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THE CRITICAL MINERALS CURSE

Rabah Arezki and Frederick van der Ploeg*

Abstract

Economic super-powers are racing to control critical minerals in developing economies fueling conflict, environmental damage and poverty. In this paper, we first explore what could well constitute a new “critical minerals curse”. We then highlight the dualism of institutions required for developing countries to navigate the phenomenon. Specifically, we argue that the difficulty for developing countries rich in minerals lies in the balancing act between these two different types of institutions, namely outward- and inward-facing institutions.

JEL Classification: O12; O13; F14; F10; L12.

Keywords: imports, market concentration, natural resources, resource curse.

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The Race for Critical Minerals

A race is raging among the super-powers over critical minerals in developing countries to power the simultaneous energy and digital transitions the world is experiencing. The extraordinary growth in demand for critical minerals is putting upward pressure on prices and stimulating new critical mineral discoveries all around the world. In developing countries, the new bonanza from critical minerals presents opportunities but also important risks. The present paper argues that absent governance system shifts, the risk for developing countries is to face the “critical minerals curse”.

Today’s race to secure critical minerals by economic super-powers is far from new. It stems from a long-standing and fundamental asymmetry between advanced economies and developing economies. Indeed, developing economies are less industrialized and tend to consume fewer minerals than they produce. That situation lends itself to influence over these minerals by foreign economic powers, where the latter also enjoy advances in technology, and military might. When this happens, one can speak of a grab for minerals.

Historically, the competition among 19th century European empires for copper, tin, rubber, timber, diamonds, and gold was the trigger of what was otherwise known as the scramble for Africa’s resources. The advance of steam engine navigation made access to and transport of these resources much easier for these empires. These resources were essential to powering industrial revolutions. People in the colonies where the resources were located largely faced expropriation and were subjected to various forms of forced labor including to extract these resources. As a result, former colonies inherited a complex history and bad institutions with which countries, including many in Africa, continue to grapple with. The 2001 article authored by the three 2024 Nobel Laureates Daron Acemoglu, Simon Johnson, and James Robinson exploits how Europeans colonized large parts of the globe to illustrate how institutions are shaped by the history of extractive activities. Importantly, the article also provides evidence for the persistence of the effect of these extractive institutions for today’s economic prosperity.

Notwithstanding the seminal nature of the 2001 article, its title “on the colonial origins of economic development” evocative of “positive” contributions of the colonial enterprise and its empirical findings have led to controversy. Albouy (2012) challenged the robustness of the results based on the collection of data on settler mortality. Further, Conley and Kelly (2025) have also challenged the larger body of work documenting persistence by highlight the lack of robustness when appropriately accounting for the standard errors. That said the work of the 2024 Nobel echoes the work on institutions by the 1994 Nobel Laureate Douglas North, who

renewed interests in economic history using quantitative methods to explain economic and institutional change. In the present paper, we highlight the importance of institutions for developing countries to navigate the advent of critical minerals resulting from the economic super-powers race echoing the 19th race by European empires.

A telling historical example of the complex history of developing countries is the Democratic Republic of Congo (DRC). The case of the DRC is illustrated prominently in the 2012 book entitled “Why Nations Fail” authored by two of the 2024 Nobel Laureates, i.e., James Robinson, and Daron Acemoglu. Once known as the Belgian Congo, it experienced a cruel form of colonization as, de facto, the personal property of Leopold II, Belgium’s king. The DRC’s postindependence era was plagued by direct interventions by foreign powers and autocratic rulers. That history helps explain the DRC’s deficient institutions, a persistent low level of trust among citizens, and distrust between the citizenry and the government.

