Conclusion: Extractive Orientations

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Invited Concluding Chapter to

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Is extraction exhausted? Has the potential of 'extraction', as a diagnostic tool or speculative concept, been all mined out? Research on extraction has proliferated over the past decade, diversifying its application and expanding the concept's meaning. Planetary infrastructure and finance. Artificial intelligence and the algorithmic processing of digital data. Speculative plays on urban real estate. Indigenous critiques of extractive epistemologies and research methods. Across these and other thematic areas of inquiry, extraction has slipped its historic moorings to the primary sector and no longer specifies a (niche) concern with the material processes and geographies of mining. Extraction has become a capacious critique of control, exploitation, and exposure to violence and a synonym, even, for capitalism, colonialism, or modernity. What's at stake in this 'journey' of extraction, from sectoral specification to an organizing concept?

My argument in this concluding chapter moves in two directions.[1] Extraction's proliferation risks hollowing it out: applied to everything it becomes so encompassing that it loses the capacity to specify and differentiate. Yet a strategy of simultaneously *extensifying* and *intensifying* the notion of extraction can enhance its analytical utility. Extensification here references the significant speculative potential of concepts like extraction and extractivism. It is an orientation towards an expansive mode of enquiry – already well underway - that makes connections across difference and relies, in part, on extraction's affective charge for political mobilisation. More specifically, I argue that much of extraction's capacity to connect, galvanise and enrol is linked to the 'ex' of extraction – i.e., to the moral and ethical claims associated with removal and involuntary displacement. Intensification, on the other hand, is an orientation towards the diagnostic value of extraction in relation to specificities of primary sector economies. Extraction's significant potential in this intensive mode can be

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harnessed, I argue, by focusing less on the 'ex' and more in the 'tract' – i.e., by paying attention to the techno-economic practices and socio-material configurations through which extraction attains its grip on the world, and how primary sector economies take form and endure. I illustrate this briefly by outlining four modes of economy that can take hold around (the potential for) physical displacement.

Overall, the chapter affirms the multiple possibilities of extraction as a productive concept and its capacity to do different things. It acknowledges the speculative possibilities of thinking with the 'ex' of extraction for connecting across difference. Unpacking the 'tract' part of the equation, however, can diagnose the geographical, material, and social specificities of primary sector processes, ensuring these are not obscured by speculative moves to identify connections across space and time. Together these two orientations – extensive and intensive, simultaneous yet counter-posed – allow the concept of extraction to emerge and evolve, sustaining its generative capacity for thinking and doing.

Extraction: classic editions

By convention, references to extraction perform a two-step parsing of economy: extraction distinguishes the primary sector from manufacturing and services; and then, within the primary sector, it separates extractive activities from those of agriculture. Deployed this way, extraction still names an enormous empirical diversity of practices and materials with important differences in labour regimes, forms of economic organisation, political context, and ecological implications. Yet, amid this diversity of materials, practices and implications, extraction remains a useful category because it names a key commonality: removal and mobilisation. Classically, then, extraction refers to materials and bodies that have been made to move – an enforced geography of materials and bodies moving across space (vertically and horizontally) that is, at the same time, a destructive-creative process of remaking socioecological and spatial relations. Foremost, then, extraction references flow and involuntary displacement – a metabolic process of material mobilisation understood, for the most part, from the perspective of the tributary locale. In commodity chain analysis, for example, extraction occupies the furthest left-hand station in a chain of material movement and transformation that stretches rightwards across the page. Extraction here is

the originating point for a linear flow that supplies manufacturers with energy and raw materials which, transformed by labour into commodities for exchange, then become decommodified in use (or recommodified as post-consumer wastes via recovery and recycling). Similarly, classic accounts of the Anthropocene's Great Acceleration (Steffen et al. 2015) reference extraction as an anthropogenic planetary flux – a lithospheric displacement of fossil fuels, sulphide ores, mercury, phosphates, uranium, or rare earths (for example) that has surged in scale over time to now assume geological significance.

