COVID-19 and the shifting industrial landscape

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Abstract
The COVID-19 coronavirus pandemic has fuelled debate about domestic industry and manufacturing in light of shocks to global supply chains and shortages of medical and personal protective equipment (PPE). Nevertheless, debates have been poorly attuned to geography and history. Calls for reinvigorated domestic manufacturing conceal the degree to which industrial landscapes are already entwined in geometries of power. This is especially so at ports—increasingly privatised—that have become sites of policy focus and biosecurity panic. Crucial trading zones, ports are being refashioned as growth machines for commodity export, energy, and logistics, undergirding national manufacturing capacity via trade and material commodity flows. Yet ports have also always been vectors for disease transmission and are central places for COVID-19 crises. Writing from Port Kembla, south of Sydney, Australia, we catalogue five themes warranting geographical analysis and global comparison in light of coronavirus: disruptions to supply chains (with implications for global production networks); domestic industrial capacity and the future of manufacturing; biosecuring industrial sites; precarious labour and work; and vernacular emergency response capacities within industrial communities. Amidst heightened geopolitical tensions, geographers reveal how industrial landscapes are contested. Logistical and biosecurity roles are enveloped by enduring infrastructural materialities, local histories, and regional legacies of skill and ingenuity.

KEYWORDS
coronavirus, intermediaries, manufacturing, regions, resilience, supply chains

1 | INTRODUCTION

On 5 April 2020, the cruise ship Ruby Princess moored at Port Kembla, 70 kilometres south of Sydney. A fortnight earlier, the ship had arrived at Circular Quay in Sydney Harbour. Despite some passengers displaying symptoms and awaiting COVID-19 test results, 2,700 people freely disembarked and filtered through the wider population—catching trains and connecting to national and international flights (Probyn, 2020). By the time the Ruby Princess reached Port Kembla, over 600 cases had been identified, and a dozen of its passengers had died. The ship’s crew—a thousand workers from over 50 countries—remained on board, without legal representation and unsure of their immediate future. Upon arriving at Port Kembla, the Ruby Princess languished. At an inaccessible industrial site behind a massive grain terminal (Figure 1), criminal investigations commenced.

At the same time, public concern grew about critical disruptions to supply chains of food, toilet paper, and
personal protective equipment (PPE) (Carr, 2020). In the United States, authorities failed to provide sufficient necessary equipment to frontline health workers, amplifying exponential case numbers (Gereffi, 2020). Governments globally issued urgent calls for local manufacturers to pivot towards production of hand sanitiser, masks, and surgical gowns (Department of Industry, 2020; Miller, 2020; NSW Government, 2020). Brought into question were domestic industrial capacities, reliance on complex global supply chains, and the future of local manufacturing sectors. In Australia, where the authors are based, after decades of assuming that the nation was ‘post-industrial’—no longer a ‘country that make things’ (Gibson et al., 2012)—politicians and media commentators began to ask: What industrial capacities do we need to retain and nurture in order to respond to events like the current health crisis or 2019’s and 2020’s catastrophic bushfires and floods? Port Kembla found itself at the heart of this debate, too. At Port Kembla, a new campaign was unveiled urging governments to prioritise domestic procurement for economic recovery projects (Ellis, 2020). Shortly thereafter another major announcement suggested that domestic vehicle manufacturing would indeed return to Australia—in the form of hydrogen-electric powered trucks and cars, to be made in Port Kembla.

In this article, we argue the case for a critical geographical perspective on the coronavirus pandemic, writing from this place. Port Kembla is both a concrete industrial landscape with intersecting experiences of the coronavirus pandemic and a portal to explore wider implications. Industrial landscapes are necessary to the functioning of economy and society—their factories, warehouses, and transport infrastructures furnishing populations with the physical goods considered central to ‘quality of life’ (Carr & Gibson, 2016). After the 19th-century’s smog and toxicity, industrial activities were dispersed and regulated into discrete zones, often massive complexes, such as Port Kembla. Necessary but deemed ugly, industrial landscapes were kept apart from city centres and leafy residential suburbs—hidden from middle-class view by distance and zoning. The COVID-19 pandemic has brought them firmly back into view. A host of industrial sites—warehouses, distribution centres, abattoirs, and ports—have become vectors of disease transmission and focal points of economic and geopolitical anxiety. And from specific places such as Port Kembla, geographical analysis reveals several themes with likely global parallels. In what follows, we briefly

![Key insights](FIGURE 1  Port Kembla, NSW, Australia—9 April 2020 Ruby Princess cruise ship with crew infected with COVID-19 docked in Port Kembla Harbour (photo with permission: Mandy Creighton/Shutterstock.com))

**Key insights**

From pandemic experience at Australia’s largest industrial complex, Port Kembla, five key themes warranting geographical analysis arise in light of coronavirus: disruptions to global supply chains; domestic industrial capacity and the future of manufacturing; biosecuring industrial sites; precarious work; and vernacular emergency response capacities within industrial communities. Calls for reinvigorated domestic manufacturing conceal the degree to which industrial landscapes are contested, already entwined in geometries of power.
catalogue five: (a) disruptions to supply chains (with implications for global production networks [GPNs]); (b) domestic industrial capacity and future manufacturing; (c) biosecuring industrial sites; (d) precarious labour and work; and (e) vernacular emergency response capacities in industrial communities. We argue that making sense of these themes requires a perspective attuned to place as contested and continually embroiled in geometries of power (Massey, 1993). Geographers are uniquely positioned to contribute synthetic analyses of pandemic relationships (between capital and labour, humans and nonhumans, technologies, and landscapes), mobilities (of substances, workers, vessels, virus cells, and bodies), and materialities (of infrastructures, goods, and commodities).

