WILEY

AREA

Mining in Africa after the supercycle: New directions and geographies

Journal:	*Area*
Manuscript ID	AREA-RP-Dec-2019-0115
Manuscript Type:	Regular Paper
Keywords:	Africa, Mining, Critical review, Supercycle, Development
Abstract:	Mining in Africa is at a pivotal moment. For most of the period 2000 to 2012, the extractive industries were in a 'supercycle' of sustained high commodity prices. Driven by resource-intensive growth in emerging market economies, prices were anticipated to continue for decades to come. However, this 'supercycle' ended in 2012 and there followed a severe slump in mineral prices from 2014 onwards. A new era of commodity market dynamics has begun, with changing patterns of economic activity, minerals governance, and environmental regulation. In this paper we map the terrain of research on the supercycle in Africa and identify emerging post-supercycle trends - some of which have overtaken research - to establish key questions for scholarship and policy. We first note the broad trends in commodities investment and production that characterised the supercycle. Following this we explore four themes which emerge from the supercycle, and existing research, around: (1) new geographies of investment and extraction, (2) new geographies of struggle, (3) national minerals-based development and (4) labour and livelihoods. For each of these themes we summarise existing research and identify emerging trends and key questions for future research in Africa, before concluding. We argue that the end of the supercycle has reconfigured the geographies of extraction in ways not yet captured in the existing research, particularly around corporate strategy, state-business relations and models for mineral-based development strategies. On the other hand, the end of the supercycle has continued or intensified pre-existing trends towards mechanisation, automation, and enclavity while distributive pressures on companies by local communities and host nations increase.

1. Introduction

Mining is at a pivotal moment. For much of the previous decade, observers considered the extractive industries to be in a 'supercycle' driven by rapid resource-intensive growth in China and other emerging economies, and a lag in supply growth (Humphreys, 2015; Morris et al., 2012). The history of the mining industry is defined by successive cycles of boom and bust, due to the combination of cyclical demand for minerals and the time required to create new supply capacity. However, a prolonged period of high prices across a range of commodities, and the expectation that this trend would continue despite economic cycles due to demand from emerging market economies, sustained both high levels of investment in extractive industry, and a push into new geographies. Mining companies expanded into new frontiers across the globe, investing in low and middle income regions previously deemed marginal or risky. This included an increased interested in African mineral reserves among multinational investors. Artisanal and small-scale mining (ASM) using hand-held tools or portable mechanized equipment, too, proliferated, particularly for gold - estimated to provide direct income to more than 10 million people (Hayes 2008). Optimism abounded amongst African policy makers about the prospects for minerals based development (African Union, 2009). Some economists proclaimed the supercycle offered developing countries a once in a generation opportunity to escape poverty, through either improved fiscal management of natural resource revenues (e.g. Collier 2015), or industrial policy leveraging mineral licensing to compel higher local content and local economy diversification (Morris et al., 2012).

Driven by changing patterns of economic activity and environmental regulation this supercycle has ended and a new, more complex, era of commodity market dynamics has begun. The euphoria of prolonged high prices, which quickly rebounded after the 2008 global financial crisis, saw companies rush to expand, creating oversupply in multiple commodity categories, and high levels of corporate indebtedness. In a severe period of economic distress from 2014 onwards, prices plummeted, corporates attempted rapidly to cut costs, and revenues dwindled for commodity-dependent governments. Recovery since 2016 has been faltering and uneven. Key industrial and energy minerals - notably iron ore, coal and oil - are widely anticipated to face stagnant or declining demand over the demand the long-term (e.g. see International Energy Agency, 2019; Fitch, 2019). However, there have been surges in investor interest - both from private and state actors - in 'clean energy' minerals - such as

coltan and lithium. Gold prices have surged as investors seek a familiar counter-cyclical hedge in response to increased global economic uncertainty. Notwithstanding these examples, the mining industry as a whole is facing difficult circumstances. In this context, multinational mining companies have in general become more cautious, focusing on lowering costs and risks: shedding tens of thousands of jobs and reducing costs through organisational and technological innovation, while repositioning project portfolios away from more 'complex' operating environments. This has profound consequences for economic development and political change in resource-rich African countries. Having borrowed heavily –particularly on infrastructure– and expanded public spending during the boom, lower growth rates and tax revenues have fiscally strained governments. The IMF (2019), for example, has noted a dualistic pattern among African economies, with resource-intensive nations experiencing slower growth and increasing signs of fiscal distress relative to non-resource intensive economies. Mining labour migration, of large-scale and especially artisanal mining has set in train demographic change that continues spurring economic diversification and new spatial and occupational patterns (Kamete 2012, Mususa 2012).

Raised popular expectations have been built around the developmental benefits of an industry whose future is now uncertain. Policy mechanisms conceived during a boom have been implemented during a slump. This is creating political tension at local and national scales (Bebbington et al., 2018), and reconfiguring state-business relations. The rise of 'resource nationalism' takes on new dimensions in this context (Andreasson 2015; Childs 2016). Perceptions of the limited benefits deriving from extractive industries and the unsatisfactory fiscal contribution of multinational investors are driving new demands for the state to 'retake control' of mineral resources. However, with declining resource rents, balances of bargaining power between cash-strapped African states and multinational firms rationing investment are shifting.

