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Article (Accepted Version)

Selwyn, Benjamin (2023) Limits to supply chain resilience. Monthly Review, 74 (10). pp. 27-37. ISSN 0027-0520

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Limits to Supply Chain Resilience

Abstract
The Covid-19 pandemic generated the first global supply chain (GSC) crisis. In response, supporters of GSCs advocate strategies to enhance supply chain ‘resilience’. The notion is pitched as applicable to all lead firms. This commentary outlines the notion of resilience, and argues that it is limited – in explanatory and in policy terms - in four ways. First, it ignores capital-labour relations upon which supply chain resilience is achieved. Second, it obscures the overwhelming capacity of some oligopolistic lead firms to reshape the resilience of their supply chains by increasing control over suppliers. Third, it neglects ways in which enhanced resilience may exacerbate tendencies towards concentration amongst lead firms. Fourth, it underplays how the notion of supply chain resilience is being deployed geopolitically by the US state. We argue that the resilience strategy will likely contribute to enhanced lead firm control over suppliers, greater concentration amongst GSC firms, heightened labour exploitation and increased geo-political tensions.

1 INTRODUCTION
As the Covid-19 pandemic expanded across the world in early 2020, it generated the ‘first global supply chain crisis’ and the first ‘great lockdown’ (Feltri: 2020, Gopinath: 2020). These events had a shattering impact on global supply chains (GSCs), and in the depths of the crisis it was common to hear predictions, for example from the IMF, that the ‘global economy would suffer its worst blow since the 1930s.’ (Giles: 2020). In response to the crisis, the GSC community –
encompassing academics and policy-makers - began to debate the sustainability of GSCs and developed the key concept of supply chain ‘resilience’, which denotes a set of policies to be implemented by lead firm managers and supported by states.

Resilience policies aim to reduce supply chain risk, which has been magnified by war, pandemic, and slow growth following the 2008 ‘great recession’. Supply chain resilience has been defined by the WTO and Asian Development Bank as ‘the ability of these chains to anticipate and prepare for severe disruptions in a way that maximizes capacity to absorb shocks, adapt to new realities, and re-establish optimized operations in the shortest possible time’ (Xing et al: 2021, 154). It is widely assumed within the mainstream GSC community that ‘[t]he majority of countries are better off in the interconnected regime, both in terms of levels and stability of economic activity’ (Arriola et al; 2020, 7).

In this commentary, we discuss the notion of supply chain resilience from a critical political economy perspective. We foreground the social relations of production and trade in GSCs. Chief amongst them are the antagonistic exploitative relation between capital and labour, and competitive capital accumulation between firms that generates a tendency toward global concentration and centralisation (oligopoly)(Authors). We make four main points. First, the emerging literature ignores the class (capital-labour) relations upon and through which resilient supply chains are constructed. Second, while the literature offers its advice as representing the general interest – it appears to be articulating the interest of a minority of very well resourced giant lead firms. Third, and consequently, it fails to discuss how the resilience agenda may well fuel increased lead firm control over supplier firms, and dynamics of concentration and centralisation amongst lead firms. Fourth, it underplays how
the notion of supply chain resilience is being deployed geopolitically by the US state. We argue that the resilience strategy will likely contribute to enhanced lead firm control over suppliers, greater concentration amongst GSC firms, heightened labour exploitation and increased geo-political tensions.

Following this introduction, section two outlines the emerging notion of resilience as formulated within the GSC community. Section three shows how many GSC firms have enhanced their resilience by increasing labour exploitation. Section four discusses how the notion of resilience relies upon digitalisation, but occludes how digital technologies are being used to enhance capital’s power over labour. Section five argues that the resilience agenda fails to conceptualise lead firms’ differential resources and capacities to implement resilience strategies, with the potential outcome of heightened lead firm control over supplier firms, and new rounds of lead firm concentration and centralisation. Section six identifies the geo-political dynamics of resilience, focusing on the White House’s (2021) report *Building Resilient Supply Chains, Revitalizing American Manufacturing, And Fostering Broad-Based Growth*. Section seven concludes.

