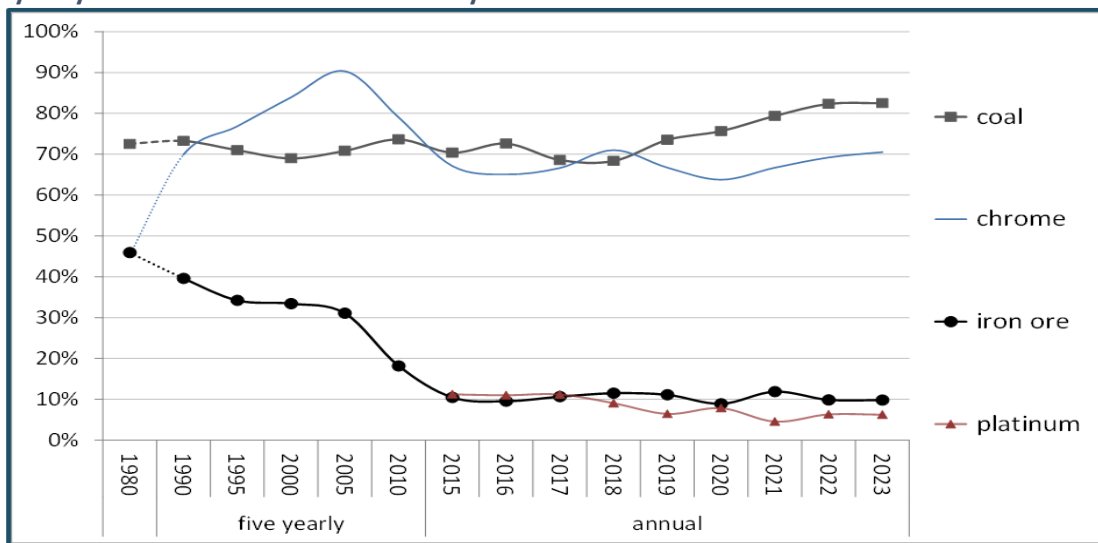
Local sales accounted for only around half of total coal revenues in the 2010s, rising to two thirds in 2020 and 2021 but falling back to 45% in 2022 when world prices jumped.

Eskom accounted for over half of local coal sales. For the mines, it acted as a backstop, buying lower coal grades while exporting better quality coal at a far higher price. As a result, local sales accounted for only around half of total coal revenues in the 2010s, rising to two thirds in 2020 and 2021 when world prices jumped, but falling back to 45% in 2022 when world prices jumped. From 2019 to 2022 the unit export price for coal spiked over 250% in constant rand terms (deflated with CPI), although it partially subsided from mid-2023. In the same period, unit domestic prices rose only 14%.

For chromium, exports and local sales grew at around the same pace from 2015. Local sales ranged between 65% and 75% of the total from 2015 to 2023.

Graph 1 shows long-term trends in the share of mining products sold locally, by weight.

Graph 1: Local sales as a percentage of exports, platinum, iron ore, chrome and coal, five yearly from 1980 to 2015 and annually from 2015 to 2023



Source: DMRE data accessed via Quantec. EasyData. Macroeconomic series. Accessed at www.quantec.co.za in September 2024.

Overall, the massive increase in iron ore exports while steel production declined accounted for most of the fall in the local beneficiation rate after 1994. The structural decline in platinum occurred off a much lower base. For the other main industrial products, the share benefited locally was mostly stable through 2023.