Our themes arise from observing events at Port Kembla and they reflect diverse perspectives among the authors, encompassing feminist labour geography and material cultural studies (Carr), labour and social history (Taksa), economic geography (Warren), urban political economy (Lyons), and cultural economy (Gibson). Our intent is not to write a definitive account of COVID-19. Instead, we seek to open dialogue from this tangible place, where our working and family lives and past and current research projects have intersected. The crisis compels analysis grounded in regional settings, given its uneven geographical impacts and the spatial nature of responses including lockdowns (Bailey et al., 2020). In seeking to make sense of the pandemic and its implications, geographers globally would do well to focus on industrial regions where there are likely to be shared experiences. Port regions are prominent cases: key sites of policy focus and biosecurity panic in the present pandemic, but which were already entwined in evolving processes of privatisation, financialisation, and globalisation (Watts, 2019). Crucial trading zones and connection points, ports are being refashioned as economic growth machines for commodity export, energy, and logistics (Infrastructure Australia, 2018; NSW Ports, 2015). Ports enable manufacturing via trade and supply of material commodities and increasingly sophisticated logistical techniques and technologies (Grappi & Neilson, 2019). Yet ports have historically also been hotspots of viral transmission and sites of tension engulfling the movements of physical goods (Echenberg, 2007; Tatem et al., 2006). Through ports move raw materials, medical equipment, and other supplies needed to manage public health responses. They also host hazardous materials that expose people and environments to underappreciated risks. Beyond the gates and CCTV cameras of securitised wharves, ports are lived places, the focus of proud local communities and skilled workers. Understanding industrial landscapes during a pandemic requires critical consideration of industrial legacies in both built environments and connected residential and worker communities (Eklund, 2002). The relationality of ports is embroiled with all sorts of politics—a lens into Massey’s (1993) point about connections across difference.

2 | DISRUPTIONS TO SUPPLY CHAINS

The systems of provision that furnish people with material goods are now highly fragmented, socially and spatially. Commodity production is coordinated through GPNs: dispersed commercial relationships and layers of subcontracting and vertical disintegration, enabled by multilateral and bilateral political negotiations (Yeung & Coe, 2015). COVID-19 has highlighted how much humans rely on taken-for-granted infrastructures that “make things circulate” (Schouten et al., 2019, p. 779), delivering raw materials, component parts, and specific finished goods to retailers and consumers. COVID-19 has brought into clearer view the range of intermediary actors and sites, such as ports, that together shape logistical worlds in support of GPNs and other commodity and material mobilities (Birchthinell et al., 2015; Rossiter, 2014). Ports connect firms, labour markets, and materials within (intra) and across (inter) wider landscapes (Coe & Yeung, 2015). The latter is usually emphasised in trade and export statistics, overlooking the intra-economic relationships ports facilitate.

A related concern is of the places contributing to the resilience of supply chains in the face of sudden shocks. Prior to the pandemic, economic geographers were already scrutinising the pressures and ruptures that unsettle and unbind global production (Bridge & Le Billon, 2017; Gibson & Warren, 2016). Coronavirus has spawned additional challenges, both in terms of the logistical mobilities of commodities and from geopolitical tensions amplified by the pandemic. In early March 2020, as the pandemic’s first wave in France intensified, Emmanuel Macron’s government broke European Union (EU) trade protocols and blocked the export of six million facemasks from Lyon and Marseille. The masks had been made in France by Swedish company Mölnlycke. They were headed to Spain, Italy, Portugal, Belgium, and Sweden. Military personnel boarded trucks and ships and took command over the now medically precious cargo. Mölnlycke tried to divert masks from suppliers in Southeast Asia so that Spain and Italy would receive a million masks each just as their health situations took a drastic turn. But their export was delayed by governments in source nations too. An
outward Swedish government commenced diplomatic discussions with EU member states but failed to quickly resolve the situation. Similar tensions emerged within national jurisdictions, as when, in the United States, Illinois and Maryland governments covertly imported from China medical supplies under the cloak of darkness, lest the Trump administration seize them, as had occurred in Massachusetts (Klebnikov, 2020). Virtually all PPE-producing nations imposed emergency export controls (Gereffi, 2020). As Michael Watts (2019, p. 943) described shortly before the pandemic, supply chains “operate less across a frictionless, smooth, monochromatic abstract space ... than through a networked mosaic of more or less regulated, more or less ordered, more or less calculable nodes, sites, and spaces.”

As the current pandemic exposes these irregularities and asymmetries, actors in procurement, certification, and distribution gain heightened importance, working amidst scarcities and political tensions, and with increased compliance requirements (cf. Gibson & Warren, 2016). During the pandemic, increasingly complex negotiation, coordination, and procurement expertise has been necessary, not just for medical equipment but for agricultural supplies, processed food, and chemical products—for example, glyphosate (in short supply due to supply chain interruptions in China coinciding with farmers panic-buying amidst drought-breaking rains), and among water suppliers and treatment companies requiring chemicals to treat water and prevent disease (Hutchens, 2020; Thackray, 2020). Trade tensions with China during the pandemic have exacerbated supply security risks (Thompson, 2020). The physical movement of commodities and goods rests on diplomatic relations, regulation, and governance arrangements, to which ports are absolutely central.