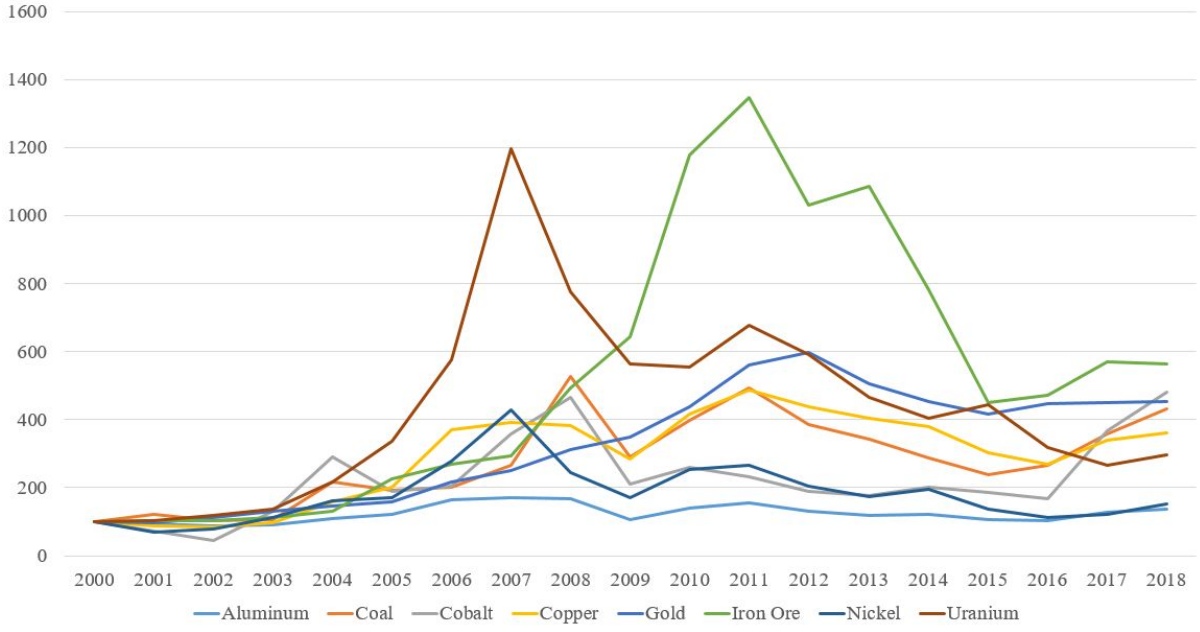
In the context of these changes, this paper considers the implications of the end of the supercycle for critical scholarship. The booming extractive sector spurred a concomitant research boom. However, geographers have been quicker to examine the consequences of commodity 'booms' than resource 'busts' in the developing world. In both academic and policy circles, research has focussed on capturing and using the rewards of a super-cycle than on managing the industry's volatility and busts (exceptions noted below). In this paper we

map the terrain of research on the supercycle in Africa in Geography[1] and identify emerging post-supercycle trends - some of which have overtaken research - to establish key questions for geographers and policy. In Section 2 we note the broad trends and new geographies in commodities investment and production that characterised the supercycle. The following three sections explore emerging themes from the supercycle and existing research, around: new geographies of struggle (Section 3), national minerals-based development (Section 4) and labour and livelihoods (Section 5). For each of these sections we summarise existing research and identify emerging trends and key questions for future research, before concluding.

2. Key dynamics of the supercycle and beyond

From the early 2000s, rising emerging-market demand - particularly China - drove rapid, concurrent price increases across key minerals commodities of a kind not seen since the 1960s (Figure 1). Interrupted by the global financial crisis of 2007/08, it recommenced immediately thereafter. This reinforced dominant industry narratives that commodity prices were not in an ordinary price cycle, but a 'super-cycle' that would continue for decades (Humphreys, 2015). These narratives had important effects on the expectations of mining investors, corporations and governments.

Figure 1: Index of mineral commodity prices, 2000-2018 (2000=100) (Source: IMF)

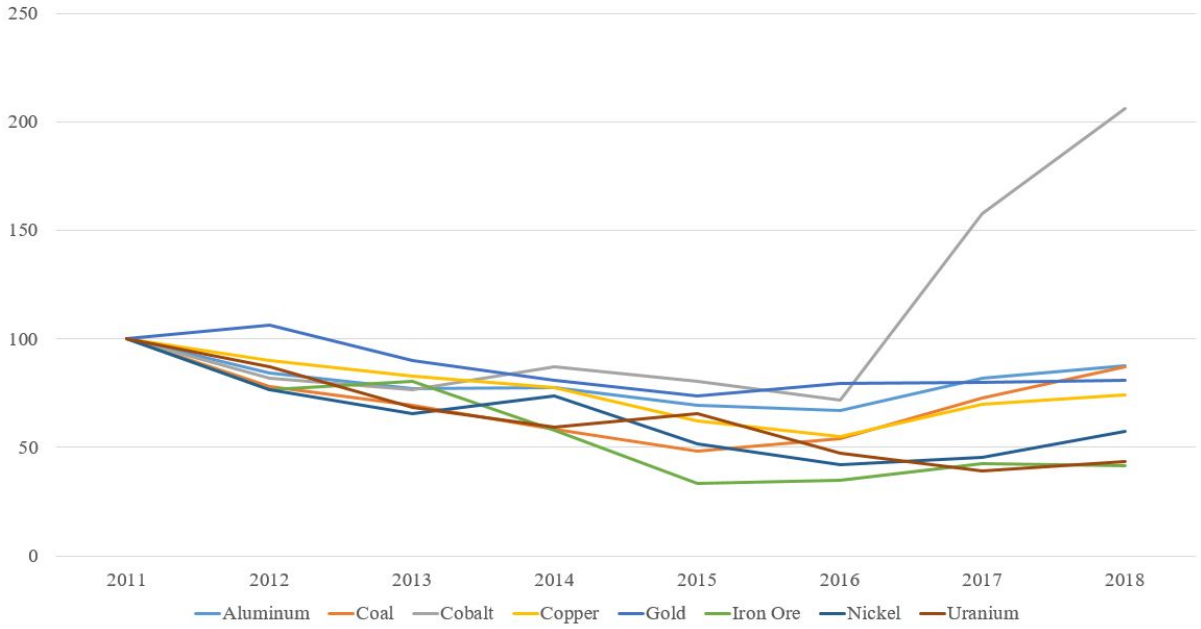


[1] Our citation strategy prioritises a) scholarly geographic thought and b) African scholars critically researching the extractive industries that have been historically underrepresented in the literature.

Mining is defined by the imperative of continual spatial expansion to secure new reserves, but this took on a new character during the boom (Bridge, 2008). Inflated price expectations made projects previously deemed uneconomic or excessively risky newly attractive to multinationals, while expectations of scarcity compelled strategic outward investment from a range of emerging market mining companies, particularly Chinese state-owned companies (Carmody, 2011). Mining's geographic frontiers expanded rapidly, with pronounced effect in many African countries. This was exemplified by increased multinational interest in high-risk post-conflict jurisdictions such as the DRC, Mozambique and Sierra Leone, as well as large increases in FDI to reach unexploited deposits in established mining jurisdictions like Zambia, Ghana and Guinea. There has also been a spatial shift in focus to the deep-ocean as a new space of mineral extraction with diamonds and phosphate now mined from the seabed within the EEZs of Namibia and South Africa (Carver 2019; Childs 2018). Similarly, the search for new, 'unconventional' rare earth mineral deposits focuses not just on land (e.g. Mkango Resources in Malawi), it also encompasses water where such as the tellurium-rich Tropic Seamount, 500km off the coast of northwest Africa (Cornwall 2019). This expansion was facilitated by prior decades of pervasive neoliberal reforms designed to improve investor shares of resource rents (Campbell, 2013). It was variously characterised as either a 'scramble for Africa' (Carmody, 2011) entrenching Africa's neo-colonial insertion in the global economy (Taylor, 2014; Bush, 2010), or 'Africa Rising' (e.g.) prompting optimistic reappraisals of the minerals' role in Africa's economic development (African Union, 2009; Morris et al. 2012) (see Section 4). Scholars and policymakers shared a common assumption of continued scarcity of mineral resources and rapid expansion of mining frontiers.