2 RESILIENCE IN GLOBAL SUPPLY CHAINS
The GSC community’s response to the Covid-19 pandemic has been to call for greater supply chain resilience. As Gereffi et al; put it: ‘At the firm level, resilience can be strengthened by enhancing the capabilities of lead firms, suppliers, and other partners through strategies that improve risk management, flexibility, and agility to respond to and recover from disruptions and vulnerabilities.’ They also identify the importance of institutional support for such strategies: ‘[w]ith sophisticated firm-level capabilities and complex GSC configurations, more direct participation of the state is crucial in the quest for recovery.’ (Gereffi et al; 2022, 48, 61 and see Xing et al: 2021) (and see section 6).
A key vector of the debate about enhancing resilience revolves around the trade-off, or relationship between ‘risk’ and ‘resilience’. The former is a consequence of just-in-time production (JIT), which was immensely profitable to firms during the expansion of the GSC world via decreased inventory costs and increasing the flexibilization of employment. However, the benefits of JIT are potentially complicated or undermined by supply chain disruptions. JIT magnifies so-called bullwhip and ripple-effects – situations where small disturbances at one node in the supply chain generate increasingly large disruptions further up or down the chain (see Selwyn: 2008). As Peter Hasenkamp – former director of Tesla’s supply chain strategy – noted ‘It takes 2,500 parts to build a car, but only one not to’ (cited in McGee and Edgecliffe-Johnson: 2020).

In response to heightened risks, firms are advised to increase their supply chain resilience by introducing:

- **New products** – which enable easier replacement of standardised inputs and the establishment of buffer stocks;
- **New forms of chain governance** – through risk analysis of places and suppliers, and,

Multilateral agencies and consultancies have operationalised these concepts into specific recommendations for supply chain managers. This is captured in a two-pronged strategy outlined in a World Bank publication by Qiang et al (2021). On the one hand, the deployment of new technologies will be essential:

‘Plant shut downs and the consequent labour shortages have rippled through industries from food processing to automotive manufacturing.’
Firms are increasingly looking to robotics to augment locked-down employees, support health and safety measures, and tap into new opportunities or salvage their operations.’ (Qiang: 2021, 201).

On the other hand, new dynamics of outsourcing are posited as enabling cost-efficiencies.

‘By geographically broadening their supplier bases, MNCs are more likely to cut production costs by offering more competitive wages at the local level and more likely to better serve local customers by tailoring products to their demands.’ (ibid, 204, for the avoidance of doubt, ‘more competitive wages’ means lower wages).

In a widely cited report, the McKinsey Global Institute (2020b) provides a generic list of actions that firms can undertake to enhance resilience. These include strengthening risk-management, reshoring production, reducing product complexity, building capacity to flexibilise production across myriad sites, improving supply chain transparency, and building redundancy into the supply chains (by, for example, using multiple suppliers for each part, maintaining low capacity utilization and holding extra inventory.)

These recommendations are being adopted by lead firms. A McKinsey survey of supply chain executives across different industries in July 2020 found that 93% aimed to enhance their supply chain resilience, and that 90% aimed to increase the use of in-house digital technologies to do so. 70% and 55% of the executives thought that re-skilling current, and recruiting new, employees would facilitate this endeavour (McKinsey Global Institute: 2020a). A mid-2021 follow-
up survey found that almost 90% of the executives expected to pursue ‘some degree of regionalisation’ within the next three years.

In addition, supply chain mapping is increasingly posited as a necessary strategy for lead firms. A Harvard business review article highlights how it ‘entails going far beyond the first and second tiers and mapping your full supply chain, including distribution facilities and transportation hubs’, to identify suppliers’ capacity to withstand shocks (Shih: 2020). Intrinsic to notions of supply-chain mapping is enhanced surveillance by lead firms over supplier firms, as an additional aspect of lead-firm governance strategies. Even mainstream GSC commentators note how such dynamics may generate ‘a rather paradoxical co-evolution of surveillance and collaboration wherein companies will be more watchful of their suppliers’ actions and capabilities while collaborating with them to strengthen their capabilities’ (Panwar et al 2022, 14). As Sébastien Miroudot notes:

Large multinational enterprises (MNEs) develop ‘control towers’ and information systems that give accurate real-time information on production networks, and these tools allow for an efficient management of risks, independent of production and length of supply chains (Miroudot: 2020, 123).

In short, then, mainstream-solutions to the crisis revolve around strategies of cheapening wages, flexibilising employment and deploying new technologies in novel geographic settings to enhance firm-level competitiveness (including heightened lead firm surveillance of suppliers). What is noteworthy, however, is that the notion of resilience was formulated at exactly the same historic moment that many supply chain firms, supported by their states, were deploying
strategies to increase labour exploitation. And yet such strategies are excluded, empirically and conceptually, from the notion of resilience itself.