It is premature to claim that COVID-19 will undo globalisation—after all, low labour costs, poor environmental standards, and the potential to exercise control through subcontracting relationships remain powerful incentives to offshore (Urry, 2014). Supply chain disruptions do not necessarily compel firms to alter the underlying logics of GPNs. Nevertheless, COVID-19 has challenged a central underpinning of contemporary production and urban/western lifestyles: certainty and consistency of supply. Estimates are that global trade has contracted by a fifth, a quarter of the total ‘in play’ (shifting location at short notice) (Bartholomeusz, 2020). Governments globally have been forced to rapidly reappraise food security and national stocks of basic medical and safety equipment. Producers have had to adapt to wild swings in demand. Consumers have faced empty supermarket shelves and sudden unavailability of a range of discretionary goods. Predictions among academic commentators are that supply chains will become more strategically diversified and regionally focused, with value arising from reliability, security, and stability and not only from downward pressure on prices (Barbieri et al., 2020; Bryson & Vanchan, 2020; Kano & Oh, 2020). To these factors, we would add that the pandemic has highlighted the growing role played by intermediary actors and spaces (such as ports) that facilitate global flows—nuancing the accepted view in GPN theory, for example, that power predominantly rests with lead firms (cf. Gibson & Warren, 2016; Watts, 2019). Whether further revisions to axiomatic theories will likely be necessary is unclear, but empirical evidence will need to be grounded in landscapes such as ports, with analysis attuned to disruption, scarcity, and power relations, across systems of provision for specific commodities.

3 | DOMESTIC INDUSTRIAL CAPACITY AND MANUFACTURING FUTURES

Just as consistent supply has been challenged, the pandemic has fuelled renewed debate about domestic industry and manufacturing. With global supply chains disrupted, onshore manufacturing capacity has become critical to managing the ongoing COVID-19 pandemic. Governments have asked manufacturers with capability to re-tool production to consider making PPE and other medical supplies (Australian Government Department of Industry, 2020; NSW Government, 2020). Urgent demand and the perceived insecurity of global supply chains have left nations feeling vulnerable. In Australia, before the current crisis there was only one manufacturer of surgical face masks. For decades, Med-con, located in Shepparton in regional Victoria, held a small proportion of the market in the face of offshore competition. Now, many local firms have pivoted into PPE production in response to government calls and new market opportunities. Car parts suppliers have shifted to producing ventilators; craft brewers have switched to hand sanitiser; struggling fashion houses have enjoyed surging sales in facemasks; and a firm that 3D-prints construction industry models has turned to mass-producing test swabs (Bamford, 2020). These experiences are far from unique—the pattern being replicated globally (Barbieri et al., 2020; Kano & Oh, 2020).

Alongside critiques of globalised production’s exploitative and uneven development dimensions, supply chains are being recast as national well-being and security concerns (Carr, 2020; Stanford, 2020). In this wider frame, past policy failures return to haunt the pandemic present.
In the United States, offshoring and dependency on importing lower value input materials (for example, face mask cloth), combined with adoption of hyper-efficient just-in-time business models, left medical supply chains “fragile and brittle in times of crisis” (Gereffi, 2020, p. 293). In Australia, sustained retreat from federal policy support for manufacturing since the 1980s has, among other things, undermined regional industrial expertise and fostered an over-reliance on exporting a small number of raw materials, principally to a single market, China (Gibson et al., 2012; Schultz, 1985). As a percentage of gross domestic product, manufacturing has fallen from 30% in the 1960s to under 6% in 2019 (Pupazzoni, 2020). Analysis of manufacturing trade balances during the pandemic has revealed that of 36 Organization for Economic Cooperation and Development (OECD) nations, Australia has the worst self-sufficiency capacity (Stanford, 2020). Australia does specialise in, and export, medical equipment (worth AUD1.84 billion in 2019), but this activity meets a fraction of overall national demand (AUD4.43 billion of medical equipment was imported in 2019) (Stanford, 2020). Only one Australian company, CSL, has the capacity for full production of a COVID-19 vaccine. Even then, CSL only uses a certain type of vaccine technology—egg cultivation techniques—triggering urgent federal investments in cell-based vaccine manufacturing capability (Harris & Ilanbey, 2020). There remains no Australian manufacturing capacity to mass produce candidate vaccines using messenger RNA (mRNA) technology.

There are echoes too of earlier historical episodes such as Australia’s lack of domestic industrial capacity during WWII, and the shock confronting the nation after the fall of Singapore, when British supply lines were severed. National anxieties over industrial capacity led to post-war government support for the growth of domestic steel, car, and textile industries, including at Port Kembla (Eklund, 2002). It seems unlikely that the present conservative federal government would embrace investment in large-scale, state-sponsored regional industrial development akin to that extant in the 1950s. But certainly, citizens have become more attuned to the geographies of production, exercising choices to buy local, following successful Buy from the Bush campaigns during the 2019 drought and in the immediate aftermath of the Black Summer bushfires. During 2020, certifiers for trademark Australian Made reported record registrations among local firms for its use and, for registered Australian Made eBay sellers, sales surged by two thirds within months (Australian Made, 2020). Although there may be no return to Fordist production lines and massive domestic manufacturing, across a host of sectors local production is pivoting in response to pandemic, and consumers ought not to be underestimated as a force driving this change.