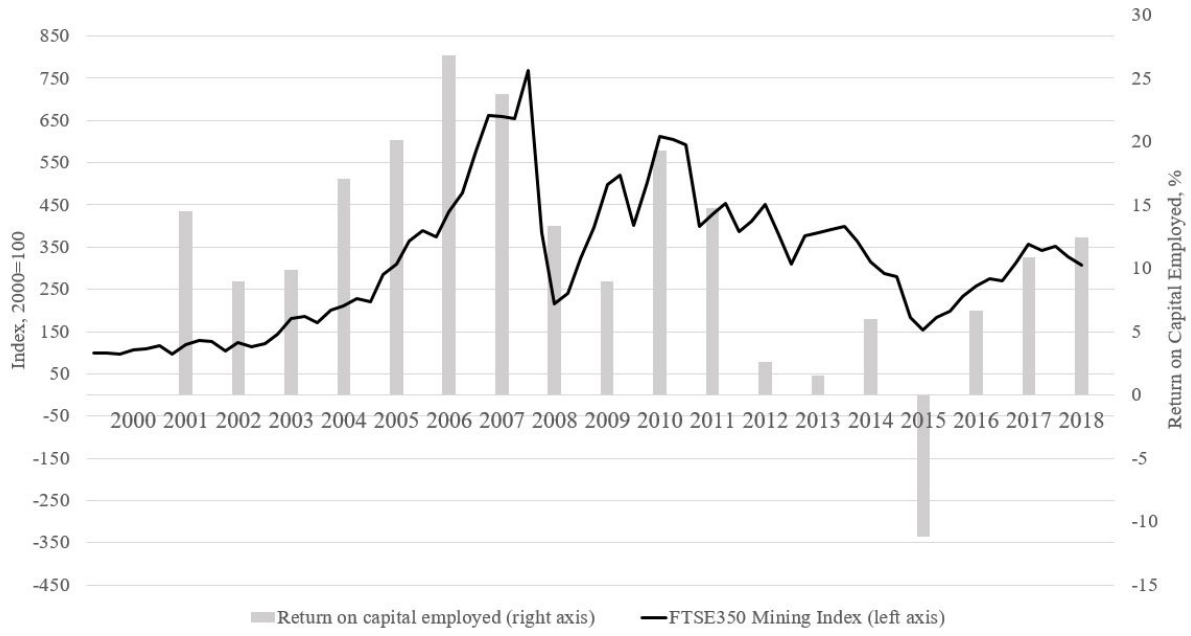
Subsequent events confounded these assumptions. Triggered by slowing Chinese growth and excess capacity created by over-investment during the boom, from 2012-2016 mineral prices slumped in near unison (Figure 2), (PWC, 2017). As of 2018, most minerals remained well below 2007/08 peaks, a notable exception being the battery metals like cobalt (Figure 2).

Figure 2: Index of commodity prices, 2011-2018 (Source: IMF) (2011=100)



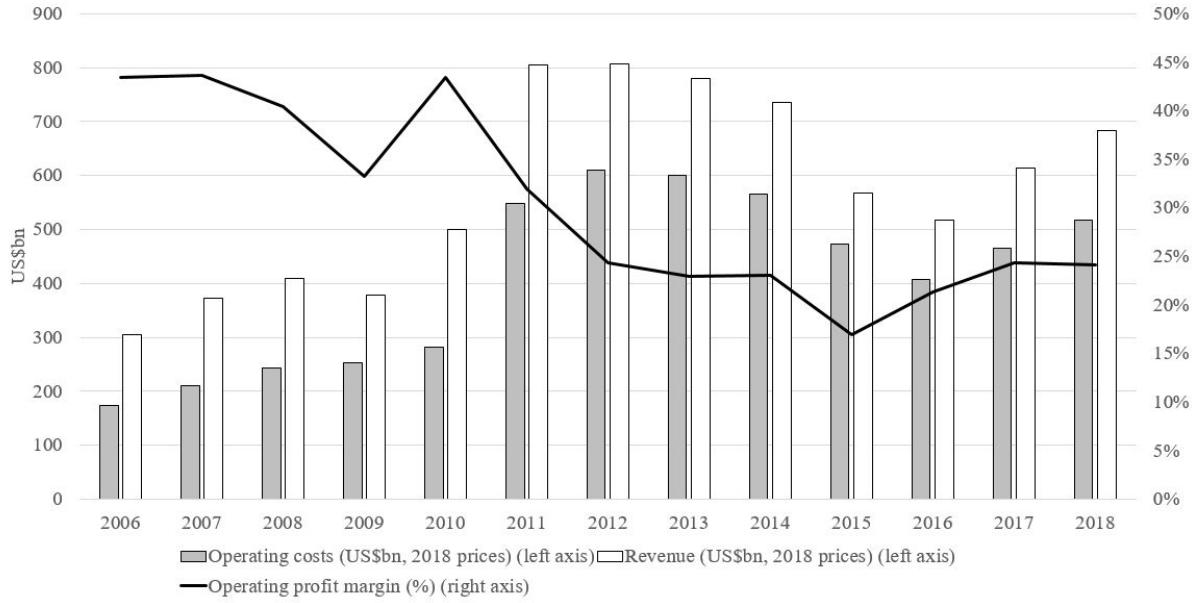
Major mining companies were in financial distress. They had (1) excess capacity; (2) highly leveraged balance sheets after increasingly financialised companies accumulated debt and distributed cash to shareholders and; (3) high operating costs as companies increased volume disregarding efficiency, accessed lower-quality ore bodies, deeper underground, in more remote and challenging locations (Humphreys, 2019b). Market valuations for major mining companies slumped as returns and investor optimism dwindled (Figure 3).

Figure 3: FTSE 350 Mining Index, 2000-2018 (Source: Bloomberg Data)



Post-2016 trends reflect these cost challenges. Revenues for PWCs top-40 largest listed mining companies are just below their 2012 peak, but margins remain considerably lower (Figure 4).

Figure 4: Revenue and profitability of to 40 largest mining companies, 2006-2018 (Source, PWC)



Corporate strategy has shifted from expansion into new frontiers to curbing costs and repairing balance sheets. Capital expenditure for PWCs top-40 dropped almost 60% 2012-2018, alongside near identical decreases in exploration expenditure and debt issuance globally (Table 1).