3 SUPPLY CHAIN FIRM RESILIENCE - THROUGH CLASS STRUGGLE FROM ABOVE

During the covid pandemic it was reported widely that corporations were using the crisis to ‘restructure’ employment relations at the expense of workers (Wall: 2021). The tendencies towards lead firm concentration, increasing markups for lead firms, declining markups for supplier firms, and an increasing share of income going to capital rather than labour within supply chains, were observed prior to the pandemic (Selwyn and Leyden: 2021). This evidence points to the common interest that lead and supplier firms have in increasing labour exploitation throughout their supply chains, even if most benefits are accrue to the former (Quentin and Campling: 2018). As some lead firms adopt the resilience strategy, it is likely that these dynamics will be reinforced.

These observations are absent from the mainstream resilience literature. This is all the more noteworthy since the first response by many firms and states to the pandemic and to lockdowns was to seek ways in which to increase labour exploitation in key supply chains. They did so through handing state (public) subsidies to big corporations while presiding over dangerous conditions, wage theft, deployment of unfree labour and forced wage labour.

At the height of the covid pandemic in April 2020, US and UK governments pushed through legislation forcing workers to labour in unsafe working conditions, which were also illegal in other sectors of the economy. US president Donald Trump deployed the Defense Protection Act to force meat processing companies to stay open amid fears of shortages. The act, supported by Tyson - the US’s largest meat processing company - reduced companies’ liability to their workers for remaining open and potentially exposing the latter to the Covid-19
virus during the pandemic (Sevastopulo et al; 2020). In the UK, thousands of Eastern European migrant workers were flown in on charter flights to work in the fruit and vegetable sector under the ‘Pick for Britain’ scheme. In a legalised contravention of the then society-wide social-distancing rules, they were housed, up to four per room, in temporary accommodation (Salyga: 2020).

The pandemic has illuminated myriad cases of how GSC firms have deployed outright wage theft, forced labour and have presided over dangerous conditions to maintain their operations. A study of garment workers in Ethiopia, Honduras, India, and Myanmar found sharp declines in working conditions and an 11% average decline in pay. Income loss occurred due to ‘less opportunity for overtime; not being paid the appropriate overtime rate; unfair deductions from wages; unpaid work; late wages; severance pay theft for workers who have been terminated; and unpaid wages for workers who have been temporarily suspended’ (Le Baron et al., 2021, 21). In Bangladesh over a million workers were fired or furloughed by mid-2020, with 72% of them losing pay, as buyers cancelled orders and refused to compensate suppliers (Anner: 2020, 2). According to the Clean Clothes Campaign (2020), garment workers globally had lost approximately $6 billion in unpaid wages by mid-2020.

The provinces of Bac Ninh and Bac Giang, located east of Hanoi, are the centre of Samsung’s operations in northern Vietnam. In early 2020 in the early days of the covid-19 pandemic, Vietnamese electronics exports boomed as the country appeared to have implemented successfully a zero-covid strategy. However, by May 2020 cases began to spike, and worryingly for the government and for exporters, to cluster in industrial districts. In response, the government told manufacturers to either shut down operations, or find ways of maintaining them by isolating workers from the wider population. Samsung Vietnam formulated a “three-on-site,” containment policy, where workers worked, ate,
and slept in the same area. Lam Le reported what this arrangement meant for ‘Nam’:

[Workers] were moved onto the factory’s premises. The lines between their workplace and home evaporated. For nearly three weeks, Nam slept with a blanket on a mattress in a warehouse alongside around 100 other male colleagues, moving between there, the company canteen and the production line in what felt like a twilight of unending work. His life revolved around screens.

Supplier firms used compulsory redundancies to attack trade unionists and workers they considered less productive. As a Bangladeshi worker producing for H&M testified to the Clean Clothes Campaign:

The factory management is very hostile to its workers. Last year, they sacked more than 500 workers in the name of order cancellations. However, most of the sacked workers were elderly like me and were involved with a workers’ union (Clean Clothes Campaign: 2021, 23).