While debates concerning the importance of domestic industrial capacity have been ignorant of history, they have also been poorly attuned to geography. Production is differentiated, spatially and functionally, among firms in advanced manufacturing (gravitating to facilities in business parks), craft products and food processing (older industrial districts in the inner and middle rings of larger cities that have evaded being rezoned), and heavier forms of manufacturing (steel, shipbuilding, and vehicle production) (Groch & Gibson, 2019). Exactly where Australian manufacturing will take place in the future is based on the diverse character of contemporary production and accompanying spatial divisions of labour, the materiality of goods produced, and the space needs of firms. Calls for reinvigorated domestic manufacturing also conceal the degree to which industrial landscapes are already enmeshed in unfurling power relations. Many industrially designated precincts in urban contexts have, for example, been lost to rezoning for high-rise residential development.

Irrespective of whether a domestic manufacturing revival is likely, ports will undergird national manufacturing capacity. Indeed, counter to narratives of terminal decline, steel manufacturing has not ceased at Port Kembla. Industrial skills linger in place, within workplaces but also in communities and homes (Carr, 2017). Investors behind the proposed manufacture of hydrogen-electric powered vehicles at Port Kembla have pointed to the region’s industrial manufacturing workforce and skills, and prospects of a new green hydrogen plant nearby (Ellis, 2020). Future domestic industrial plants must locate somewhere with requisite access to labour, skills, energy, and materials.

There are also considerations related to infrastructural finance, returns to private investors, sunk capital, and inertia in the material built environment. Industrial infrastructural complexes such as Port Kembla are increasingly privatised, functioning as spaces facilitating particular material commodity flows and accumulation (Chen et al., 2017). Over time, ports have come to specialise in handling particular commodities (with relevant infrastructural assets, skilled workers, and transport connectivity). They cannot easily adjust to meet the needs of other industries—say the sudden handling of sensitive ventilators that have to be packed and handled differently to grain, coal, or iron ore. Ports become locked-in to handling and processing particular global material commodities (Grappi & Neilson, 2019) in part a consequence of the drive for efficiency, including greater use of automation and this matters for thinking about manufacturing capacity and industrial futures, too. Rival
visions preside over Australian ports: whether prioritising container shipping, cruise ship passenger arrivals; or processing and movements of energy and raw commodities. It remains to be seen what kinds of competing pressures will be placed on such infrastructures and adjunct industrially zoned land and factories. During and after the pandemic, needs may be compromised by other priorities.

4 | BIOSECURING INDUSTRIAL LANDSCAPES

In the past decade, critical geographical analysis has explored the biosecuring of territory (Miller, 2019; Phillips, 2013). Such perspectives assist understanding of the manner in which human mobilities and virus spread are problematised and governed. Existing work on biosecurity and industrial landscapes has mainly focused on sites of agricultural production as generating bio-insecurity (Blanchette, 2015; Hinchliffe & Bingham, 2008). Geographers have explored how supply chain mapping is used within food systems to anticipate problematic futures (Donaldson et al., 2019), but less has been said concerning the biosecuring of logistical sites of circulation through which materials pass. And yet, history demonstrates that ports have long been key sites of biopolitics. The histories of the Bubonic Plague and the 1918–1919 influenza pandemic have been closely associated with maritime transport and ports, along with a recognition of their long-term social and economic impacts for local communities and for entire nations (Curson & McCracken, 1989; Echenberg, 2007; Taksa, 1994).

Ports exist in a legislative form and are bounded places, territorially speaking, at the interface or maritime and terrestrial space. This quality of being at one or more interfaces can confound jurisdictional responsibility, as we saw with the Ruby Princess and with the controversy surrounding the cargo ship Al Kuwait, which docked with sick crew at Fremantle at the height of the first spike of COVID-19 in Australia. On the one hand, the pandemic has shown the commercial mobility of goods to be intimately entwined with biopolitical concerns. On the other hand, industrial ports fall through the cracks, jurisdictionally governed as points of customs and maritime unions and neighbouring communities, such trends physically and symbolically sever access to and from port spaces (cf. Jansen et al., 2018; Teschner, 2019), with implications for industrial organising.

5 | PRECARIOUS LABOUR AND WORK

Making matters worse have been increasingly precarious labour arrangements. The pandemic has highlighted persistent injustices that arise from the casualisation of work, growing job insecurity, stagnant wages, and constraints on the ability to organise and commence industrial action. Wages have for a decade been suppressed as a consequence of the weakening of support for labour rights, especially for low waged work in often gendered sectors such as aged care, childcare, retail, and health services (Stewart et al., 2019). Jobs have been lost, hours cut, and health and safety threatened during lockdowns and heightened pandemic concerns (Apouey et al., 2020).