Table 1: Global mining industry investment, 2012-2018 (US$bn, 2018 prices)

	Exploration expenditure Global (PDAC/S&P)	Equity capital raised Global (PDAC/S&P)	Debt capital raised Global (PDAC/S&P)	Capital expenditure Top40 largest mining companies (PWC)
2012	23	37	110	140
2013	16	26	103	140
2014	11	40	70	110
2015	9	31	59	87
2016	7	29	35	51
2017	8	32	56	52
2018	10	21	45	57
% change 2012-2018	-58%	-45%	-59%	-59%

Efforts to improve productivity have generated interest in advancing automation and mechanisation (Durrant-Whyte et al., 2015; Deloitte, 2018) with implications for labour. Major mining companies already show signs of significant shifts in labour intensity (Humphreys, 2019a). Rio Tinto, Anglo American and BHP Billiton have reduced employee numbers 35-50% since 2012, even as asset values per employee have increased (Table 2).

Table 2: Employment and capital intensity of production in global diversified mining companies, 2008-2018 (Source: company reports)

	Rio Tinto		Anglo American		BHP Billiton	
	Employees	Asset value per employee ($m)	Employees	Asset value per employee ($m)	Employees	Asset value per employee ($m)
2008	105,733	0.85	105,000	0.47	41,732	1.82
2018	47,458	1.92	61,527	0.85	27,161	4.12
% change	-55%	126%	-41%	81%	-35%	126%

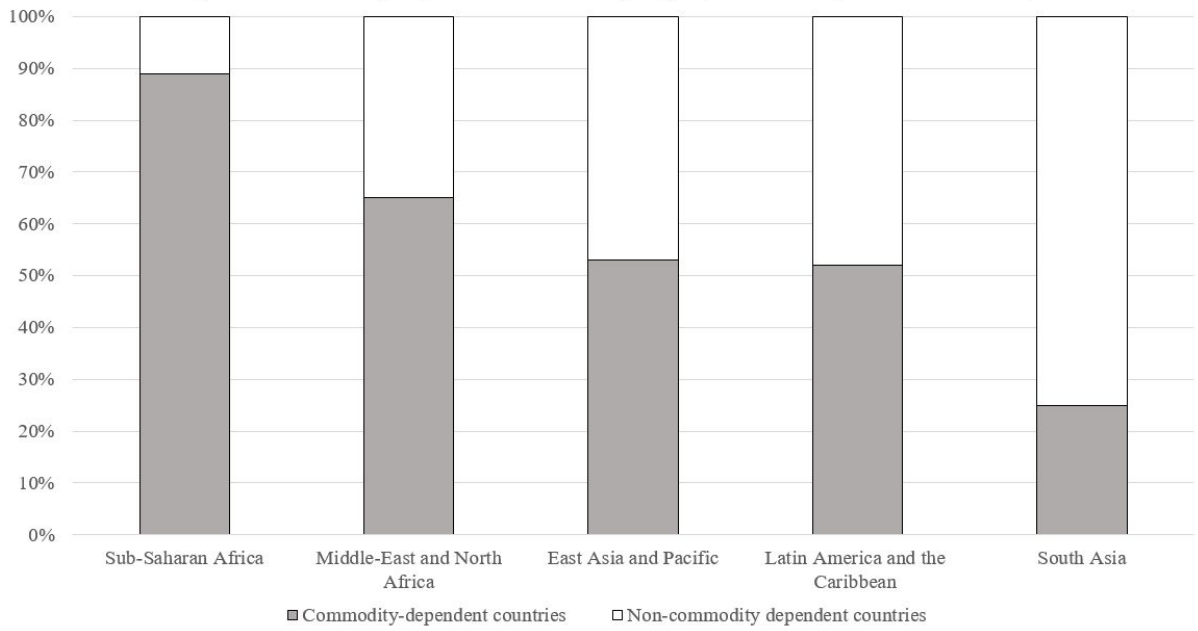
Declining profitability and investor conservativism has clear implications for mineral-dependent African countries. Contrary to common narratives, despite significant growth over recent decades Africa remains a relatively marginal presence in global mining, with important exceptions in some commodities (Table 3). The continents' annual share of global exploration expenditure over the past decade averages well below 20% of global totals (PDAC, 2019). Nonetheless, mining plays an outsize role in many African countries given low levels of economic diversification.

Table 3: Africa's share of global mineral production (Source: World Mining Data, 2018)

	Iron and ferro-alloys	Non-ferrous metals	Precious metals	Industrial minerals	Mineral fuels	Diamonds
	US$bn	US$bn	US$bn	US$bn	US$bn	Ct
Africa's share of global production (2016)	28%	6%	22%	3%	4%	43%
Excluding South Africa	4%	5%	14%	2%	3%	38%

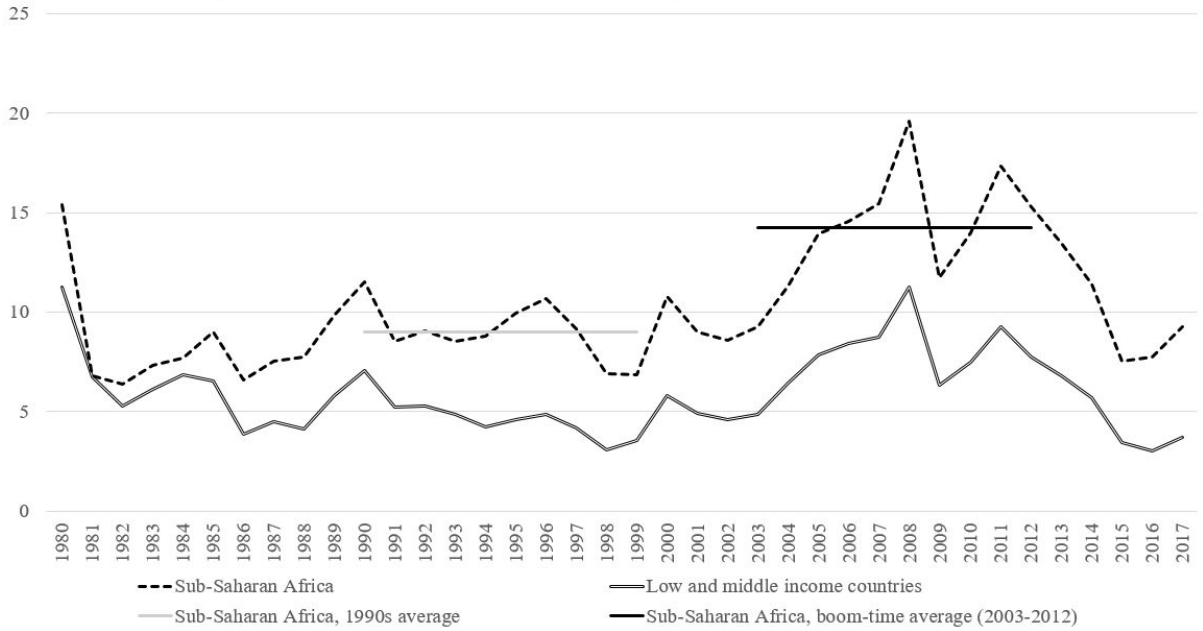
Despite the slump, for the 2013-2017 period, 90% of sub-Saharan African countries were commodity dependent (commodity exports > 60% total merchandise export value) (Figure 5), with 18 classified as mineral-commodity dependent (UNCTAD, 2019). Altered conditions in the mining industry have had significant macroeconomic consequences for many African countries' growth prospects. The IMF has observed the emergence of a dualistic pattern, with resource intensive African countries averaging 2-3% annual GDP growth since 2013 - meaning relatively stagnant per capita growth - compared to above 5% in non-resource intensive African countries (IMF, 2019).