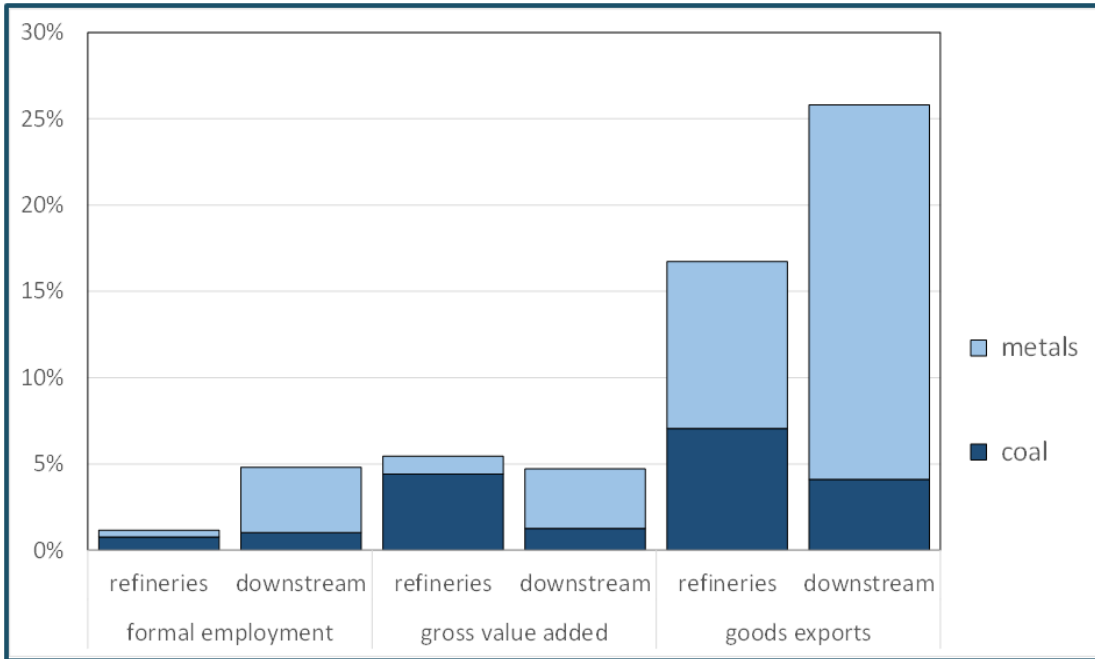
Economic impacts

While both refining and downstream manufacturing count as beneficiation, their economic impacts vary substantially. Downstream manufacturing is far more jobs rich and uses much less electricity than the refineries. If autos are included, it is also more export intensive. Taken together, refining and downstream manufacturing contribute close to half of all South African goods exports.

Graph 2 summarises the main economic impacts of the metals and coal refineries compared to downstream manufacturing. As a group, the refineries contribute 1% of national formal employment, 5% of value added, and 17% of exports. Downstream manufacturing accounted for five times as much employment, slightly less value added and 40% more exports. Downstream manufacturing is defined in this brief as including machinery and equipment; auto; basic metal and plastic products; and furniture. It excludes clothing and textiles, some of which use petrochemical-based synthetics. That said, the entire economy should arguably be treated as downstream from coal because Eskom supplies 90% of grid electricity.

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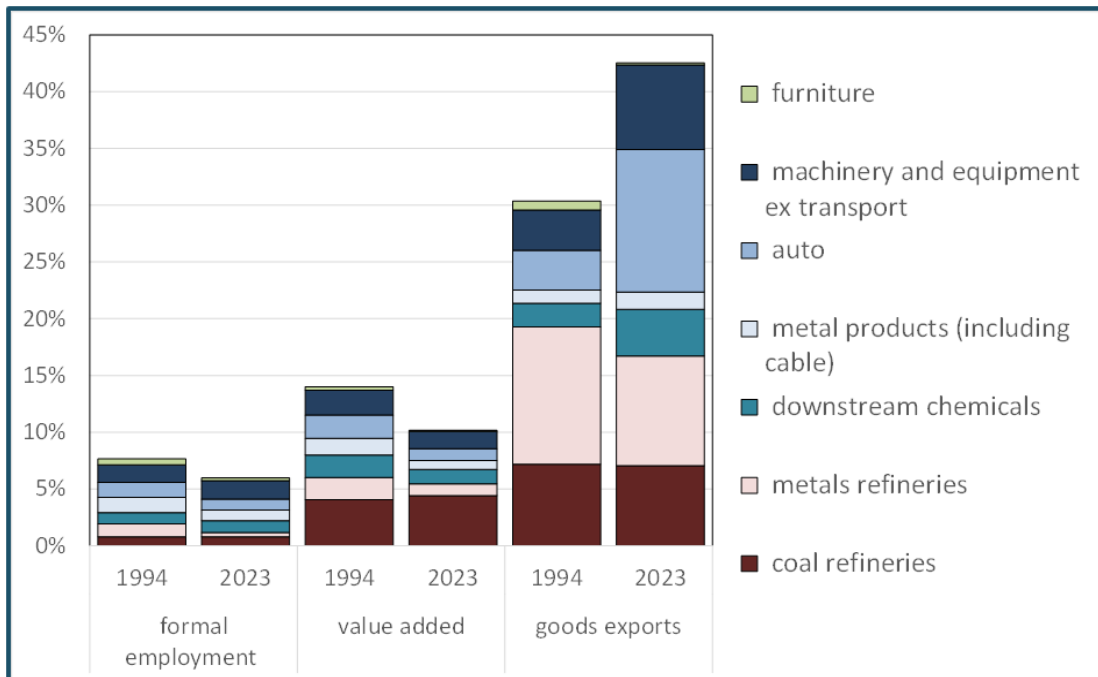
Graph 2: Contribution of metals and coal refining and of downstream manufacturing (a) to employment, gross value added and goods exports, 2023



Source: Calculated from Quantec. EasyData. Standardised Industry Service. Interactive dataset. Accessed at www.quantec.co.za in September 2024.