Classic accounts of extraction do more than simply reference flow, however. Work on extraction in political ecology (and related fields) adopts the same primary sector focus as technical and liberal accounts of extraction (as material mobilisation) but departs from their largely apolitical analysis. Adopting a critical perspective attuned to revealing and challenging inequalities in economic and political power, this work embeds material displacement within historical geographies of colonialism and capitalism to show how extractive primary sector activities are "patterned in a particular way"– i.e., how they dissolve and reconstitute forms of social and territorial (dis)order (Ye et al. 2020, 156; Rasmussen and Lund 2018; Postar et al. 2023). Contributors to this book show how these forms of order are predicated on exclusions and inclusions that reproduce violent exploitative processes on the ground. They unpack extraction into a series of binaries, revealing how they are constitutive of extraction rather than incidental or unfortunate side effects. They document how extraction's uneven power geometries are being produced, experienced and contested, even as resource-owning states and international investors (highly concentrated forms of economic power with the capacity to control exclusive access rights) champion the primary sector - without a hint of irony – as a means to deliver 'inclusive growth' (Postar et al. 2023).

Understanding how binary geographies of "inclusion and exclusion are…part and parcel of…remaking uneven development" (Werner 2016) in the context of extraction is an urgent task. The social and spatial ordering effects consequent to extraction are central to the experiences and fantasies of extractivism, a mode of accumulation and an ideology of development premised on the large-scale (mono)production of natural resources and their export in a largely unprocessed state (Acosta 2013; Gómez-Barris 2017). A growing body of work on green colonialism and climate extractivism shows how the capacity of

developmentalism to absorb critique and promote extractivism (yet again) should not be under-estimated (Fjellheim 2023; Zografos and Robbins 2022; Voskoboynik and Andreucci 2022). Decarbonisation strategies premised on reducing fossil fuel consumption are driving horizontal (i.e. land-hungry) energy regimes that valorise, claim and convert land for its renewable energy generation potential; at the same time, decarbonisation is mineral intensive, accelerating extraction of many (non-fuel) materials such as copper, nickel, lithium and rare earths (Bazilian 2018; Huber and McCarthy 2017; Dunlap 2020).

Extractivism, then, is arguably stronger now than ever, whether in the guise of 'pro-poor' growth, neo-extractivist models of 'inclusive development' that incorporate participatory processes and elements of re-distribution, or climate change mitigation. Each modality of extractivism rests on specific exclusions and inclusions, yet they tend to amplify one another to reproduce and consolidate extractivism as a system of domination, violence, and dispossession. Isla's (2022) notion of greening as the 'highest stage' of extractivism captures the interlocking and mutually reinforcing character of exclusion, manifesting as the "massive expropriation of territories, depredation and contamination of the soil, and dispossession of the workers, through the monetization of nature that requires the devaluing of all other forms of social existence, transforming skills into deficiencies, commons into resources, knowledge into ignorance, autonomy into dependency, and men and women into commodified labour-power whose needs require the mediation of the markets." Critical social theory has long acknowledged extraction's intimate connection with other forces of domination. Brechin's (1999) 'pyramid of mining', for example, expresses the durable power geometries of extraction, drawing its inspiration from Mumford's (1934) description of the mechanisms of wealth and power that link mining, mechanisation, metallurgy, militarism and moneymaking. At the apex of the pyramid is mining as this extractive activity, writes Brechin (1999, 19), "retains a seminal and dominant role over the other four activities…from that most fundamental of industries issue the others, and from the union of all five, joined in a crystalline lattice of enduring stability and hierarchical organisation, the pyramid derives its accelerating power to transform both human societies and the organic world."