Figure 5: Commodity-dependent countries by region, 2013-2017 (Source: UNCTAD)



This has fiscal consequences. Since the 1980s, African countries have had significantly larger resource rents (oil, gas, mineral and forest rents) relative to GDP than Lower Middle Income Countries averages, and these rents are additionally important to government revenues given thin tax bases. Resource rents grew spectacularly during the 2000s, averaging just under 15% of GDP compared to 8% during the 1990s, but have fallen back to 1990s levels. This has created severe fiscal strains as many governments increased public expenditure and borrowing in anticipation of a sustained supercycle (IMF, 2019).

Figure 6: Resource rents as a proportion of GDP, 1970-2017 (Source: World Bank)



As the following sections discuss, these changing economic dynamics challenge underlying assumptions framing scholarship on mining and development over the past decade. Important questions emerge. Firstly, how has the changing economic context altered the trajectory of mining frontiers across different countries and commodity groups? Leaving aside examples such as battery metals, the framing assumption of a 'scramble' –inexorable rapid expansion of frontiers to secure scarce resources– no longer appears true. Instead, a more complex picture is emerging. Major mining companies have adopted more conservative approaches, favouring lower-cost, higher-grade deposits in less 'risky' jurisdictions. China's growth is slowing and shifting to a less mineral-intensive economic model. What does heightened mining company investment caution and withdrawal mean for policy in commodity-dependent African states such as Zambia, the DRC and Guinea? How will this alter relations and bargaining between mining, states, communities and labour? How has the composition of mining frontiers changed? Will artisanal miners utilising informal labour and evading regulation, or emerging market companies with longer time horizons and fewer reputational concerns, be better placed to exploit high-risk deposits (Verbrugge & Geenen, 2018)?

3. New geographies of struggle

As mining has expanded in Africa, geographers have documented a concomitant boom in struggle from industry entering 'new' areas or new forms of mining in previously mined areas (e.g. shift from shaft to open pit mining). The ICMM documented an eight-fold rise in

conflict between 2002 and 2013 (ICMM 2015). This struggle occurs on multiple fronts. (1) Processes of dispossession which attend mining's arrival fuel struggle. Extractive operations' need for land and other resources (water) leads it to exclude others from these resources leading to livelihoods and resource access loss (Frederiksen and Himley forthcoming). Asset (land) transfers across many African countries have driven displacement of populations from homes and livelihoods (Abuya 2016, Akiwumi 2011). The industry's reputation for resettlement is dire. Livelihoods are rarely replaced alongside homes (e.g. Abuya, 2016). (2) Mining's expansion produces struggles over its environmental impacts, including pollution, which can lead to loss of access to (despoiled) land and water resources (Abuya 2016, Akabzaa 2009, Akiwumi 2011). (3) Rents generated by industry can trigger national and regional struggles. At the national level, rising 'resource nationalism' often plays out as a struggle over taxation levels (see Section 4). New flows of rents created newly powerful political actors (including regions) shifting political settlements spurred struggles over rent distribution (Akabzaa 2009, Bebbington et al. 2018, Lungu 2008, Tsuma 2010). (4) At the local level, resource flows from companies spur contest. Companies frequently operate 'enclave' models, reducing opportunities to spread benefits widely (Ferguson 2006, Negi 2011). Jobs, contracting and services tenders have all become foci for struggles over mining wealth. Communities frequently see themselves as underemployed, challenging extractive operations using capital-intensive, low-labour methods (Ofori & Ofori 2018). Companies often seek to manage these challenges through CSR programmes. Despite evidence that CSR programmes scope and resource have expanded, their development impacts are questioned and contested (Andrews 2019, Franks et al. 2014, Frederiksen 2018, Rajak 2011).

As the super cycle has ended, dynamics are changing. Some conflict associated with expansion may reduce; simply because mining companies are less active and not entering new areas. As revenues decline, communities' bargaining power over mining companies is reduced and their 'dependence' exposed (Verbrugge & Geenen 2018). Other forms of struggle may increase, however; for example, strikes around layoffs (see Section 5). Where operations continue, expectations of company behaviour have been raised and are not all falling - particularly in areas with histories of mining conflict (e.g. Ghana). Declining revenues see pressures on community investment budgets used to ameliorate conflict. An uneven picture is emerging. Spending is determined in part by local levels of agitation and acceptance and community expectations. For some industry observers, this has led to an increased focus on instrumentality of CSR (Thomson pers. comm.). Community development

is taking backseat to 'shared value', risk management and 'social performance' and 'measurable results'; while 'social license', remains, despite its faults (Frederiksen 2018).

These trends raise important questions for researchers. Primarily, what are these new geographies of struggle? How will levels of conflict over extractive industry change as, for example, mining retreats from or shrinks in areas?; Or new (BRICS) actors, often with less experience of managing extraction's impacts, enter to run 'poorer performing' mines? There are arguments for both increasing and decreasing levels of conflict. What are the long-term consequences of automation and retrenchment on political volatility? Further, how can mines generate benefits (and therefore legitimacy) for local communities when they are increasingly 'enclave', employing fewer people? How do changing discourses and pressures on CSR shape development outcomes? Does resurgent CSR instrumentality affect patronage and clientalism in areas of operation?