Some companies responded to the skyrocketing demand for PPE (personal protective equipment) during the pandemic by forcing workers to labour. Malaysia and China were two important locations of PPE production, both presiding over increased incidences of forced labour. The majority of the almost-2 billion examination gloves used across (mostly core states) during the first 6 months of the pandemic were sourced from Malaysia. Forced labour is endemic throughout the sector, to the extent that the US Bureau of International Labour
Affairs includes Malaysian rubber gloves in its ‘List of Goods’ produced by child or forced labour. According to the bureau:

‘Forced labour predominately occurs among migrant laborers from Bangladesh, India, Myanmar, and Nepal working in more than 100 rubber glove factories throughout Malaysia. Reports indicate that there are an estimated 42,500 migrant workers employed in the Malaysian rubber glove industry. Workers are frequently subject to high recruitment fees to secure employment that often keeps them in debt bondage; forced to work overtime in excess of the time allowed by Malaysian law; and work in factories where temperatures can reach dangerous levels. Additionally, laborers work under the threat of penalties, which include the withholding of wages, restricted movement, and the withholding of their identification documents.’

The above examples outline how lead and supplier firms have a common interest in increasing labour exploitation throughout their supply chains. However, the former are able to use their overwhelming power to shift the burdens of the pandemic onto supplier firms, which in turn deploy strategies of enhanced labour exploitation. From cancelled orders that result in wage theft and mass unemployment, to lead firms’ structural power which compel suppliers to adopt novel strategies to maintain production – workers and their labour power are maintained as cheap and often expendable ‘factors of production’. These dynamics are empirically and conceptually absent from the resilience literature.

4 DIGITALISATION AND RESILIENCE
Common to all discussions of enhanced supply chain resilience are the purported opportunities and imperatives of digital technology deployment, whether in ‘smart factories’, or through increasingly widespread ‘remote work’ (see below). As president of the European Central Bank Christine Lagarde puts it ‘[g]reater use of digital technology makes it easier to better match jobs with skills across Europe – especially in the face of limited labour mobility’ (ECB Europa: 2020). While Lagarde notes the dangers of rising rates of unemployment generated by the uptake of digital technology (ibid), she portrays such technologies as representing an opportunity to foster sustainable growth across Europe (and by implication, across the world). She does not dwell upon the implications for employed workers’ conditions.

Digital technology provides new opportunities for capital to increase the rate of labour exploitation – by increasing work intensity and the amount of unpaid work - while simultaneously countering labouring classes’ attempts to resist such moves. Giant lead firms are investing heavily in robotisation and automation to achieve these objectives. In the global warehouse sub-sector, for example, the automation market is projected to increase from $15bn in 2019 to $30bn by 2026 (O’Connor: 2021). Amazon is at the forefront of these innovations that seek evermore to subordinate workers to machines. As Sarah O’Connor reports in the Financial Times:

‘Chuck is an autonomous robot trolley which leads a human picker through a warehouse from one shelf to the next. 6 River Systems, which sells or rents the robots to warehouse operators such as DHL, XPO Logistics and Office Depot, says the technology relieves strain on workers because they no longer have to push a trolley around. But Chuck also sets a relentless pace... A 6 River Systems “business case” report says workers who set their own pace “travel
only half as fast as when they follow Chuck [and] their speed without Chuck also fluctuates wildly (O’Connor: 2021).’

The human developmental consequences ever-greater subordination of workers to machines are predictably dire. In a survey of 145 workers at an automated Amazon warehouse on Staten Island, 66% experienced physical pain while working (in their shoulders, hands, back, ankles and knees) and 42% continued to experience pain outside work (NYCOSH: 2019). As Sarah O’Connor notes ‘humans are being crunched into a robot system working at a robot pace’ (O’Connor: 2021).

In addition to its role in enhancing surveillance in ‘traditional’ working environments such as factories, digital technology has been deployed by increasingly powerful platform firms through the so-called gig economy (Srnicek: 2017). The number of digital labour platforms have increased five-fold since 2010 (ILO: 2021). As lead firms intensively focussed upon their ‘core competencies’ they contracted out non-core activities, which are now increasingly undertaken by individualised workers employed through digital labour platforms (Scheiber: 2015). Such platforms have facilitated remote working (often labelled ‘cloud’, ‘crowd’, or ‘micro’ work) for tasks such as translation, data collection and processing, image identification, audio and video transcription, transcription and annotation and content moderation (Berg et al: 2018).