The concept of *extractivismo* - originating in analyses of neoliberal policies promoting raw material production and export from Latin America and contextualising them by reference to centuries of land appropriation and dependent forms of development – captures the

primary sector's interdependence with (and reproduction of) wider forms of social and territorial order (Gudynas 2018; Alimonda 2012; Domínguez Martín 2021). It links extraction-as-material mobilisation to primitive accumulation, a mode of appropriation synonymous with colonial plunder and producing forms of territorial order and racial stratification that transcend extraction as a specific sector or economic activity. Extensive analyses of *neoextractivismo* in Latin America highlight the continuity of raw material extraction and primary exports under left-Indigenous governments, but also a "deepening of the dynamic of dispossession… (around) land, resources, and territories, principally by large corporations, in multiscalar alliances with different governments" (Svampa 2015, 66). It also relates contemporary territorial struggles to "the exclusions and violence created by sedimented histories of colonial extractivism," while showing how extractivism can also generate novel territorialities, institutions and identities as existing inclusions and exclusions are recombined and/or reinterpreted (Postar et al. 2023, 11; Rasmussen and Lund 2018; Anthias 2018). In sum, classic work on extraction centres on material displacement – a geographical flux or 'dragging out' (Latin: *extrahere*) of materials from one location to another - with critical analyses showing how displacement is, at the same time, an assembling and disassembling of social and territorial order that exceeds the sites of extraction.

EX-Tract: harnessing the speculative potential of extraction

The capacity of extraction/extractivism to index geographical displacement and accompanying processes of spatial and social ordering means increasingly these terms function as general signifiers. They reference the kind of exploitative relations and asymmetric structures constituted through difference documented by many of the chapters in this book, but gesture towards a wider horizon beyond the primary sector. No longer tethered to its conventional role as a sectoral identifier, extraction is experiencing a form of 'conceptual creep' to reference wider organisational logics, sites of violence and modalities of power – an "ever more complex web of extractivisms" (Chagnon et al. 2021, 177). The capacity for this expansion pivots, to a large degree, on the 'ex' of extraction – the asymmetric practices and geographies of appropriation, removal, and transplantation. The 'ex' connects to ontologies of separation (for which the separability of minerals from their

ecological and socio-historical context offers a grounding abstraction); to experiences of severance as violence and (dis)possession (directed at lands, bodies and knowledges); to processes of valorisation/devalorisation that occur through the making and unmaking of external relations; and to political asymmetries and epistemological hierarchies.

This 'ex' of extraction has significant speculative potential as it enables connections to be forged across substantial differences (materials, bodies, territories, temporalities), linking displacement of materials to other flows involved in colonial and capitalist economies and, in the process, stripping extraction of some of its liberal conceptual baggage. For example, displacement emerges from this process as more than a physical transfer of materials and, instead, as an appropriation and transfer of value (a process of seizing and plunder, in a continuation of colonial looting) that, at the same time, also allocates exposure to harm and vulnerability. Associated initially with A.N. Whitehead (1929), and more recently revived in fields like human geography, speculative potential refers to "a style of thinking that prioritises an openness to what thought might become, and which therefore reconfigures empirical problems beyond what seems given in an immediate experience" (Williams and Keating 2022, 2). It is, in Whitehead's useful phrase, about "mak(ing) thought creative of the future" (ibid.). This style of conceptual work considers how concepts and abstractions condition thought and practice, while also recognising the possibilities of their "relative emptiness (which allows them to assume different meanings and to relate to many other, different, and conflicting terms)" (Ophir, 2018). To think about extraction through the lens of speculative potential, then, is to recognise how concepts emerge through material processes (so that their meaning and utility evolves through unconventional application) and, more broadly, that concepts like extraction can do several different things.

The speculative possibilities for extrapolating from specific experiences of the extractive sector to economies at large has been recognised for a while. Ferguson's (2006, 210) work on the governance of mineral extraction in Africa, for example, considers how the spatialisations of order and disorder associated with extraction might presage the emergence of broader patterns of political-economic governance. His account of the socially-thin relations around offshore oil in Angola – in comparison to the historically thick social relations (extending to housing, education and social service provision) associated with the Zambian Copperbelt – led him to speculate on a mode of "extractive neoliberalism"

that is “oil-like” in its patchwork territoriality, reliance on private contractors, and abdication of responsibility by (foreign) private capital for the public realm (see also Appel 2012a).