4. National minerals-based development

The 'supercycle' induced significant shifts in thinking about mining's role in economic development in many Africa countries, and the state's in governing mineral extraction. The rise of 'resource nationalism' broke a period of consensus around neoliberal models of mineral governance. This emphasised favourable conditions for FDI, minimising risks and increasing investors' resource rents (Campbell, 2013). These policies reflected dominant thinking in economics which saw mineral wealth's role in development negatively. The 'resource curse' frames mineral rents as economically distorting (Obi 2016, Siakwah 2017), catalysing social conflict and clientelism (Collier et al., 2011) and solved by 'good-governance' –institutions for minerals which minimise political discretion and state intervention. Dissatisfaction over the benefits of these policies, despite the supercycle, led many resource-rich governments to consider alternatives (Besada, 2016; Mkandawire, 2014). Reviews of mining legislation and contracts with a view to increasing state and/or community shares in mineral rents took place in multiple African countries including Tanzania, Ghana, Sierra Leone, South Africa, Liberia, the DRC, Zambia, and Zimbabwe, including higher taxes or royalties, indigenous ownership requirements, and domestic value addition or local content requirements (Humphreys, 2019a). Pejoratively termed 'resource nationalism' by critics, this represented a reframing of mining's role in national development (Childs, 2016; Andreasson, 2015). To counter previous enclave tendencies (e.g. Bush, 2010; Ferguson, 2006), new

policies used state intervention to increase domestic economic linkages with large-scale mining and boost domestic industrial capacity with requirements for local content upstream in the value chain and mineral beneficiation downstream (Morris et al, 2012; Jourdan, 2013). Such ideas were influential in African policy circles, the 2009 Africa Mining Vision (AU, 2009; Busia & Akong, 2017), and saw new legislation, local content policies and mining licence renegotiations across the continent (Ayisi, 2015; Ambe-Uva, 2017).

The end of the supercycle undermined policies premised on market dynamics that favour national governments controlling scarce mineral resources over mobile investors competing for projects. Key research took it for granted that the supercycle would continue for decades (e.g. Morris et al, 2012). The post-2012 slump has altered this equation. However, this has not led to 'resource nationalism's' retreat, far less a return to investor-friendly models. Instead, many African governments are pursuing a harder line against multinational mining companies. Notably, in recent years this has included protracted disputes between governments and multinational investors over efforts to increase rates of taxation on mining in Tanzania, Zambia and the DRC, even as mineral prices have remained low, exploration expenditure declined, and investors threatened to withdraw. This raises questions about how changing market dynamics intersect with the political economy of mining. The shift in economic policy towards mining was accompanied, in many instances, by changing political rhetoric about natural resources' contribution to development, and a raising of expectations around public expenditure, employment and opportunities for domestic business elites (See Frynas et al, 2017; Barlow, forthcoming). Alongside altering expectations, this can create new interest groups, patronage networks and political claims on the mining industry (Ibid, Hansen et al). How will multiplications of distributive claims and popular expectations for the mining industry's contribution to development affect political settlements and state-business relations during a slump period? Will changing economic conditions continue to entrench 'resource nationalism' or spur a return to more 'investor-friendly' governance modalities? Pursuing 'soft' local content policies, based on generous voluntary contributions from companies, in this context may prove challenging. Will mining companies previously willing to engage local content and beneficiation initiatives continue to do so or will cost-cutting and productivity imperatives spur capital-intensive, 'enclave' operating models? Historical experience shows that building industrial capabilities requires a long-term process of learning-by-doing (Khan, 2013). Can nascent domestic industries around mining survive continued instability and uncertainty? Smaller, domestic firms typically struggle to compete

with multinational firms on cost and quality and are more vulnerable to shocks. What forms of counter-cyclical industrial policy support might help protect progress made?

5. Labour and livelihoods

The supercycle expanded both formal and informal mining industries in many African countries with important consequences for labour and livelihoods. Struggles between mining companies and labour have expanded with industry growth and increased profits, with companies organising their corporate and operational structure to minimise (organised) labour's power, most notably through the use of subcontracting (Fraser and Lungu 2007, Negi, 2011, Verbrugge & Geenen 2018). In areas where deposits allow, rising prices have also made artisanal and small-scale mining (ASM) lucrative livelihood options, leading to booms in areas previously ignored (e.g. eastern DRC, see Verbrugge & Geenen 2018). Augmented local and national state resources have enabled expanded welfare programmes and state employment (Bebbington et al. 2018). However, while providing employment, the impact of mining booms on livelihoods is complex: In rural frontiers, this often disrupts existing agrarian livelihoods resources, in particular by competing for land and water, negative environmental externalities, and changing rural labour force composition (discussed in Section 3). In areas with ASM, this generated contestation between formal and informal mining over resource access, given the boom-time corporate priority of securing reserves for future growth (E.g. DRC, Tanzania, Ghana, see Hilson & Potter 2005, Verbrugge & Geenen 2018). The social impacts of mining are frequently contested. Changed land use can spur increased land prices and speculation. Areas witnessing both artisanal and formal booms saw influxes of migrant labour, for both employment in mining and the attendant service-sector around operations (Akiwumi 2011, Bryceson & Geenen 2016, Nyame et. al. 2009). This can strain existing natural resource-based livelihoods, infrastructure/social services, and create social tension. as communities link migration to crime and prostitution (Akiwumi 2011). More widely, increased competition for qualified mining talent has driven wage inflation in skilled job categories exacerbating already stark expat/local wage disparities sparking controversy.

Post-supercycle, this picture is changing. As focus shifts to cost control over expansion, emphasis increases on technological innovation and digital technologies to enable automation and mechanisation and to more efficiently manage resources and reduce costs (Durrant-

Whyte, 2015). With labour a key cost, labour intensive extraction techniques are under pressure, creating labour struggles. Redundancies and layoffs (or prospects thereof) from formal mining sector have political and economic ripple effects. For example, unemployment and constraints on government spending increases pressure on mines as a source of livelihoods and generator of employment (Hilson & Potter 2005). However, as the formal sector stalls on deposits that are no longer economic, more artisanal producers can occupy space left by the formal sector, absorbing its labour too (Verbrugge & Geenen 2018). The outlook for communities which grew up around now closed mining operations can be bleak. Historically, many communities have taken decades to recover. For example, South African ex-gold and coal mining towns suffer widespread unemployment and deprivation (Binns & Nel 2003, Siyongwana & Shabalala 2018). By contrast, company lay-offs can spur surges in artisanal mining as the unemployed miners resort to artisanal mining at sites already familiar to them (Yankson and Gough 2019). Particularly gold diggers have proliferated in mineral-rich mining sites, acting inadvertently as prospectors for large-scale mining interests. Artisanal miners, who benefitted from the gold price rise of the supercycle are likely to move to nearby towns, where they can invest their savings in diversified businesses and improved housing, thereby contributing to urbanization, also readily at hand should investment return (Bryceson & MacKinnon 2012, Jonsson & Bryceson 2017).