As Simon Joyce (2020) observes, the growth of the gig/platform economy represents a huge expansion of piece-work payment systems. In Capital vol.1 Marx described piece work as ‘the form of wages most in harmony with the capitalist mode of production’ (1990, 697-8) because:
it is naturally the personal interest of the labourer to strain his labour-power [exert maximum effort] as intensely as possible; this enables the capitalist to raise more easily the normal degree of intensity of labour. It is moreover now the personal interest of the labourer to lengthen the working-day, since with it his daily or weekly wages rise (Marx: 1990, 695-96).

As Joyce (2020, 548) notes, contemporary platform work is ‘unadorned by any accretion of legal rights, management accountability or employment and social protection’ and brings ‘no additional benefits. No pension. No training or promotion. No rights. No security. In some countries, not even health care’ (ibid). GSC firms are deploying digital technology by combining piece-rate systems with the most intensive labour surveillance known to capitalism.

Remote work boomed during the Covid-19 pandemic – as increased numbers of ‘white-collar’ workers began working from home. These workers are subject to so-called ‘algorithmic management’ – ‘continuous tracking of workers’ performance, automated decision-making about tasks and evaluations of client feedback’ - whilst undertaking a range of unpaid tasks that are essential to their jobs (Roberts: 2022, 176). Antonio Aloisie and Valerio de Stefano note the proliferation of surveillance technology at the disposal of employers:

‘Activtrack surveils the programs used and tells managers if the employee is distracted, wasting time on social media. HubStaff combines performance anxiety and control freaks, routinely taking snapshots of the personal computer screen every five minutes. TimeDoctor and Teramind keep track of every effort conducted online. Interguard compiles a minute-by-minute timeline that considers every data such as web history and bandwidth utilisation and sends a notification to the managers in
caseworkers pick up anything suspicious. *Interguard* notifies when an employee completes a combination of flagged behaviours. *OccupEye* compulsively records when and for how long someone is away from their workstation.... *Sneek* continuously takes photos of colleagues to generate a timecard and circulates them to keep the team’s mood up. *Afiniti* pairs customers with agents according to demographic data. *Pragli* synchronises professional calendars and music playlists to create a sense of community; it also features a facial recognition feature that could display a worker’s real-world emotion on their virtual avatar’s face.’ (Aloisi and de Stefano: 2021, 11-12).

In England and Wales the numbers of people undertaking work via platforms at least once a week increased between 2016 and 2021 from 5.8% to 14.7% of the working population (TUC: 2021). One platform worker told an ILO investigation: ‘I was introduced to the platform by my son, I use it to earn a little extra on the side as in the UK wages are not enough and with pensions going to be so low I will struggle to survive’ (quoted in Berg et al: 2018, 57).

In the USA, the Harvard Business Review hinted at how digital technology has enhanced capital’s power over labour, whilst generating dynamics of capital concentration:

> [T]he length of the average workday increased by 48.5 minutes during lockdown in the early weeks of the pandemic. In highly productive organizations, employees have capitalized on new technologies to stay connected with customers and co-workers during this time. We estimate that the best organizations have seen productive time increase by 5% or more (Garton and Mankins: 2020).
In addition to enhanced surveillance possibilities for capital over labour, digitally-enabled remote work represents an ‘employer win’ in at least three ways (Haynes: 2021). Unlike factories and traditional workplaces, employers do not have to pay for the buildings in which workers labour. Nor do they have to pay for electricity, water, or in some cases even the equipment that workers require. In the UK during the Covid-19 pandemic, home-workers undertook almost double the amount of unpaid labour (6 hours a week) than those who never work from home (3.6 hours) (Office of National Statistics: 2021). These dynamics have significant gender implications – as women tend to undertake significantly more unpaid labour than men in maintaining the household (Savage: 2021). Importantly, remote workers are more individualised and find it more difficult to engage in collective organisation and action.

5 INTRA-CLASS DYNAMICS OF RESILIENCE
A class-relational approach to supply chain resilience brings to the fore the relations between capital and labour, and also between different firms. Unlike the mainstream literature, it theorises the resilience strategy not as representing the general interest, but rather, the specific interests of already-powerful lead firms to increase their leverage over workers and other units of capital. Such an approach not only reveals another side (we would say the essence) of the resilience strategy, but it also illuminates the limitations to the strategy as a general panacea for GSC firms as a whole. In a World Bank publication, Qiang et al; explicate how the covid-19 crisis is exacerbating capitalism’s inner monopoly tendencies:

COVID-19 could cause a further rise in corporations’ market power because large corporations are in the best position to withstand the
economic downturn and deploy new technologies... In the past three recessions, the share prices of US firms in the top quartile across 10 sectors rose by an average of 6 percent whereas the share prices of those in the bottom quartile fell by 44 percent. The same divergence has been evident since the start of the COVID-19 outbreak (Qiang et al; 2021, 202).