Recent work with extraction moves further in this direction, positioning extraction as a systemic or structural logic working across multiple domains conventionally considered as separate. Dunlap and Jakobsen’s (2020, 1) notion of ‘total extractivism’ is arguably its imaginative apogee, a brute scaling of extraction into a “totalizing imperative and tension” driving the global capitalist economy and “at the heart of the present catastrophic trajectory.” Here extractivism works to connect a suite a materials and technologies – minerals, hydrocarbons, intensive agriculture, renewable energy, digital technologies – that are often positioned discretely (and frequently in opposition) through analytical lens like sustainability or energy transition. It speculates on their intersections, amalgamation and their aggregate colonising, converting and consuming effects, making it possible to reframe development as a giant alimentary/colonic process of material displacement. The authors harness the speculative potential of extractivism to create a dissident agenda, located outside the technocratic registers through which global environmental change is normally narrated, which frames techno-capitalist development as “progress of the Worldeater” (7).

A similar if more specific move is at work in Mezzadra and Neilson (2015, 1)’s elevation of extraction as a diagnostic tool for “really tak(ing) stock of the underlying transformations of capitalism” in a way that can push beyond ‘neoliberalism’ as explanation. Here extraction - together with finance and logistics – are no longer sectors or sites, but pervasive and defining logics. The effect is to extend extraction outwards as an ‘operation of capital,’ a logic manifest in spaces other than raw material production such as the subprime mortgage crisis in the US and the extraction of value from *favelas* in Brazil. Ye et al. (2020, 163) similarly expand extractivism from an economic niche to a system-wide phenomenon, arguing that “extractivism has travelled from de-regulated spaces at the margins…to become a main feature of global capitalism as a whole (so that) more and more economic sectors are (re-)constructed in extractivist ways.” They highlight the appropriation and draining of value produced elsewhere, oligopolistic networks that centralize wealth, and the control of circulatory flows rather than ownership of production.

Equally expansive approaches to extraction can be found in decolonial feminist scholarship, and in work on the aesthetics of the Anthropocene, where extraction names a field of racialised and gendered power relations that works by categorising minerals, bodies, and multiple other forms of matter as active or inert (Murrey and Mollett 2023; Yusoff 2019). Extraction here references categorical distributions of matter (i.e. ontological inclusions and exclusions), together with their systemic effects that materialise as forms of "embodied-landed violence" reaching well "beyond subsoil resources, contaminated environments and displaced communities" (Murrey and Mollett 2023). Yusoff's notion of an "extractive grammar" – "inhuman, property, value, possession…categories (that) move across territory, relation, and flesh" (2019, 4) - articulates this expansive understanding of extraction as a system of racialised signification. Extraction here is generalised and systematised: not only "the negation of racialised peoples and the geographies they inhabit" at sites of material displacement, it is also "more fundamentally…a symbolic and systemic structure that reduces the worth of racialised peoples and geographies to the marketable value of an extractable resource" (Çaylı 2021, 1392). For Yusoff, for example, extraction is both the moment of colonial racial categorisation (positioning extraction in a political-historical relationship to racial difference) *and* the occlusion of racialised difference that is inherent to the '*Anthro*pocene.'

The capacity of extraction and extractivism for forging conceptual connections has encouraged speculation on their potential as 'organizing concepts' for the critical social sciences. Chagnon et al. (2022, 762), for example, consider how extractivism references "socio-ecologically destructive processes of subjugation, depletion, and non-reciprocal relations, occurring at all levels of practice" in ways that make it an "effective tool for sharpening critiques of what constitutes the 'sustainable' in development practices, while simultaneously opening the possibility for transformational practices, policies, and designs". Significantly, it is the generality of the 'ex' – a lack of diagnostic specificity about techniques of separation and removal – that is key to extraction's speculative potential as it affords an openness and creative possibility, allowing extraction to proliferate semantically, producing what Ophir (2018) describes as "dense semantic intersections that connect (it) with many other terms". When mobilised for its speculative potential, the concept of extraction "construct(s) plural rather than singular narratives, recuperate(s) multiple rather than

complete forms of knowledge, value(s) holding open what is at stake and can be brought into purview and, in doing so, intensif(ies) alternative possibilities" (Williams and Keating 2022, 1-2). It points - as highlighted by chapters in this book - to the possibility of thinking outside binaries of inclusion/exclusion and developing alternative registers to those of action/resistance.