All this raises questions for future research. Automation and mechanisation leads to a smaller labour force, with higher skill requirements. Technology has often been used as a means to control labour, what now? How will these trends interact with expectations for employment creation? If the retreat of the formal sector sees a concomitant growth in the artisanal sector, how best to manage the social and environmental impacts of ASM? How do mining and other livelihoods (particularly, agrarian) interact in changing rural spaces? What do these changing livelihood opportunities mean for patterns of migration in extractive zones? How to best manage impacts of mine closure on local communities? Can deindustrialisation lead to economic innovation and alternative paths to development (Binns & Nel 2003)? The presence of erstwhile mining activity lingers, leaving political traces and shaping material and emotional geographies with it. For example, how are former mine sites remembered and what ‘ghosts’ might they leave behind (Edensor 2005)? What affectual and physical legacies are left behind in the material waste flows created by the mining process and what are their enduring implications for thinking about social justice (Pini et al 2010)?

6. Conclusions

In this paper we have explored recent research on the mining sector in Africa and reflected on this considering recent changes of the supercycle's end. The paper opened by exploring the changing geographies of investment and sectoral shifts in mining before examining the changes brought by the supercycle, its end, and what questions emerge for future research in three key areas of: struggle, national development strategies and labour and livelihoods. The last half decade has seen a fundamental shift in the possibilities of extraction-led development and the reconfiguring of governance of the extractive sector. New trends have emerged around corporate strategy and actors, with the increasing presence of BRICS-based companies with implications for state-business relations and models for mineral-based development strategies. Equally, the end of the supercycle has continued or intensified pre-existing trends towards mechanisation, automation, and enclavity while distributive pressures on companies by local communities and host nations increase. While, at the global level at least, it remains that Africa is not that important to mining, but mining is important to Africa; As scholars we need to more effectively grapple with the changes afoot in Africa since the end of the supercycle. The research directions suggested here offer initial directions to chart ways mining can offer more constructive pathways towards development in both boom and bust.

Acknowledgements

Bibliography

Abuya, W. O. (2016). Mining conflicts and Corporate Social Responsibility: Titanium mining in Kwale, Kenya. *The Extractive Industries and Society*, *3*(2), 485–493.

African Development Bank. (2007, February 15). **AfDB, World Bank Experts Reach Common Grounds on Extractive Industry**. Retrieved April 29, 2019, from https://www.afdb.org/en/news-and-events/oil-gas-and-mining-in-africa-2641/

African Union (2009) *African Mining Vision*. Addis Ababa: African Union

Akabzaa, T. (2009). Mining in Ghana: Implications for National Economic Development and Poverty Reduction. In *Mining in Africa* (pp. 25–65). London: Pluto Press.

Akiwumi, F. A. (2011). Global Incorporation and Local Conflict: Sierra Leonean Mining Regions. *Antipode*, 44(3), 581–600.

Ambe-Uva, T. (2017). Whither the state? Mining codes and mineral resource governance in Africa. Canadian Journal of African Studies/Revue canadienne des études africaines, 51(1), 81-101.

Andreasson, S. (2015). Varieties of resource nationalism in sub-Saharan Africa's energy and minerals markets. *The Extractive Industries and Society*, 2(2), 310-319.

Andrews, N. (2019). *Gold Mining and the Discourses of Corporate Social Responsibility in Ghana*. Cham: Palgrave Macmillan

Ayisi, M. K. (2015). The review of mining laws and the renegotiation of mining agreements in Africa: recent developments from Ghana. The Journal of World Investment & Trade, 16(3), 467-505.

Barlow, A (forthcoming) The Politics of the Temporary: Local Content in the East African Crude Oil Pipeline.

Bebbington, A. J., Abdulai, A.-G., Bebbington, D. H., Hinfelaar, M., & Sanborn, C. A. (2018). *Governing Extractive Industries* (pp. 1–290). Oxford: OUP.

Besada, H. G. (Ed.). (2016). *Governing natural resources for Africa's development*. London: Routledge

Binns, T., & Nel, E. (2009). The Village in a Game Park: Local Response to the Demise of Coal Mining in KwaZulu-Natal, South Africa. *Economic Geography*, *79*(1), 41–66.

Bridge, G., 2008. Global production networks and the extractive sector: governing resource-based development. Journal of Economic Geography, 8(3), pp.389-419.

Bryceson, D. F., & Geenen, S. (2016). Artisanal frontier mining of gold in Africa: Labour transformation in Tanzania and the Democratic Republic of Congo. *African Affairs*, *115*(459), 296–317.

Bush, R., 2010. Conclusion: mining, dispossession, and transformation in Africa. In Zambia, mining, and neoliberalism(pp. 237-268). Palgrave Macmillan, New York.

Busia, K., & Akong, C. (2017). The African mining vision: perspectives on mineral resource development in Africa. Journal of Sustainable Development Law and Policy (The), 8(1), 145-192.

Bryceson, D.F. and MacKinnon, D. (2012). 'Eureka and beyond: Mining's impact on African urbanisation'. *Journal of Contemporary African Studies* 30(4), 513-537.

Campbell, B. ed., 2013. *Modes of Governance and Revenue Flows in African Mining*. Springer.

Carmody, P. (2011). The New Scramble for Africa. Polity.

Carver, R. (2019). Resource sovereignty and accumulation in the blue economy: the case of seabed mining in Namibia. *Journal of Political Ecology*, *26*(1), 381-402.

Childs, J. (2016). Geography and resource nationalism: a critical review and reframing. The Extractive Industries and Society, 3(2), 539-546.

Childs, J. (2018). Extraction in four dimensions: Time, space and the emerging geo (-) politics of deep-sea mining. *Geopolitics*, 1-25.

Collier, P., Venables, A. J., & Venables, T. (Eds.). (2011). *Plundered nations?: Successes and failures in natural resource extraction*. Palgrave Macmillan.

Collier, P. (2015). *The end of the super-cycle: the time for taking stock of what went wrong*. Retrieved from http://webtv.un.org/watch/the-end-of-the-super-cycle-the-time-for-taking-stock-of-what-went-wrong/4080666618001/?term=

Cornwall 2019 https://www.sciencemag.org/news/2019/09/mountains-hidden-deep-sea-are-biological-hot-spots-will-mining-ruin-them

Deloitte (2018) *The Future of Mining in Africa: Navigating a Revolution*. Johannesburg: Deloitte

Durrant-Whyte, H, Geraghty, R Pujol, F and Sellschop, R (2015) How digital innovation can improve mining productivity. *Mckinsey Metals & Mining November 2015*

Edensor, T. (2005). The ghosts of industrial ruins: ordering and disordering memory in excessive space. *Environment and planning d: society and space*, *23*(6), 829-849.