These dynamics are crucial in terms of deciphering the developmental impacts of the resilience strategies adopted by lead firms, upon supplier firms, their workforces, and workers within lead firms. The power disparities between many giant lead firms and their suppliers means that the resilience agenda will likely enhance the power of the former over the latter.

On the surface, mapping supply chains to improve the efficiency of inter-firm interactions and reduce risk makes sense for lead firms. It represents a ramping-up of their governance and surveillance capacity, increasing their panopticonic powers over suppliers. However, it is easier said than done.

In fact, a key dynamic that underpins the GSC world – hyperspecialisation in the context of competitive accumulation between oligopolistic firms - complicates the possibilities of risk-mapping as a comprehensive resilience strategy. Hyperspecialisation has increased the scale and complexity of supply chains. Competitive capital accumulation in the context of widespread digital technology means that complex non-generic knowledge is an ever-more important element in production. Consequently, it is increasingly jealously guarded by firms. The possibilities of sharing of knowledge along chains is limited not just by the complexity of these chains, but also by the fundamentals of capitalist social relations – private property and competitive capital accumulation.
There is also a tension in the feasibility of lead firms conducting supply chain mapping exercises and undertaking new rounds of supplier diversification. Incorporating new suppliers promises to complicate already complex existing supply chains, and renders risk-mapping as a general strategy somewhat myopic. As Elizabeth Braw writes in *Foreign Policy*:

‘[N]o CEO actually knows his or her companies’ complete supply chain.... suppliers are just the first tier of the supply chain. [They] have suppliers of their own, who may, in turn, even have a third layer of suppliers... a multinational company such as Volkswagen has 5,000 suppliers (the so-called tier-one suppliers), each with an average of some 250 tier-two suppliers. That means that the company actually has 1.25 million suppliers—the vast majority of whom it doesn’t know (Braw: 2020).

As Foster and Suwandi note ‘[u]sually, the financial centers and procurement officers in corporations know their first-tier suppliers, but not their second-tier... much less the third- or even fourth-tier suppliers.’ (Foster and Suwandi: 2020, 7). Part of the reason for these limits to informational flows – even though chain governance is meant to reduce such transaction costs – is that firms are unlikely to share this information with each other, as it is a key source of competitive advantage.

In practice, the costs and labour requirements to undertake supply chain mapping and risk assessment are often prohibitively expensive. As Willy C. Shih (2020) notes in the *Harvard Business Review* ‘[e]xecutives of a Japanese semiconductor manufacturer told us that it took a team of 100 people more than a year to map the company’s supply networks deep into the sub-tiers following the earthquake and tsunami in 2011.’
Two consequences flow from this fact. First, because risk-mapping is an expensive, complex and labour-intensive innovation to lead firms’ governance strategies, it can only be successfully undertaken by a minority of well-resourced lead firms. Smaller, less-resourced lead firms will not be able to undertake such risk-mapping exercises, or will do so less effectively. Second, such mapping requires, and generates, the attainment of more and better information by lead firms about their suppliers’ activities. The concentration and ownership of information about activities by and within other firms is part and parcel of the emergence of intellectual monopoly capitalism (Pagano: 2014, Rikap: 2021). Practices imposed by lead firms upon their suppliers, such as requiring the latter to open their books (Miller: 2013) are being used to augment lead firm power and to exert further control throughout the supply chain by, for example, determining from whom and at what prices suppliers source inputs.

So, rather than supply chain mapping representing a general strategy for supply chain resilience, it is perhaps better interpreted as a particular strategy for oligopolistic lead firms to increase further their already unprecedented power over suppliers. To the extent that supply chain mapping becomes an increasing and exclusive core competence of a few lead firms, it is likely to exacerbate the continuing trend of concentration and centralisation in GSCs.

In addition to supply chain mapping, advocates of supply chain resilience recommend that, under certain circumstances, lead firms pursue strategic forms of re-shoring and localisation (engendering a supplier base closer to, if not in the same country as, lead firms) in conjunction with the deployment of new technologies (Phillips et al; 2022). Even prior to the pandemic, and in response to rising wages in China, these strategies were discussed widely by supply chain managers. They were also part and parcel of Donald Trump’s Make America Great promise – to bring back industries that had relocated production to China,
Mexico and other low-wage production zones. Implicit in his promise was that such firms’ restarting of operations in the USA would entail the proliferation of good jobs and working conditions.