Ex-TRACT: diagnosing how raw material economies take hold

An alternative orientation to extraction, I suggest, is to re-focus on the specificities of primary sector economies. The impulse here is to double-down on the diagnostic capacity of extraction – its potential for parsing difference among modes of production and for identifying the particularities, contradictions, and evolving practices of raw material extraction. The value of extraction here, I suggest, lies not so much in the 'ex' but in the 'tract' – the techno-economic practices and socio-material orders through which extraction (as a primary sector activity centred on the mobilisation of materials) attains its grip on the world. The focus is less on the geographical mobilisation of materials and the spatial transfer of value, and more on the inclusions and exclusions through which extractive, primary sector activities come to take hold and endure. Focusing on the 'tract' of extraction highlights material appropriation and mobilisation as a project – a techno-economic and material 'confrontation' with space and nature as both an obstacle and source of wealth and power – and how these are made conducive to accumulation and/or control (Banoub et al. 2021; Bustos-Gallardo et al. 2021; Moore 2015; Rasmussen and Lund 2018). Tsing's (2005; 2012) account of resource-making through "patches" - and her master-narratives of capitalist development occurring through "friction" and "zones of awkward engagement" - point the way here. They suggest how materials cannot be merely drawn from locations but must be "coaxed or coerced," and how scalable capital need always articulate with the specificity of each extraction site and with non-scalable geological and biological systems. In other words, a "messy engagement with difference is the assumed starting point" (Appel 2012b, 697).

Rather than generalising extraction to establish connections across domains of difference, the impulse here is to focus inward on the extractive sector (classically understood) to

understand its specificity and disclose internal differences. Exploring the tractability of raw material extraction and attending to difference (rather than generalising across it) has the effective of multiplying extraction: it treats extraction not as a unitary logic or imperative but as grounded projects centred on claiming, severing and mobilising materials that, in practice, amalgamate and combine several forms of economy, each with different consequences for socio-political ordering. Significantly, these plural economies of extraction are not all of a piece – they differ, for example, in their economic objectives (ownership, production), economic benchmarks (cash flow, capital gain) and material geographies - suggesting how extractive projects can be subject to inter-capitalist tensions (and how these differences might work as cracks, offering ways to loosen the grip of extractive projects outside the binary of 'resistance'). I briefly outline here four modes of economy around extraction. They are not intended to be comprehensive and are necessarily stylised accounts.

Treasure

'Treasure' here articulates the classical political economy understanding that resources are 'gifts of nature,' materials for which the work of formation occurs prior to human labour and which can be captured and claimed. Gold nuggets, oil accumulations and coal seams all owe their existence, as physical concentrations of materials, to the deep-time processes of astrophysics (in the case of metals) or geological time in the case of oil and coal. They serve, therefore, as an economic 'outside' so that extraction (as treasure taking) is characterized by 'production without reproduction' – "the resources needed are not reproduced – neither within the enterprise that consumes them nor obtained, through market exchange, from other enterprises that produced them" (Ye et al. 2020, 157). Subject to epistemological work to render them legible and actionable, resources need only to be captured and removed for their value to be appropriated – something the popular idea of 'bounty' or 'treasure' readily conveys. Capturing is a primary form of economy in relation to extraction: an act of appropriation directed towards materials that have social utility and value through exchange. Rarely is this a wholesale taking of materials from the earth's crust: more often it involves selective appropriation, a process of identifying, sorting and sifting the most

valuable forms (e.g. concentrated minerals, productive land). We can think of these concentrations of materials as a form of time-space appropriation, a condensation of deep time and wide spatial horizons into a specific material form (Hornborg 2006). This is perhaps clearest with something like oil which, as the rendered bodies of plants and animals, concentrates into individual oil fields the solar energy of photosynthesis from across the space of continents and the time of millions of years. Similarly in the case of land, productivity also relates to concentrations and distributions (of nutrients, organic matter, water etc.) although these are often, at least in part, the work of previous generations.