Nowadays, the DRC is touted as the new “Saudi Arabia of critical minerals.” But that abundance has not improved citizens’ lives in one of the poorest countries in the world. The DRC is the repository of the world’s largest reserves of critical minerals such as cobalt, copper, and lithium. Indeed, the DRC holds around 70 percent and 60 percent of the world’s cobalt and lithium reserves, respectively, as well significant deposits of nickel and uranium, which are metal components for energy generation and batteries for electric vehicles. Yet the DRC encapsulates the seemingly insurmountable and intertwined challenges posed by critical minerals. These challenges are tied to geopolitics, conflicts (both internal and external), the environment as well as economic and social dimensions.

Fast forward to today, the race for natural resources to power the simultaneous energy and digital transitions the world, with China in the lead position, is raging among economic super-powers. In principle, that renewed interest by super-powers for minerals in developing countries should mean the latter may receive windfalls. But historically, developing countries have had difficulties managing bonanzas from the export of natural resources. Here, we highlight the dualism of institutions required for developing countries to navigate the phenomenon. Specifically, we argue that the difficulty for developing countries rich in minerals lies in the balancing act between these two different types of institutions, namely outward- and inward-facing institutions.

Demand and supply of critical minerals

While both the energy and digital transitions rely on technologies that require such critical minerals, the clean energy transition is most prominently associated with the intensive use of

these minerals. Technologies including wind turbines, solar PVs, electricity networks, electric vehicles and nuclear power require minerals such as copper, lithium, nickel, silicon, cobalt, rare earth elements and uranium. Demand for these minerals is expected to grow very quickly as the clean energy transition gathers pace.

In the face of that growth in demand, the limited supply of critical minerals has put upward pressure on their prices albeit the increase in prices has receded for select minerals especially energy minerals.

Forecasts suggest that mineral demand for clean energy technologies would rise by at least four times by 2040 to meet climate goals, with particularly high growth for minerals needed for electric vehicles (IEA, 2021). Graphite, nickel, lithium, and rare earth minerals are expected to witness explosive demand when policy changes so that climate goals are met. Recent setbacks on the global climate consensus cast uncertainty on future demand for energy related critical minerals. That said, in their most recent update, the IEA (2025) forecast that demand for critical minerals will continue to grow strongly in 2024. Despite this rapid demand growth, major supply increases – led by China, Indonesia and the Democratic Republic of the Congo (DRC) – caused a glut which pushed prices down, especially for battery metals. The current investment decisions will likely take account of significant market and economic uncertainties, even though future demand growth is expected to be strong. Supply is expected to catch up demand though to 2035, but concerns remain, especially for copper.

We argue that the bonanza from the exploitation in developing countries create both opportunities but also important risks especially for developing countries.

Geography of mineral mining and processing

The production of critical minerals is relatively scattered. Yet the salient issue is where the residual production of critical minerals net of domestic consumption (i.e., exports), especially of raw critical minerals, is concentrated. The production of critical minerals is highly prevalent in the major economic blocks namely China, the United States and European Union. These blocks typically consume more of what they produce hence making them dependent on exporters of raw critical minerals. Australia, Russia, Kazakhstan, DRC, Mozambique, Chile, South Africa, and Zimbabwe as well as many others are important exporters of raw critical minerals and thus are courted by superpowers which strive to ensure secure supplies of such minerals.

The geography of mining versus processing of critical minerals is telling. China completely dominates the processing of copper, nickel, cobalt, rare earths, and lithium, but China only dominates in the production of rare earths while Chile and Peru dominate in the production of copper, Indonesia dominates in the production of nickel, DRC dominates in the production of cobalt, and Australia and Chile dominate in the production of lithium. It is mind-boggling that China is the dominant producer in the world economy of offshore wind, onshore wind, solar, and electrical vehicles and has 40-45% global shares in the production of fuel cell trucks, heat pumps, and electrolyzers (Leruth, Mazarei, Régibeau, and Renneboog, 2022).

According to the IEA (2025), the supply of critical minerals, especially in refining and processing, has become less diversified and diversifying refining supply chains is stalling. This raises risk of energy security. Although mining is still less concentrated than refining, it shows a similar trend. Export restrictions and security risks are proliferating.