Industrial spaces and associated sectors handling the production and circulation of physical goods have not been immune. Factory floor staff in COVID-19 hotspots and shiftworkers at large fulfilment centres in the United States have been fearful of catching COVID-19 at work, while reluctant to self-isolate or be tested, lest they lose hours or break contract conditions (Greene &
Dwoskin, 2020). Although vital to the continued movements of goods during the pandemic, workers in distribution warehouses and gig economy delivery drivers have experienced suppressed incomes, and job losses from automation (Apouey et al., 2020). Meanwhile at ports, according to the ITF (2020, p. 5):

There has been a decline in trade through virtually all ports as economic activity slowed ... The stress of dealing with the virus at work is now compounded with loss of income and redundancies. Combined with the weakness of WHS law in addressing the power imbalance between employers and workers, this is likely to make workers more reluctant to raise safety issues in the future.

At the height of the pandemic's first lockdowns, an estimated 200,000 seafarers were stranded globally at sea, many forced to work months beyond contract (ITF, 2020). Ships crews also faced stigma from working on vessels associated with disease outbreaks. Against the grain of such stigma, the Ruby Princess crew would be the focus of another, unanticipated response—not from border force or public health officials but from local people.

6 | VERNACULAR EMERGENCY RESPONSE CAPACITIES IN INDUSTRIAL COMMUNITIES

Beyond factories and docks are adjacent communities, the homes and families of port workers, and related industrial workplaces (Carr, 2017). The view from here reveals an industrial capacity that is not monolithic. At Port Kembla, the steel and coal industries continue to operate, but also evident are new enterprises, many connected with a university founded on strong industrial links. Often overlooked in economic debates about manufacturing futures are the diverse cultures that industrial regions and enterprises foster (Carr & Gibson, 2016). Localised resilience and a culture of experimenting with materials are deeply entwined with regional industrial capacity—a vital asset during the pandemic.

In the Illawarra region that includes Port Kembla, as elsewhere, skilled industrial workers and engineers have mobilised to provide PPE for frontline health workers. In April 2020, University of Wollongong (UOW) researchers marshalled resources through a centrally funded Makerspace to prototype face masks and have them tested for use in Wollongong Hospital. The connection was not forged by formal ‘innovation’ networks or enterprise relationships but rather resulted when technical capacities intersected with diverse social networks. Pivoting to face mask production happened in a matter of days, precipitated by a ‘what if?’ conversation in the intensive care unit (ICU) between the Makerspace manager, a materials engineer, and her friend, an emergency nurse. The ICU director became involved in a prototyping process, drawing up plans for modifying equipment late into the evening after his shift. By mid-morning, new prototypes were produced and ready for testing. The university's advanced bioprinting facilities provided additional expertise in producing surgical grade equipment and, along with local maker communities, were on standby to scale up production. More mutual aid networks emerged, producing hand-sewn cloth masks in domestic spaces for distribution to those who need them. There is a commonly held misconception that the industrial sector is concentrated at two ends of a spectrum: on one end, old behemoths that are slow to adjust and, on the other, high technology, high value enterprises. In the rush to re-tool processes, regions with long-held legacies reveal diverse industrial cultures (cf. Gibson-Graham et al., 2019), incorporating nimble capacities for prototyping and makeshift responses.

Meanwhile, at Port Kembla, union delegates and volunteers from the local seafarers' mission were eventually able to connect with crew on board the Ruby Princess. In a poignant example of the capacities within industrial regions to share and extend relations of care—“to be touched, moved, swayed by the plight of strangers” (Clark, 2011, p. xxi)—Kiama resident Nicole Dillon began collecting donations of care packages for crew members. Within a week, 1,200 such care packages were delivered to Ruby Princess workers (McIlwain, 2020), filled with basic provisions, food staples and personal hygiene items, and drawings from children at local schools with messages of love and support. As John Kewa, Chaplain with Port Kembla Mission to Seafarers explained:

It's a message of empathy and compassion from the community. [The crew] have been caught in a crossfire of negativity ... but they are sons, daughters, parents and even grandparents. As a community of people, we have a duty of care to them. This is just a small way we can show them that we care. Our message to them is: ‘It's not your fault, we hope you’re ok.’” (quoted in McIlwain, 2020)

Industrial settings are central not only to economic geographical questions of global production and supply chains but also to considerations of regional resilience in the face of crisis, enabled by unlikely relationships and lines of solidarity.
7 | CONCLUSION

The COVID-19 pandemic highlights an urgent need to connect questions of industrial and manufacturing capacity with broader debates around health and geopolitical crises and the moral economy. The authors have identified themes for consideration among researchers concerned with industrial landscapes, regional legacies, and resilience capacities, writing from a specific place, Port Kembla, which sits at the nexus of several entwined pandemic experiences. A geographical perspective, we argue, brings into sharp focus the centrality of the material basis of the economy, and accompanying mobilities of physical commodities and bodies, encompassing logistical infrastructures and intermediaries, financial calculations, virus cells, and workers (cf. Mitchell, 2008). The need to consider physical sites, hazards, working people, and manual competence remain, irrespective of the digital economy (cf. Carr & Gibson, 2016; Guéry & Deleule, 2014). So do the legacies of the past: policy support and withdrawals; failure to heed lessons from prior experiences; and material lock-ins from previous eras, in the functions and built environments of industrial landscapes (Gereffi, 2020; Gibson, 2016). Existing inequalities, power relations, and debt exposures will likely deepen (Sokol & Pataccini, 2020), alongside possibilities shaped by legacies and lingering capacities.