Extraction then is premised on opportunities for primitive accumulation, for laying claim to sources of value in whose production the capitalist has not invested (the fruits of other people's – or nature's - labour) and for enforcing that claim over claims of others. It is simultaneously a profound act of inclusion – of binding the extra-economic (the constitutive outside of the economy) into the economic process – while also being violently exclusionary since it rests on determining (via a claim to property) who has rights to remove materials (and who does not), what kinds of materials can be extracted, whose knowledge systems frame the space-times through which extraction emerges as a possibility, and who must be denied access, expelled or dispossessed for extraction to take place. Chapters in this book illustrate empirically these forms of exclusion underpinning extraction and how they are simultaneously practical, epistemological and ontological. Indigenous and decolonial scholarship shows how extractive activities rely on the exclusion, marginalisation or miscommunication of knowledge systems that engage with the more-than-human in relational ways (Fjellheim 2023; Cameron 2015; Çaylı 2021). It unpicks the way recognition and the liberal politics of inclusion can work to legitimise extraction, operating as a form of 'inclusionary control' that intensifies dispossession (Coulthard, 2014; Tornel, 2023).

Extraction as primitive accumulation takes place in multiple different technological forms. Artisanal gold panning and offshore oil production both rest on appropriation, but show how exclusion works through property but it is not limited to it: technological requirements can create high barriers to entry around, for example, the specialised equipment and/or capital costs necessary for project development, excluding all but the world's largest firms which are able to access global sources of finance (undermining efforts to 'indigenize'

extraction by promoting domestic and 'national' extractive capital). And, because property is always embedded in existing social formations, there are formal and customary exclusions – as well as manipulations of property law by the powerful - that prevent marginalised peoples from claiming land, exclude them from consultations on land use and reproduce relations of domination by, for example, disregarding non-Western knowledge or displacing root causes of conflict (Fjellheim 2023). Physical violence, meted out against other land users and against other claimants, frequently involves factions of the state. In short, the exclusions associated with primitive accumulation revolve around property but are not limited to it.

Rent

The second distinctive opportunity extraction affords, as a mode of economy, is the opportunity for rent. Qualitative differences in resource quality (ease of accessibility, grade, purity, etc.), and in social and environmental protections, mean some sites have lower extraction costs than others. These production costs are locally embedded, to the extent they depend on the quality of the resource and on socio-politically negotiated settlements in relation to social and environmental protections. Yet prices for many extracted commodities are international as they reflect the costs of the highest-cost producer whose production fulfils demand. Because prices arise 'globally' but production costs arise 'locally' there can be big differences in profitability between the highest and lowest cost producers (Bomsel 1992). Very large rents are possible in oil and gas, for example, as by far the largest driver of (Ricardian) rent is the quality of the resource: once oil or gas wells are in production, labour productivity in oil and gas extraction is more or less the same around the world. Rents tend to be lower overall in mining than in oil and gas, as significant variations in labour productivity in mining means levels of differential rent are related to both quality of resource and productivity of labour (Bomsel 1992).

The opportunity for differential rent gives rise to competition to control the best sites. A good deal of the geographical strategy adopted by large resource extraction firms is about precisely this dynamic – seeking to monopolise ownership of (or access to) resource patches that afford the greatest differential rent. This materialises in large international mining firms, for example, as a strategy of occupying the 'bottom quartile' of projects worldwide –

i.e., the 25% of all operating mines that have the lowest production costs. Focusing on rent highlights the capacity of landlords – "the person who by virtue of title to a portion of the globe has become the proprietor of these natural objects" – to lay claim to some of these differential rents (Marx 1894). A focus on distribution (between landlord and capitalist) shifts attention from differential rent based on resource quality to a Marxian rent analysis based on property, and how the landlord can "wrest surplus profit from functioning capital…thanks to his title to this piece of the globe endowed with singular properties" (Marx 1894).