Economic security and value chains

Many developing countries including Zimbabwe attempt to maximize the value of their raw critical minerals by setting up cartels. Historically, in response to the unfair share they believed they received from the exploitation of these critical minerals, developing countries have set up producer cartels, such as the Organization of the Petroleum Exporting Countries (OPEC). While these cartels may get higher prices for these critical minerals and add revenue to government coffers, in practice advanced economies eventually find alternative suppliers (for example, non-OPEC producers) or develop alternative products (such as synthetic palm oil or shale oil). Moving up the value chain would be a better route but that too has proven difficult. The risk of cartelization is another source of concerns for major economic powers dependent on exports from developing countries. The uneven distribution of production of critical minerals is, however, likely to diffuse as elevated prices will steer exploration investment efforts and eventually lead to more discoveries (Arezki, van der Ploeg, and Toscani, 2019). A case in point is lithium production which price has fallen after fear of scarcity in the face of extraordinary demand growth.

Environmental hazards

The ramping up of mining activities around critical minerals has severe environmental, health, and social consequences. Indeed, mining activities can cause irreversible damages to the environment and is also an important source of emissions of greenhouse gases undermining climate goals. Mining of critical minerals is intensive in the usage of water and can contaminate

water especially in places where standards and controls are weak. Also, in places where labor standards are weak, working conditions can be very harsh and child labor is also rampant including in the DRC. Still, the DRC has become the darling of the US and the EU despite huge governance challenges on account of the DRC negotiating contracts away from China.

The risk of environmental damage is exacerbated by the NIMBY (not in my backyard) politics of industrialized countries which abundantly consume these critical minerals. There is ample room here for international corporations, especially those headquartered in industrialized countries, to step up their efforts and adhere to their home standards to avoid environmental and health disasters in the most vulnerable countries where these minerals are extracted. If not confronted, these environmental degradations will leave people for decades behind in developing countries where critical minerals are extracted.

Danger for democracy and potential mineral curse

The new geopolitical environment whereby mineral-rich developing countries become the center of attention of major powers is likely to slow down or reverse democratization in many developing countries. That is because new “geopolitical rents” for leaders aligning with superpowers are now back. That is not auguring well for citizens and the prospects for improved economic governance in those developing countries.

Leaders of countries like the DRC have been courted simultaneously by China and the US. That is despite the poor track record in terms of governance and human rights abuses. The bonanza from critical minerals is, however, not necessarily good news. Developing countries have traditionally not managed well the proceeds from the exploitation of their natural resources with dire consequences for their citizens. The new geopolitical environment may make things worse.

The track record of developing countries in managing their natural resources have indeed been subpar so much so that the term “resource curse” was coined describing the paradox of countries rich in natural resources performing worse than countries that are resource poor (e.g., van der Ploeg, 2011). The macro-institutional consequences of traditional resources offer lessons of what to avoid when managing booms in critical materials.

Macroeconomic volatility, loss of competitiveness, excessive indebtedness, excessive rent seeking of revenues from the sale of raw materials, and internal and external conflicts have been found to be behind the poor performance of traditional resource-rich countries.

Dualism of institutions

Unfortunately, rule of law and worsening of the quality of institutions tend to be part of the resource curse and minerals curse too. On the other hand, Mehlum, Moene, and Torvik (2006) have shown that good institutions, unsurprisingly, moderate the natural resource curse. But which ones? There are two key areas:

- the policies and institutions that govern the opening of the natural resource sector to attract investment and hence generate revenues for the state.
- the quality of redistributive institutions that govern how the proceeds from the exploitation of these resources are used to benefit people, including in terms of human capital.

Thus, the difficulty for developing countries rich in minerals lies in the balancing act between these two different types of institutions, namely outward- and inward-facing institutions. The outward-facing institutions govern the opening of the resource sector to attract investment and hence generate revenues for the state. The inward-facing institutions govern how the proceeds from the exploitation of these resources are used and benefit people, including in terms of human capital (cf. Arezki, van der Ploeg, and Toscani, 2019).