Graph 3 shows the share of employment, gross value added and goods exports by industry in 1994 compared to 2023. The share in employment and the GDP of refining and downstream manufacturing combined declined over this period, mostly because the services grew more rapidly. Metals refining saw a particularly sharp fall relative to the national economy as AMSA downsized and steel production shrank, as noted in section 2.2.

Graph 3: Contribution of metals and coal manufacturing industries to employment, gross value added and goods exports, 1994 and 2023



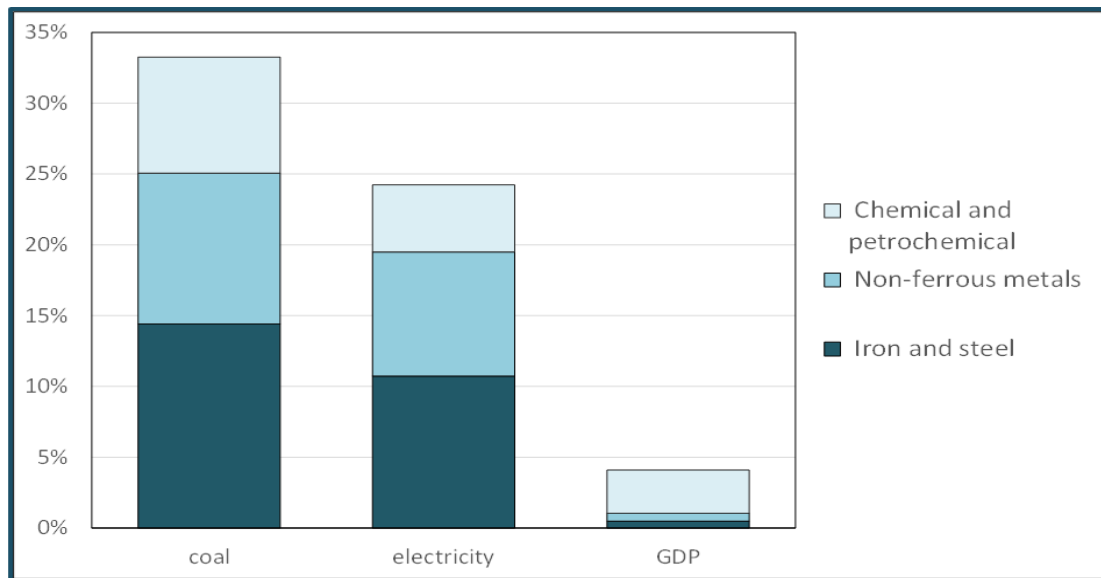
Source: Calculated from Quantec. EasyData. Standardised Industry Service. Interactive dataset. Accessed at www.quantec.co.za in September 2024.

Metals refining saw a particularly sharp fall relative to the national economy in the period from 1994 compared to 2023 as AMSA downsized and steel production shrank.

The metals and coal refineries are extraordinarily electricity intensive. According to the DMRE’s energy balance estimates, they used a quarter of national electricity and a third of coal in 2021. Those figures were several times their share in the GDP. (Graph 4) For comparison, households as a group used just over a fifth of the electricity supply.

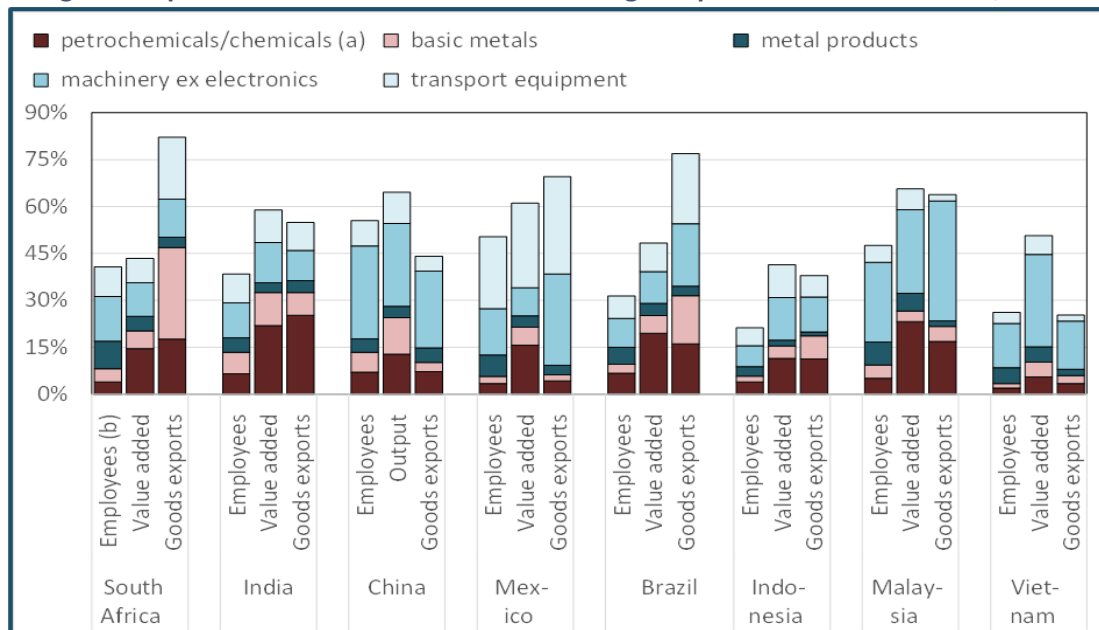
The refineries reliance on coal-fuelled electricity poses risks for their exports in light of the climate emergency. In particular, leading overseas markets plan to limit access to emissions-intensive products. The European Union has begun to implement border taxes to achieve that aim. BHP Billiton argues that unless it can find cleaner energy sources for its South African aluminium refinery, whether renewable or nuclear power, it will not be viable in the long run.