Ferguson, J. (2006). *Global shadows: Africa in the neoliberal world order* (pp. x–257). Durham N.C.; London: Duke University Press.

Fitch (2019) *Global Mining Summary: October 2019*. http://www.fitchsolutions.com/sites/default/files/white-papers/Global%20Summary%20Mining%2021st%20October%202019.pdf

Franks, D. M., Davis, R., Bebbington, A. J., Ali, S. H., Kemp, D., & Scurrah, M. (2014). Conflict translates environmental and social risk into business costs. *Proceedings of the National Academy of Sciences of the United States of America*, *111*(21), 7576–7581. http://doi.org/10.1073/pnas.1405135111

Fraser, A., & Lungu, J. (2007). *For Whom the Windfalls; Winners & Loser in the Privatisation of Zambia's Copper Mines*. Lusaka: Civil Society Trade Network of Zambia & Catholic Centre for Justice, Development and Peace.

Frederiksen, T. (2018). Corporate social responsibility, risk and development in the mining industry. *Resources Policy*, *59*, 495–505.

Frederiksen and Himley (forthcoming) Tactics of dispossession. *Transactions of the Institute of British Geographers*

Frynas, J. G., Wood, G., & Hinks, T. (2017). The resource curse without natural resources: Expectations of resource booms and their impact. *African Affairs*, *116*(463), 233-260.

Hansen, M. W., Buur, L., Mette Kjær, A., & Therkildsen, O. (2016, May). The economics and politics of local content in African extractives: lessons from Tanzania, Uganda and Mozambique. *Forum for Development Studies* (Vol. 43, No. 2, pp. 201-228).

Hayes, K. (2008) 'Artisanal and Smalll-scale mining and livelihoods in Africa'. Amsterdam: Common Fund for Commodities

Hilson, G., & Potter, C. (2005). Structural adjustment and subsistence industry: artisanal gold mining in Ghana. *Development and Change*, *36*(1), 103–131.

Humphreys, D., 2015. *The remaking of the mining industry*. Basingstoke: Palgrave Macmillan.

Humphreys, D., 2019a. Mining productivity and the fourth industrial revolution. *Mineral Economics*, pp.1-11.

Humphreys, D., 2019b. The mining industry after the boom. *Mineral Economics*, *32*(2), pp.145-151.

ICMM. (2015). *Research on company–community conflict* (pp. 1–8). London.

IMF (2019) *Regional Economic Outlook: Sub Saharan Africa: Recovery Amid Elevated Uncertainty: April 2019. Washington: IMF*

IEA (2019) *World Energy Outlook 2019.* Paris: IEA

Jonsson, J.B. & Bryceson, D. (2017) 'Beyond the artisanal mining site: Migration, housing capital accumulation and indirect urbanization in Tanzania'. *Journal of East African Studies* 11(1). 3-23.

Jourdan, P. (2013). Toward a resource-based African industrialization strategy. In *The Industrial Policy Revolution II*(pp. 364-385). Palgrave Macmillan, London.

Kamete, A. (2012). Of prosperity, ghost towns and havens: Mining and urbanisation in Zimbabwe. 30(4), *Journal of Contemporary African Studies* 30(4), 589-610.

Khan, M. H. (2013). Technology policies and learning with imperfect governance. In The Industrial Policy Revolution I (pp. 79-115). Palgrave Macmillan, London.

Lungu, J. (2008). Copper Mining Agreements in Zambia: Renegotiation or Law Reform? *Review of African Political Economy*, *35*(3), 403–415.

Mkandawire, T., 2014. Can Africa turn from recovery to Development?. *Current History*, *113*(763), pp.171-177.

Morris, M., Kaplinsky, R. and Kaplan, D., 2012. "One thing leads to another"—Commodities, linkages and industrial development. *Resources Policy*, *37*(4), pp.408-416.

Mususa, P. (2012) 'Mining, welfare and urbanisation: The wavering urban character of Zambia's urban Copperbelt'. *Journal of Contemporary African Studies* 30(4), 571-588.

Negi, R. (2011). The micropolitics of mining and development in Zambia: Insights from the Northwestern Province. *African Studies Quarterly*, *12*(2), 27–44.

Nyame, F. K., Andrew Grant, J., & Yakovleva, N. (2009). Perspectives on migration patterns in Ghana's mining industry. *Resources Policy*, *34*(1-2), 6–11.

Obi, C. (2016). Understanding the Resource Curse Effect: Instability and Violent Conflict in Africa. *Minding the Gap: African Conflict Management in a Time of Change*, 91-102.

Ofori, J. J. Y., & Ofori, D. R. (2018). Earning a social license to operate: Perspectives of mining communities in Ghana. *The Extractive Industries and Society*, 1–11. http://doi.org/10.1016/j.exis.2018.11.005

PDAC, *State of Mineral Finance 2019: At the Crossroads*. Toronto

Pini, B., Mayes, R., & McDonald, P. (2010). The emotional geography of a mine closure: a study of the Ravensthorpe nickel mine in Western Australia. *Social & Cultural Geography*, *11*(6), 559-574.

PWC (2017) *PWC Mine 2017: Stop, Think… Act*. Melbourne

Rajak, D. (2011). *In Good Company.* Stanford: Stanford University Press.

Siakwah, P. (2017). Political economy of the resource curse in Africa revisited: the curse as a product and a function of globalised hydrocarbon assemblage. *Development and Society*, *46*(1), 83.

Siyongwana, P. Q., & Shabalala, A. (2018). The socio-economic impacts of mine closure on local communities: evidence from Mpumalanga Province in South Africa. *GeoJournal*, *84*(2), 367–380.

Taylor, I., 2014. *Africa rising?: BRICS-Diversifying dependency*. Boydell & Brewer Ltd.

Tsuma, W. (2010). *Gold Mining in Ghana*. LIT Verlag Münster.

UNCTAD (2019) *State of Commodity Dependence.* Geneva

Verbrugge, B., & Geenen, S. (2018). The gold commodity frontier: A fresh perspective on change and diversity in the global gold mining economy. *The Extractive Industries and Society*, 1–0.

Yankson, P. & Gough, K. (2019) 'Gold in Ghana: The effects of change in large-scale mining on artisanal and small-scale mining', *The Extractive Industries and Society* 6: 120-12.