In practice, this means that countries rich in critical minerals get their fair share of revenues from extraction by multinational corporations. That starts with transparent mining contracts and by strengthening local governments' capacities to negotiate fair contracts with multinationals. Improved transparency and mining contracts will help producer countries to redistribute the proceeds to citizens to ensure economic justice. The governments of resource-rich countries should also pursue local content policy by localizing the processing of critical minerals. A telling example is the case of Botswana, which acquired a 15 percent stake in the world biggest diamond miner, DeBeers, which helped lock in local diamond cutting activities.

Beyond these economic considerations, countries rich in critical minerals coveted by super-powers often experience both internal and external conflicts. A case in point is the DRC which has long faced massive violence and crimes in mineral-rich provinces such as Katanga and North Kivu, fueled by neighbors such as Rwanda and Uganda. The advances of Rwanda-backed M23 rebels in eastern Congo is alarming for the DRC and could fuel a "major continental conflict". The Trump administration is actively pushing for a peace deal between the DRC and Rwanda to end the violence. This peace deal appears to be contingent upon the two countries each signing a bilateral economic agreement with the US involving mineral

extraction and processing. Of course, the US has pursued a similar strategy by forcing the Ukraine to sign an agreement to hand over part of its mineral wealth.

Further, the extraction of critical minerals is leading to significant environmental and health hazards. Indeed, extraction is often associated with deforestation, loss of biodiversity, and the use of toxic chemicals (including mercury), which are polluting ground water sources. Add to that child labor in the extraction of critical minerals, with children and women facing health degradation and abuse. The weak enforcement of environmental and social standards in many mineral rich countries is very concerning. A global debate is raging over the boycott of critical minerals emanating from zones of conflicts and forced labor. These boycotts alone are unlikely to sway governments in mineral-rich countries to do right by its citizens, but multinational corporations and foreign governments may be more susceptible to change.

As the rivalry between economic super-powers continues to intensify over the access to critical minerals, these multifaceted challenges will grow insurmountable. That should not deter the governments and the citizenry in mineral-rich countries from defending their interests by building and reinforcing their social and economic institutions.

Indeed, regulation at the national level has often failed to address issues of over-exploitation of natural resources as well as displacement, environment degradation, and risk to biodiversity, which are often best managed by local communities. The work of the late Elinor Ostrom (2009) has shed important light on the design of self-organized user communities to achieve sustainability in the exploitation of natural resources which can be salient for getting the governance of critical material booms right.

Various existing international initiatives have focused mainly on transparency such as the Extractive Industry Transparency Initiative (EITI). The development of environmental, social, and corporate governance norms (ESG) has roots in the socially responsible investing movement that began in the 1970s. It is unclear whether and how the ESG norms could be enforced also considering their voluntary nature. One encouraging sign is that consumers in advanced economies appear to be changing their behavior with regards to the environment. But investor behavior, especially in developing countries, may not be so amenable to change. The challenge with all these international initiatives is the difficulty in translating them into the right context and fostering ownership, especially at the local and national levels.

Conclusion

To avert a new curse of critical minerals, developing and advanced economies need to build a new model of international governance that account for interdependencies related to peace and

stability, global health, environmental and climate issues in a world increasingly organized into blocs. If externalities are to be internalized, a new international mode of governance will effectively deliver technology transfers from advanced to developing economies to provide the tools to address the threat of climate change and meet climate goals including by moving value chains of critical minerals. That international governance should also promote effective access to international capital markets through, for example, green, nature, or blue bonds instead of opaque resource-backed loans. Developing countries also need to shift their domestic governance to ensure that foreign direct investment delivers on local content, environmental protection, and jobs to address rising discontent in communities where mining or other extractive industries operate.

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