Graph 4: Share of metals and coal refineries in national electricity and coal use compared to their share in the GDP, 2021



Source: Coal and electricity use calculated from DMRE. Commodity Flows and Energy Balance. 2021, Excel Spreadsheet. Accessed at <https://www.dmre.gov.za/energy-resources/energy-statistics-reports/energy-balances> in September 2024. GDP data from Quantec. EasyData. Standardised industry service. Interactive dataset. Accessed at www.quantec.co.za in September 2024.

Graph 5: South African minerals refining and downstream employment, value added and goods exports as a share of total manufacturing compared to other countries, 2017

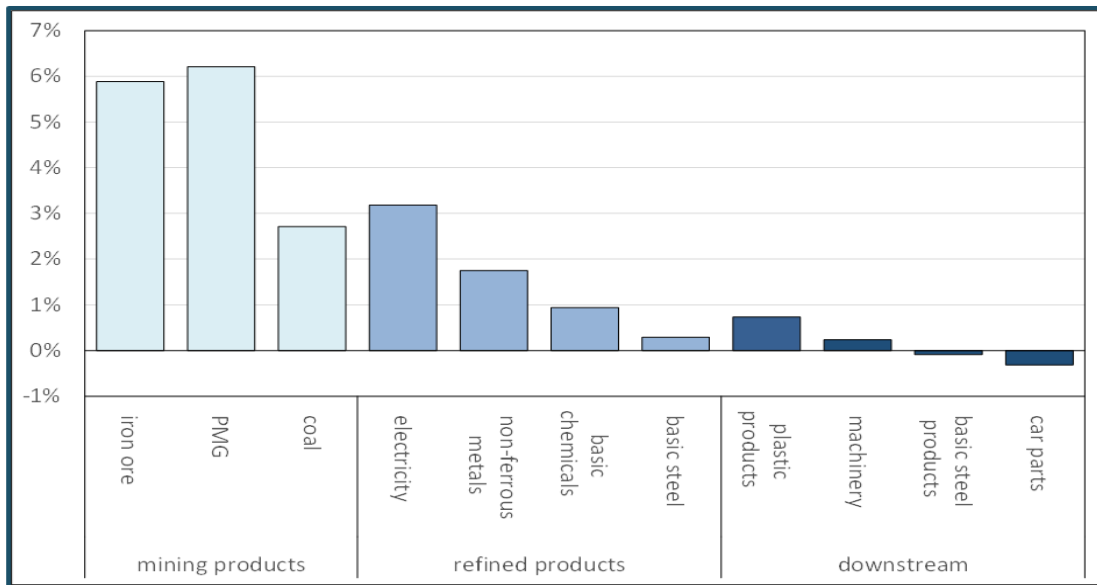


Notes: (a) Excluding pharmaceuticals. (b) Formal employment only. Sources: Employment and value added, for South Africa calculated from Quantec. EasyData. Standardised Industry Series. Accessed at www.quantec.co.za in September 2024. For other countries, calculated from UNIDO. Data Browser. Interactive dataset. Accessed at <https://stat.unido.org/data/download?dataset=indstat&revision=4> in August 2024. For exports, calculated from UNCTAD. Data Centre. Merchandise Trade Matrix. Interactive data set. Accessed at <https://unctadstat.unctad.org/datacentre/dataviewer/US.TradeMatrix> in October 2024.