Much is unresolved from an emergency and accompanying recession that appears likely to be drawn out. Counter-interpretations and divergences are certain in other contexts and facets of economic geography (see, for example, Bailey et al., 2020). But there will likely be parallels. The COVID-19 pandemic seems certain to be more than an episode—a transformative moment that amplifies pre-existing trends while introducing new challenges (Kano & Oh, 2020). One cannot help but reflect upon how contemporary economic arrangements have been thrown into disarray by a wily virus. Imperceptible to the human eye, its propagative strategies outwit humans, revealing the folly of self-serving speciesism. If appetite grows for a widespread rethinking of economy (Bryson & Vanchan, 2020; Latour, 2020), there is merit in considering how economic landscapes, manufacturing skills, and industrial cultures—both old and new—might prove important resources in facing volatile events. At the least, the pandemic should be a lesson for national governments and private enterprise about the importance of retaining domestic manufacturing capacity in critical areas. COVID-19 raises existential questions for society and for the state, about the conditions of our collective existence, who makes the things we need, and how and where they circulate—whether via existing nodes of manufacturing and logistics, or across more decentralised spaces and nimble forms of industrial organisation.

ENDNOTE

1 Beirut's tragic explosion of ammonium nitrate during the coronavirus pandemic illustrated this point. The port of Newcastle, Australia, also houses stocks of ammonium nitrate (used for explosives in Upper Hunter Valley coal mines), causing ongoing conflict with nearby residents, who have protested on safety grounds (Millington, 2020).

REFERENCES

Apouey, B., Roulet, A., Solal, I., & Stabile, M. (2020). Gig workers during the COVID-19 crisis in France: Financial precarity and mental well-being. *Journal of Urban Health*, 97, 776–795. https://doi.org/10.1007/s11524-020-00480-4

Australian Government Department of Industry. (2020). Call for Australian manufacturers to supply Covid-19 test kit components. https://www.industry.gov.au/news-media/covid-19-news/call-for-australian-manufacturers-to-supply-covid-19-test-kit-components

Infrastructure Australia. (2018). *Inquiry into national freight and supply chain priorities*. Canberra: Australian Government.

Bailey, D., Clark, J., Colombelli, A., Corradini, C., de Propris, L., Derudder, B., ... Usai, S. (2020). Regions in a time of pandemic. *Regional Studies*, 54, 1163–1174. https://doi.org/10.1080/00343404.2020.1798611

Bamford, M. (2020). First Australian-made COVID swabs a promising sign for local manufacturers. *ABC News*, 2 August. https://www.abc.net.au/news/2020-08-02/first-australian-made-covid-swabs-point-to-manufacturing-pivot/12530190

Barbieri, P., Boffelli, A., Elia, S., Fratocchi, L., Kalchschiadt, M., & Samson, D. (2020). What can we learn about reshoring after Covid-19? *Operations Management Research*, 13, 131–136. https://doi.org/10.1007/s10263-020-00160-1

Bartholomeusz, S. (2020). Australia’s economy in crosshairs as pandemic threatens global supply chains. *Sydney Morning Herald*, 12 August. https://www.smh.com.au/business/companies/australia-s-economy-in-crosshairs-as-pandemic-threatens-global-supply-chains-20200812-p55kya.html?btis

Birchnell, T., Savitzky, S., & Urry, J. (Eds.) (2015). *Cargomobilities*. London: Routledge. https://doi.org/10.4324/9781315866673

Blanchette, A. (2015). Herding species: Biosecurity, posthuman labor, and the American industrial pig. *Cultural Anthropology*, 30, 640–669. https://doi.org/10.14506/ca30.4.09

Bridge, G., & Le Billon, P. (2017). *Oil*. Cambridge: Polity Press.

Bryson, J., & Vanchan, V. (2020). COVID-19 and alternative conceptualisations of value and risk in GPN research. *Tijdschrift voor Economische en Sociale Geografie*, 111, 530–542. https://doi.org/10.1111/tesg.12425
Carr, C. (2017). Maintenance and repair beyond the perimeter of the plant. Transactions of the Institute of British Geographers, 42, 642–654. https://doi.org/10.1111/tran.12183

Carr, C., & Gibson, C. (2016). Geographies of making: Rethinking materials and skills for volatile futures. Progress in Human Geography, 40, 297–315. https://doi.org/10.1177/030913251578775

Carr, K. (2020). Time to revitalise our manufacturing sector. Sydney Morning Herald, 21 April, https://www.smh.com.au/business/the-economy/time-to-revitalise-our-manufacturing-sector-20200421-p54ir4.html

Chen, P., Pateman, H., & Sakalayen, Q. (2017). The latest trend in the economy/time-to-revitalise-our-manufacturing-sector-

Clark, N. (2011). Inhuman nature. London: SAGE Publications.

Coe, N. M., & Yeung, H. (2015). Global production networks. London: Routledge.

Cowen, D. (2010). Containing insecurity: Logistic space, U.S. port cities, and the ‘War on Terror’. In S. Graham (Ed.), Disrupted cities (pp. 69–84). New York: Routledge.

Cowen, D. (2014). The deadly life of logistics. Minneapolis: University of Minnesota Press. https://doi.org/10.5749/minnesota/9780816680870.001.0001

Curson, P., & McCracken, K. (1989). Plague in Sydney: The anatomy of an epidemic. Sydney: UNSW Press.