From this perspective the opportunity for rent revolves around the landlord/capitalist relation, although for historically and geographically specific reasons the landlord in relation to natural resources is frequently the state. The history of state ownership of resources is rich and complex, arising often in the 20th century as a consequence of specific contradictions associated with private resource ownership. In the UK, for example, the state became the steward of underground coal resources in the 1930s as a way of overcoming fragmented private ownership which had become an obstacle to accumulation (Fine 1990). In the post-war period, the doctrine of permanent sovereignty over natural resources secured ownership of resources to the state in many newly independent states in Asia and Africa, as well as in countries in Latin America independent since the 1820s, in a context where the developmental state was seen as both a bulwark against imperialism and a modernising force. The state, then, has become a significant actor in the political economy of resource extraction, so that the "variable geometry" of the state, in terms of its porosity and relation to multinational capital and social movements, has a dominant role in shaping inclusions and exclusions that materialise as, for example, governance of risks, distribution of royalties and rents, and the epistemologies through which extraction and its consequences are disclosed (Svampa 2015).

Scale Economies

Extraction holds significant opportunities for capturing economies of scale, in part because other strategies for improving profitability are limited: there is not much potential for achieving economies of scope (using the fixed stock of extractive equipment to produce a

range of different goods); and, with some notable exceptions (such as in the case of oil or tin) where cartelisation or market-cornering is achieved, limited opportunities to drive accumulation by pushing up price. Economies of scale take the form of scaling up of extractive machinery and infrastructure so that individual unit costs for handling and processing material falls. By reducing costs of production at a particular facility, individual extractors can temporarily capture more differential rent, although this is only temporary because declining costs of production draw down price over time.

This dynamic, the 'technological treadmill,' is a conspicuous feature of extraction (Hanink 2005) and has several implications. First, it drives an innovation trajectory in extraction towards ever greater economies of scale, which is particularly visible around extractive and motive power (digging and hauling machinery), material processing, and transportation (such as conveyors, pipelines and port facilities). Second, larger trucks and higher capacity machinery represent an increase in the technical composition of capital, the ratio of capital to labour. These growing capital costs mean barriers to entry rise: smaller (domestic) firms become squeezed out, as extraction increasingly requires firms with access to finance, a process that drives consolidation and, along with it, the development of new sources of financing. Third, growing capital requirements lead to expanding debt and a structural tendency to over-invest in capacity that, ultimately, powers the boom-bust cycle of extraction (experienced as squeezes on labour, crushing write downs, abandonment and closure). Finally, economies of scale in processing and transportation require increased inputs that, as a general rule, cannot be generated by intensification in the way it is possible to increase yields from the same area with agriculture (Bunker and Ciccantell 2005). Economies of scale in transportation, then, drive a logic of extensification in extraction, materialising as deepening mines, expanding pits and larger farms and plantations (see Fine 1994, 285). Here the scalability of capital confronts the limited scalability of the geological, biophysical and labour systems that subtend the primary sector, as opportunities for formal subsumption of labour and nature (by merely expanding throughput) falter and extractive projects search for ways to reconfigure materials, ecologies and bodies in an effort to scale output from non-scalable inputs (i.e. achieve a real subsumption of nature). The differential opportunities of biologically and geologically-based systems generate the plantation and the mine as distinctive forms of extractive land and labour relations (Peluso 2017). The

inclusions and exclusions that subtend mines and plantations are not only technical and economic but fundamentally ecological, as extractive capital (and communities) navigate "the dialectic between the ever-mounting material-throughput demands of an ever-growing mass of capital and the ever-mounting biophysical degradation that ensues through the endless accumulation of this capital" (Moore 2010, 38).