Benchmarking beneficiation against peer economies is difficult because of limited data on production and employment by manufacturing industry. Graph 5 compares South Africa to some major developing economies. The data suggest that basic metals (mostly steel, ferro alloys, platinum and aluminium) are unusually important for South Africa's GDP and exports. The picture on downstream manufacturing is more complex. In South Africa, it is dominated by petrochemicals, especially basic plastic inputs; capital equipment; and auto. In other countries, machinery and refined petroleum are more important.

The refineries affected downstream production through their pricing strategies as well as the range and quality of raw materials they supplied. (See Makgetla 2024) Through the democratic era, their prices to domestic producers tended to drift closer to international markets, except during the extraordinary spikes in the late 2010s and early 2020s. Overall, from 1994 to 2023 refined minerals, especially electricity, saw prices rise faster than downstream products. In turn, prices of ores and coal rose faster than refined outputs. (Graph 6)

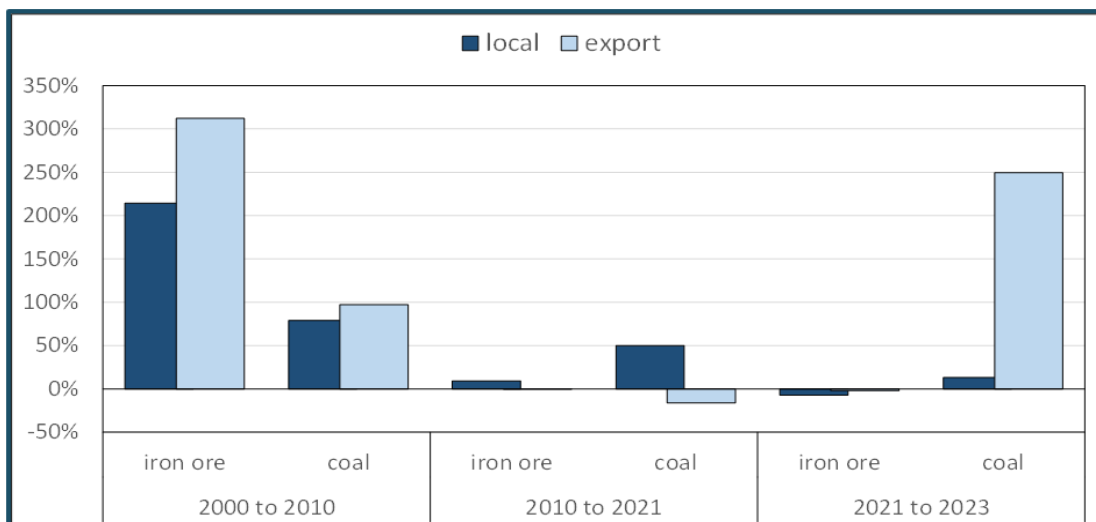
Graph 6: Average annual real price increases (a) along the mining value chain, 1994 to 2023



Note: (a) Deflator per product divided by CPI. *Source:* Calculated from Quantec. Standardised Industry Series. Interactive dataset. Downloaded from www.quantec.co.za in September 2024.

The total price includes export and local prices. In practice, local mineral prices tracked the trends in world markets. They fell behind somewhat when global prices spiked in the late 2010s and early 2020s, but increased faster than international prices in between spikes. (Graph 7)

Graph 7: Real export and local unit price increases (deflated with CPI), 2000 to 2010, 2010 to 2021 and 2021 to 2023 for iron ore, coal and chrome



Source: Calculated from DMRE. Bulletin B1. Data accessed via Quantec. EasyData. Macroeconomic series. Accessed at www.quantec.co.za in September 2024.