Donaldson, A., Brice, J., & Midgley, J. (2019). Navigating futures: Anticipation and food supply chain mapping. Transactions of the Institute of British Geographers, 45, 606–618. https://doi.org/10.1111/tran.12363

Echenberg, M. (2007). Plague ports. New York: NYU Press.

Eklund, E. (2020). Port Kembla could soon be home to Australia’s new car manufacturing industry with hydrogen-electric powered vehicles made as soon as 2022. Illawarra Mercury, 15 June, https://www.illawarramercury.com.au/story/6793617/port-kembla-could-soon-be-home-to-australias-new-car-manufacturing-industry/

Eklund, E. (2002). Steel town: The making and breaking of Port Kembla. Melbourne: Melbourne University Press.

Ellis, G. (2020). Port Kembla could soon be home to Australia’s new car manufacturing industry with hydrogen-electric powered vehicles made as soon as 2022. Illawarra Mercury, 15 June, https://www.illawarramercury.com.au/story/6793617/port-kembla-could-soon-be-home-to-australias-new-car-manufacturing-industry/

Eklund, E. (2002). Steel town: The making and breaking of Port Kembla. Melbourne: Melbourne University Press.

Gibson-Graham, J. K., Cameron, J., Healy, S., & McNeill, J. (2019). Economic geography, manufacturing, and ethical action in the Anthropocene. Economic Geography, 95, 1–21. https://doi.org/10.1080/00130095.2018.1538697

Gibson, C. (2016). Material inheritances: How place, materiality and labor processes underpin the path-dependent evolution of contemporary craft production. Economic Geography, 92, 61–86. https://doi.org/10.1080/00130095.2015.1092211

Gibson, C., Carr, C., & Warren, A. (2012). A country that makes things? Australian Geographer, 43, 109–113. https://doi.org/10.1080/00049182.2012.682298

Gibson, C., & Warren, A. (2016). Resource-sensitive global production networks. Economic Geography, 92, 430–454. https://doi.org/10.1080/00130095.2016.1178569

Gibson-Graham, J. K., Cameron, J., Healy, S., & McNeill, J. (2019). Economic geography, manufacturing, and ethical action in the Anthropocene. Economic Geography, 95, 1–21. https://doi.org/10.1080/00130095.2018.1538697

Grappi, G., & Neilson, B. (2019). Elements of logistics: Along the line of copper. Environment and Planning D: Society and Space, 37, 833–849. https://doi.org/10.1177/0263775818814535

Greene, J. & Dwoskin, E. (2020). Amazon’s warehouse workers sound alarms about coronavirus spread. The Washington Post, 17 March, https://www.washingtonpost.com/technology/2020/03/17/amazons-warehouse-workers-sound-alarms-about-coronavirus-spread/

Grodach, C., & Gibson, C. (2019). Advancing manufacturing? Blinkered visions in US and Australian urban policy. Urban Policy and Research, 37, 279–293. https://doi.org/10.1080/08111146.2018.1556633

Guéry, F., & Deleule, D. (2014). The productive body. Abingdon: Zero Books.

Harris, R. & Ilanbey, S. (2020). Billion-dollar deal brings new vaccine plant to Melbourne. Sydney Morning Herald, November 15, https://www.smh.com.au/politics/federal/billion-dollar-deal-brings-new-vaccine-plant-to-melbourne-20201115-p56es2.html

Hinchliffe, S., & Bingham, N. (2008). Securing life: The emerging practices of biosecurity. Environment and Planning A, 40(1534), 1551.

Humphries, G. (2020). Unions left waiting for a Princess to give them a call. Illawarra Mercury, 7 April, https://www.illawarramercury.com.au/story/6714761/unions-left-waiting-for-a-princess-to-give-them-a-call/

Hutchens, G. (2020). How will Australia respond to exposed supply chains in a post-coronavirus world? ABC News, 3 May, https://www.abc.net.au/news/2020-05-03/coronavirus-global-supply-chains-and-essential-services-exposed-12209246

International Transport Workers Federation (ITF). (2020). Submissions on behalf of International Transport Workers Federation and Affiliate Unions, to the NSW Government Special Commission of Inquiry into the Ruby Princess. https://www.rubyprincessinquiry.nsw.gov.au//assets/scirp/Final-submissions-from-Unions-redacted-2020.07.14.pdf

Jansen, M., van Tulder, R., & Afrianto, R. (2018). Exploring the conditions for inclusive port development. Maritime Policy & Management, 45, 924–943. https://doi.org/10.1080/03088839.2018.1472524

Kano, L., & Oh, C. H. (2020). Global value chains in the post-COVID world: Governance for reliability. Journal of Management Studies, 57, 1773–1777. https://doi.org/10.1111/joms.12626

Klebnikov, S. (2020). Illinois Gov. Pritzker secretly bought medical supplies from China. Forbes, 18 April https://www.forbes.com/sites/sergeiklebnikov/2020/04/18/illinois-gov-pritzker-secretly-bought-medical-supplies-from-china-and-the-white-house-is-not-happy/#2ed2f2d7891f

Latour, B. (2020). What protective measures can you think of so we don’t go back to the pre-crisis production model? http://www.bruno-latour.fr/sites/default/files/P-202-AOC-ENGLISH.pdf

Ridley, S., & Bingham, N. (2008). Securing life: The emerging practices of biosecurity. Environment and Planning A, 40(1534), 1551.