Financial Speculation

The treasure like character of extraction offers the speculative possibility of an 'upside': the possibility of striking it rich, particularly in metal mining and in oil (less so in coal or bulk minerals like bauxite). Histories of extraction have enough of these bonanza type finds to offer a compelling narrative to attract certain forms of speculative finance. At the core of speculation is an inverse relation between value and certainty: speculation thrives on possibility, while certainty transforms it – either by killing the possibility outright, or by converting what is ultimately a gamble into a sober projection of economic return. The constitutive uncertainty that makes possible extractive economies of speculation derives from multiple sources (commodity price risk, geopolitical risk, etc.). At the development phase of extractive projects – where, in mining for example, a lot of public capital is raised - there is a fundamental spatial uncertainty. Material heterogeneity offers affordances for speculation, enabling land and unextracted materials to circulate as possibilities for future revenues. Such speculative dreams – "conjuring the prospect of wealth from the spaces in between the drill holes" (Majury 2014, 548) - are fundamentally volumetric in character as they relate to the qualities of specific territory, such as the scale and extent of mineralisation, its consistency/uniformity across horizontal and vertical dimensions, and the proximity and density of infrastructure.

These material qualities of territory offer different possibilities for capital circulation. Classic commodity production, via the activity of mining for example, is one option but sinking capital in mines, producing materials, and then realising their value through sale is a slow and risky means to accumulation. The uncertain qualities of the underground enable 'economies of appearances' to take hold, with mining share booms prime examples of this form of spectacular accumulation in which assumed future value of extracted materials is

captured in the present (Tsing 2000, 2005). This distinction between extraction-as-commodity production and extraction-as-speculation is a site of discipline. It performs materially significant inclusions and exclusions that, together, constitute financial markets, including the apparatus of public warrant and systems of disclosure related to company registration and public equities, such as those of Securities and Exchange Commission. Extraction's capacity for 'rank speculation,' for example, saw mining physically excluded from the London Stock Exchange until the mid-19th century; while new standards of disclosure introduced to the Toronto Stock Exchange in the 1990s, following the Bre-X scandal, limited authorship of technical disclosure, mandated more inclusive access to geoscientific data via transparency, and re-scaled the warranting process to include reference to non-Canadian reporting and valuation regimes (Majury 2014). To be clear, primary sector extractive activity is more than a set of composite economies: it fashions gendered, racialised and sexed subjects, buttresses (exclusionary) national histories, provokes alternative visions for the future, and much more besides. Outlining some of the multiple forms of economy folded within conventional extractive activity, however, serves to illustrate a diagnostic orientation towards extraction – i.e., understanding how extractive activities operate - centred on the geographical, techno-economic and material specificities of primary sector processes.

Conclusion

Extraction is not exhausted as a concept – as the creative work unpacking power dynamics of resource exploitation in this collection demonstrate - although that is in part because a concept can be and do multiple things. I have argued here that working critically with the concept of extraction requires a dual orientation. On the one hand, a (centripetal) orientation towards greater analytic specificity by, for example, paying attention to the distinctiveness of extractive, primary sector economies and the processes through space and nature are made tractable, and are held together. And on the other, an expansive (centrifugal) orientation in which extraction casts off its sectoral roots and spins outwards, encountering novel sites, registers, and concerns. This speculative move harnesses extraction's classic concerns with displacement and social ordering, using it to offer speculative connections and multiply extraction's "spaces of denotation and connotation"

(Ophir 2018). This kind of approach acknowledges that a concept like extraction is neither fixed nor given but acquires its capacities through where and how it is performed. From this perspective, extraction and extractivism are not mined out and there is productive work with them still to be done. I have argued for a kind of kinetic binary – a double movement – through which to simultaneously intensify and extensify the notion of extraction. Kinetic here speaks to a sense of continuing conceptual travel and emergence, a 'becomingness' of extraction as it evolves through speculative gestures, diagnostic introspection, and other orientations it may be tasked to perform.

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