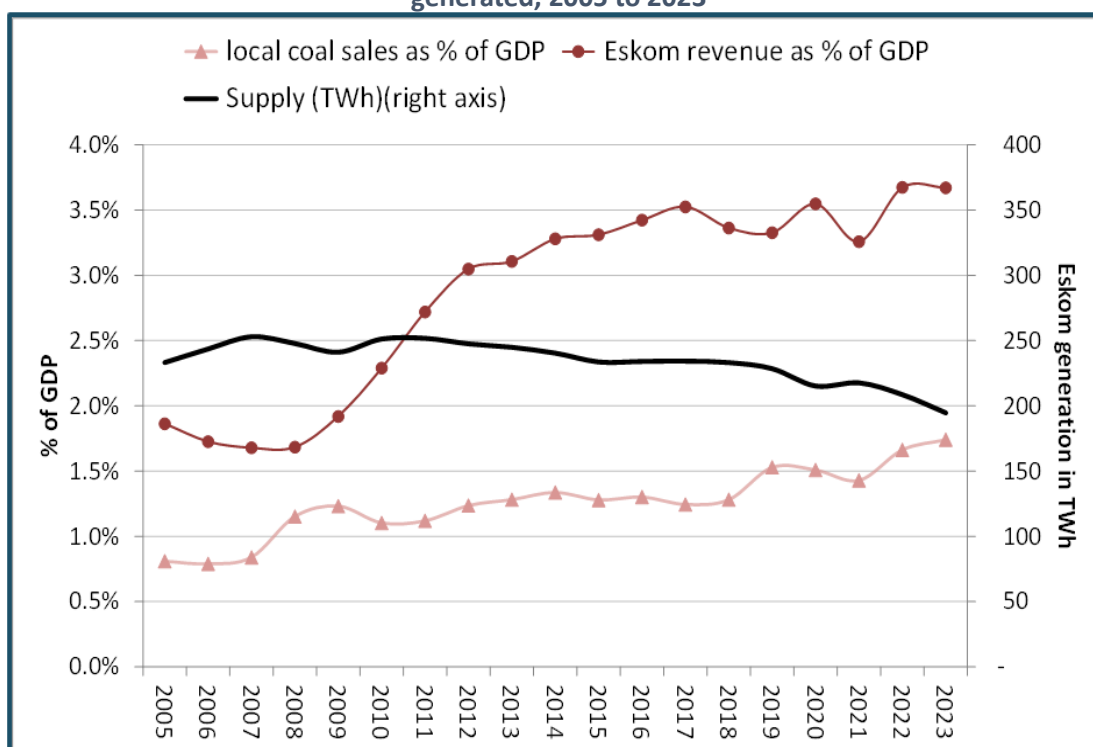
Through the 1980s, state-owned companies Eskom, Iscor and Sasol refined mining products respectively into low-cost electricity, steel and basic chemicals. They were able to procure inputs at well below long-term world prices, and passed the benefits on.

The narrowing gap between domestic and import prices represented a fundamental change in the role of the refineries in the economy. Through the 1980s, state-owned companies Eskom, Iscor and Sasol refined mining products respectively into low-cost electricity, steel and basic chemicals. They were able to procure inputs at well below long-term world prices, and passed the benefits on in the form of low-cost raw materials for downstream manufacturing, construction and mining. Relatively cheap, coal-fuelled electricity was particularly important for South African industrialisation.

From the mid-1980s, Iscor and Sasol were privatised and Eskom was commercialised. Iscor was ultimately purchased by ArcelorMittal. In 2005, it lost control over its iron ore mines, and had to pay significantly higher prices for ore. Meanwhile, changes in Eskom procurement policies that were supposed to foster competition and new entrants in coal mining ultimately led to increases in the price it paid, as well as worsening quality.

All of the refineries increasingly passed their costs on to downstream manufacturing. Eskom initially held prices down, but from 2008 embarked on a costly and inefficient expansion drive. From 2008 to 2023, it tripled its average tariff in real terms. The national grid also experienced cycles of loadshedding, in part because new plants were delayed by over five years. Nonetheless, thanks to its rising tariffs, Eskom's revenues climbed from 1.7% of the GDP in 2007 to 3.7% in 2023, while the electricity it supplied fell from 250 to 195 terawatt hours. Local coal sales rose from 0.8% of the GDP to 1.7% of the GDP in the same period.

Graph 8: Eskom and local coal sales as percentage of GDP and Eskom electricity generated, 2005 to 2023



Source: Eskom revenue from Eskom. Annual reports for relevant years. Coal sales from DMRE. B1 data. Accessed by Quantec EasyData. Macroeconomic service. Monthly minerals data. Interactive dataset. Downloaded in September 2024. GDP data from Statistics South Africa. GDP0441-2024Q2. Excel spreadsheet. Downloaded from www.statssa.gov.za in September 2024. Eskom electricity generation from Statistics South Africa. Excel – Electricity generated and available for distribution (202407). Excel spreadsheet. Downloaded from www.statssa.gov.za in September 2024.

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Basic refined mineral products – mostly metals and coal-based petrochemicals – comprise a far higher share of South African goods exports than the norm for peer economies. Still, as a share of ores mined, beneficiation was lower in the early 2020s than in the 1990s. The main reason was the fall in steel production and expansion in iron ore exports.

Summary and conclusions

The share of South African mineral production that is locally beneficiated has stabilised over the past decade. Value added from beneficiation is split almost equally between refineries and more advanced manufacturing. The figures on downstream manufacturing used here include auto and machinery but exclude synthetics used in clothing. It also excludes producers that rely on Eskom but are not particularly energy intensive.

The metals and coal refineries are generally capital and energy intensive, but create relatively few jobs. In contrast, downstream manufacturers are far less reliant on electricity, and substantially less capital intensive than the refineries. They are, however, less jobs friendly than most of the rest of the economy.