Latorre, B. (2020). What protective measures can you think of so we don’t go back to the pre-crisis production model? http://www.bruno-latour.fr/sites/default/files/P-202-AOC-ENGLISH.pdf

Australian Made. (2020). eBay Australia partners with Australian Made to support local businesses. Press release, 28 July https://www.australianmade.com.au/latest-news/2020/ebay-australia-partners-with-australian-made-to-support-local-businesses/

Massey, D. (1993). Power-geometry and a progressive sense of place. In J. Bird, B. Curtis, T. Putnam, & L. Tickner (Eds.), Mapping the futures. London: Routledge.
McIlwain, K. (2020). 1200 care packages delivered to Ruby Princess, with love from Wollongong. Illawarra Mercury 14 April, https://www.illawarramercurey.com.au/story/6721621/1200-care-packages-delivered-to-ruby-princess-with-love-from-wollongong/?cs=17267

Miller, J. A. (2020). The supply chain behind the pivot to make coronavirus relief supplies. Supply Chain Dive, April 2, https://www.supplychaindive.com/news/coronavirus-supply-chain-pivot-kr-hallcrest-soapbox/575566/

Miller, M. (2019). Biocultural nationalism? Bananas and biosecurity in Northern Queensland. Australian Geographer, 50, 349–364. https://doi.org/10.1080/00049182.2019.1591327

Millington, B. (2020). Beirut explosion raises fresh concern about Newcastle’s much larger ammonium nitrate stockpile. ABC News 5 August, https://www.abc.net.au/news/2020-08-05/beirut-blast-raises-concern-about-newcastle-ammonium-nitrate/12527546

Mitchell, T. (2008). Rethinking economy. Geoforum, 39, 1116–1121. https://doi.org/10.1016/j.geoforum.2006.11.022

NSW Government. (2020). Call for local manufacturing of medical supplies. https://preview.nsw.gov.au/covid-19/call-for-local-manufacturing-of-medical-supplies

Phillips, C. (2013). Living without fruit flies: Biosecuring horticulture and its markets. Environment and Planning A, 45, 1679–1694. https://doi.org/10.1068/a45274

NSW Ports. (2015). Navigating the future: NSW Ports 30 year masterplan. http://www.nswports.com.au

Probyn, A. (2020). Qantas and Virgin knew the Ruby Princess was a coronavirus time bomb but were powerless to stop it. ABC News 14 August, https://www.abc.net.au/news/2020-08-14/border-force-ruby-princess-qantas-virgin-manifest-coronavirus/12550558

Pupazzoni, R. (2020). Manufacturing has been in terminal decline but coronavirus might revive it. ABC News, 23 April, https://www.abc.net.au/news/2020-07-23/coronavirus-pandemic-leads-to-australian-manufacturing-revival/12481568

Rossiter, N. (2014). Logistical worlds. Cultural Studies Review, 20, 53–76.

Schouten, P., Stepputat, F., & Bachmann, J. (2019). States of circulation: Logistics off the beaten path. Environment and Planning D: Society and Space, 37, 779–793. https://doi.org/10.1068/d0263775819851940

Schultz, J. (1985). Steel city blues. Melbourne: Penguin.

Sokol, M., & Pataccini, L. (2020). Winners and losers in coronavirus times. Tijdschrift voor Economische en Sociale Geografie, 111, 401–415. https://doi.org/10.1111/tesg.12433

Stanford, J. (2020). Manufacturing renewal for the post-COVID economy. Centre for Future Work. https://d3n8a8pr07vhmx.cloudfront.net/theausinstitute/pages/3332/attachments/original/1595693276/A_Fair_Share_for_Australian_Manufacturing.pdf?1595693276

Stewart, A., Stanford, J., & Hardy, T. (2019). The wages crisis in Australia. Adelaide: University of Adelaide Press.

Taksa, L. (1994). The masked disease: Oral history, memory and the influenza pandemic, 1918–1919. In K. Darian-Smith & P. Hamilton (Eds.), Memory and history in twentieth century Australia (pp. 77–91). Oxford University Press.

Tatem, A. J., Rogers, D. J., & Hay, S. I. (2006). Global transport networks and infectious disease spread. Advances in Parasitology, 62, 293–343. https://doi.org/10.1016/S0065-308X(05)62009-X

Teschner, N. (2019). The battle over the commons in port cities. Urban Geography, 40, 918–937. https://doi.org/10.1080/02723638.2018.1506613

Thackray, L. (2020). Farmers trying to overcome drought now battle ag chemical, fertiliser supply shortages. ABC News, May 1, https://www.abc.net.au/news/rural/2020-05-01/farmers-battle-chemical-supply-shortage/12201154

Thompson, B. (2020). Nufarm warns of China’s supply stranglehold. Australian Financial Review, April 29, https://www.afr.com/companies/agriculture/nufarm-warning-on-china-s-supply-stranglehold-20200429-p54o8o

Urry, J. (2014). Offshoring. Cambridge: Polity Press.

Watts, M. (2019). Reflections on circulation, logistics, and the frontier of capitalist supply chains. Environment and Planning D: Society and Space, 37, 942–949. https://doi.org/10.1177/0263758181989446

Yeung, H. W. C., & Coe, N. (2015). Toward a dynamic theory of global production networks. Economic Geography, 91, 29–58. https://doi.org/10.1111/ecge.12063

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