Basic refined mineral products – mostly metals and coal-based petrochemicals – comprise a far higher share of South African goods exports than the norm for peer economies. Still, as a share of ores mined, beneficiation was lower in the early 2020s than in the 1990s. The main reason was the fall in steel production combined with massive expansion in iron ore exports. Only around 10% of iron and platinum ores are beneficiated locally. In contrast, four fifths of coal by weight, and half by value, is processed locally in South Africa, primarily by Eskom for electricity generation.

BENEFICIATION IN INDUSTRIAL POLICY DEBATES

This section reviews the three main arguments that have emerged for prioritising support for beneficiation as part of industrial policy. These arguments essentially hold the following:

- Relatively low-cost South African minerals should enable more competitive downstream manufacturing.
- More beneficiated products generally enjoy relatively stable world prices compared to commodities.
- Mining resources are by definition finite, so South Africa should seek to increase their value add as far as possible before selling them.

Building on South Africa's comparative advantage in mining

South Africa has a comparative advantage in beneficiation only if the refineries and downstream manufacturing in fact pay less than world prices for raw and refined inputs. As noted, the gap between foreign and domestic prices narrowed after the commercialisation and privatisation of state-owned refineries combined with the opening of the economy after 1994. In addition, the use of locally refined raw materials by downstream manufacturing may require additional investments to ensure adequate quality, for instance low-carbon steel for the auto industry.

Several legal mechanisms exist to encourage or require local mining and refining companies to supply lower-cost raw materials to manufacturers. They have not, however, been applied consistently across mining commodities. Most face intense opposition from the mines and refineries.

The steel value chain has faced particularly intense contestation over pricing along the value chain. From the 2010s, AMSA obtained tariff protection at varying rates for flat steel products, effectively increasing costs for downstream manufacturers. In 2023, it also threatened to close down its long steel production unless the government eliminated measures to reduce the cost of scrap to mini mills, which had become the main competitors to AMSA for both domestic and regional markets. In effect, the result would be higher costs for the mini mills and ultimately their downstream customers.

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Beneficiation as a policy aim only makes economic sense if the rents from ores and coal support downstream manufacturing. That means local prices for these commodities should consistently be below import parity prices.

The available mechanisms for holding down local input prices relative to imports include the following:

- Restrictions on exports as long as domestic demand is not met at a reasonable price: In practice, South Africa has only applied this approach to scrap metal. It achieved a significant reduction in costs for the mini mills, which rely primarily on scrap. The lower cost was apparently passed on at least in part to downstream customers. The measure was opposed by scrap producers and AMSA, which argued that it unduly benefited its competitors.
- Export taxes, mostly on mining products but not refined goods: The aim is to encourage local sales at prices equal to the world price less the tax. Export taxes tend to run into opposition from importing countries and free trade advocates, including the World Trade Organization, as well as the mines themselves. In South Africa, government has only agreed to an export tax on chrome production, but has not yet imposed it in practice. It has not attempted export taxes for refined products such as steel or petrochemicals.
- Leveraging government control over rail tariffs and transport to encourage the mines and refineries to hold down prices to downstream manufacturers: The iron ore and coal mines as well as AMSA, Columbus Steel and the aluminium refineries rely on Transnet for bulk freight within South Africa and for exports through the ports. Freight rail is less important for precious metals and stones, including platinum. This approach has periodically been proposed but not implemented, in part because Transnet relies on the mines for two thirds of its rail income, and in part because it would be difficult to monitor commitments on domestic prices and sales.
- The competition authorities have periodically tested assertions that Sasol and AMSA abuse their dominance in domestic markets to over-charge customers: In 2016, they reached a settlement with AMSA that included a R1.5 billion fine and agreement to keep its margin of earnings before interest and tax to 10% on flat steel products sold locally. The Competition Commission also has the power to undertake market inquiries, which could analyse pricing for other mining value chains. As with Transnet, however, monitoring implementation of these measures could prove difficult.

The first three of these mechanisms are mentioned as options in the DMRE's 2011 beneficiation strategy. (DMR 2011:7) As noted, they have not been implemented consistently to date.

Government could make beneficiation competitive by providing support even if the mines and refineries charged import-parity prices. In addition to mineral supply and pricing, the DMRE notes that possible support measures include financing, infrastructure, energy, research and development and training. Targeted support for investment to produce higher-grade refined products could also help. All of these measures are likely needed to promote beneficiation even if the mines and refineries agree to price restraint for downstream manufacturers.

If support measures do not ensure input prices below international levels, however, the central argument for focusing on beneficiation falls away. Other industries might be able to use these kinds of support as well or better than the mining value chain, and they are often more supportive of job creation and small business development.

As noted, South Africa's comparative advantage in mining can also be leveraged to promote industrialisation through upstream industries. In practice, the development of mining has given South Africa comparatively strong capabilities and exports for some capital goods and specialised protective clothing and equipment; engineering and construction services; finance; and legal services. Developing these productive clusters avoids contestation over the allocation of rents within the mining value chain.

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Manufacture of relatively advanced downstream products should help stabilise export revenues relative to reliance on commodity sales. However, it is more difficult to enter into this kind of production.

Beneficiation to stabilise export revenues

Standard economic theory suggests that more advanced products have more stable prices. Commodity prices are subject to significant price swings, due in part to changing demand and supply patterns, and in part to speculation. It is relatively easy to produce raw materials or substitute them, however, so if prices surge too much additional producers or substitutes will enter production, and prices will again subside.

In practice, if metal and coal refineries have to export most of their output, they are generally subject to the same price pressures as the mines themselves. Swings in global prices typically affect processed raw materials as well as the original minerals.

Manufacture of relatively advanced downstream products should help stabilise export revenues relative to reliance on commodity sales. As noted, however, it is more difficult to enter into this kind of production.

Adding value to a diminishing resource

Some officials argue that because minerals are a finite resource, South Africa should seek to maximise the returns it gets for them. It should therefore prioritise local beneficiation as far as possible.

This argument only makes sense when beneficiation is viable and sustainable. Otherwise the economy will lose value rather than gaining it. It is particularly important to take the opportunity costs into account. For instance, highly electricity intensive beneficiation projects do not make sense when they will impose significant costs on the rest of the economy due to the overall electricity shortage. Similarly, highly capital-intensive refineries require investment that could create more jobs in other industries, unless they open opportunities for more labour-intensive downstream manufacturers on a significant scale. Success in that regard usually depends on the price relative to imports, as noted in section 3.1.

CONSIDERATIONS IN EVALUATING BENEFICIATION PROJECTS

Experience and the theoretical framework for beneficiation of mining products suggest five main considerations in deciding on strategies and projects for individual value chains.

First, leveraging mining for sustainable, inclusive industrialisation requires the development ultimately of downstream manufacturing and/or upstream goods inputs and services. Absent these linkages, increased refining of local minerals and coal are in most cases not justified due to their pronounced capital intensity and electricity use and, as long as they rely on Eskom, large-scale generation of greenhouse gas emissions.

By extension, decisions on beneficiation should be based in an understanding of downstream demand for specific kinds of raw materials. That requires that the refineries respond more consistently to the needs of downstream manufacturers, especially around pricing and product quality. Decisions to support refineries should ideally be linked to measures to support upstream and downstream growth, including through measures to promote access to competitive technologies and high-level skills as well as foreign markets and financing. Often they require long-term strategic interventions and significant resourcing to succeed.

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Decisions on beneficiation should face the same rigorous evaluation as any other industrial-policy project. Projects and strategies should be approved only if they ultimately contribute to more inclusive industrialisation.

Second, favouring beneficiation as a policy aim only makes economic sense if the rents from ores and/or coal support downstream manufacturing. That means local prices for these commodities should consistently be below import parity prices. The same applies to the refined commodities based on mining inputs, including crude steel and electricity. Implementing policies to achieve this fundamental objective necessarily runs into opposition from mine owners,

From this standpoint, support for beneficiation is particularly problematic where it relies on tariff protection for metals or coal refineries. In effect, that approach raises input costs for downstream manufacturing, undercutting a fundamental precondition for industrialisation in the longer run. Such an approach is worthwhile only if there are external benefits in addition to the value added in processing itself. For instance, it might mean that downstream manufacturing can get more appropriate or timely inputs than if it relied on imports, or the tariffs might relate only to a temporary downturn rather than trying to ward off a long-term decline.

Third, the evaluation of projects or strategies to promote refineries should consider the opportunity cost. In effect, these industries divert significant amounts of capital and electricity from other producers. As a rule, they should be contemplated only when there are significant external benefits. Ideally they should be linked to practical plans to develop upstream or downstream manufacturing.

Fourth, beneficiation projects have to take the changing realities around energy into account. In particular, refineries that rely on coal for electricity or feedstock are likely to face escalating barriers to exports in the medium term. Renewable energy is cheaper in the long run as well as cleaner, but it requires substantial up-front financing. The economics of nuclear power are similar, but the time required to recoup the initial investment is even longer.

Finally, successful beneficiation projects, both refineries and downstream manufacturing, require key government services, especially reliable and affordable electricity as well as freight transport. It is no longer realistic to assume that investments will have access to quality, affordable electricity, freight transport and ports. Unless clear solutions are provided in these areas, projects are likely to run into trouble.

Decisions on beneficiation should face the same rigorous evaluation as any other industrial-policy project. Above all, projects and strategies should be approved only if they ultimately contribute to more inclusive industrialisation.

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