Notions of re-shoring were often presented in abstract terms – where such dynamics could combine new technologies with ‘domestic’ workers to enhance competitiveness as compared, for example, to Chinese manufacturing based upon cheap labour and less advanced technologies. So-called ‘smart factories’ represent this potential pathway to reshoring, where digital technology and labour are integrated in novel ways (Kagermann et al; 2013). Smart factories are digitalised manufacturing facilities that use:

connected devices, machinery and production systems to continuously collect and share data. This data is then used to inform decisions to improve processes as well as address any issues that may arise.... Smart factories connect the digital and physical worlds in order to monitor an entire production process, from supply chain management to manufacturing tools and even the work of individual operators on the shop floor (TWI: 2021).

However, the possibilities of reshoring and localisation are often abstracted from the material reality of capitalist production – whether the costs and complexities of building smart factories and establishing supporting labour regimes, or of writing off the massive sunk costs of already-existing infrastructures of the GSC world. For example, China’s emergence as the workshop of the world after its 2001 WTO entry was preceded by more than two decades of infrastructure development and local capital formation.
Much of the reshoring narrative is based upon an assumption that firms (supported by states) in low-wage zones of the world economy will not pursue similar technological upgrading. However, as Florian Buttolo (2021, 265) notes ‘it seems counter intuitive to suggest that a surge of automation would support tendencies towards reshoring given that catch-up automation in emerging economies could also have the effect of lowering unit labour costs of producers if productivity-enhancing automation equipment is deployed.’ Indeed, China has ‘become main buyer of automation equipment since 2013, with a share of 30% of sales in 2016’ (ibid).

Even if re-shoring and the proliferation of smart-factories occurs, the consequences for labour cannot be assumed to be positive, as hinted at in Donald Trump’s Make America Great Again politics. Rather than a re-shoring of many ‘good jobs’, it will very probably be accompanied by, on the one hand, a renewed mix of high-tech relatively good jobs for high-skilled workers, and on the other hand, an expansion of precarious low-wage employment (Buttolo: 2021). In fact, when we look at how digital technologies are being deployed under contemporary GSC capitalism, we get a good picture of what the future may hold for workers in such industries.

6 RESILIENCE AS GEO-POLITICS

Part of the resilience agenda is to highlight the importance of supply chain diversification, especially away from excessive reliance upon Chinese production, often referred to as the ‘plus one’ strategy (Enderwick: 2011). But it is not only GSC academics and commentators who are promoting the notion of resilience. The US state is a major driver of the resilience agenda as part of its intensifying geo-political competition with China. In a speech addressing the USA’s response to the GSC crisis, with implicit continuities to former president Trump’s ‘Make
America Great Again’ economic agenda, President Joe Biden invoked the notion of resilience, arguing that:

The United States needs resilient, diverse, and secure supply chains to ensure our economic prosperity and national security. . . . Resilient American supply chains will revitalize and rebuild domestic manufacturing capacity, maintain America’s competitive edge in research and development, and create well-paying jobs. They will also support small businesses, promote prosperity, advance the fight against climate change, and encourage economic growth in communities of colour and economically distressed areas (The White House: 2021a).

Four months later, The White House published its report entitled ‘Building Resilient Supply Chains, Revitalizing American Manufacturing, and Fostering Broad-Based Growth’ (The White House: 2021b). The report expressed concern that the US economy was potentially vulnerable to supply chain shocks in four key industries – rare earth minerals for telecommunications and other core electronics sectors, semiconductors, active pharmaceutical ingredients and advanced batteries for large-scale utilities and electric vehicles - and proposed a range of measures to enhance supply chain resilience.

The geo-political element of the resilience agenda is often couched in partial (anti-China) or general-interest terms, or both. For example, Panwar et al; (2022, 10) report how the above-noted White House report raises concerns about ‘aggressive industrial development policies of other countries, especially China’. A recent OECD report (Arriola et al; 2020, 11)) highlights China’s increasing dominance of many core materials and intermediate inputs. Consequentially, ‘[s]upply chains characterised by low diversity of suppliers or
buyers can indeed increase the probability of disruption and can magnify the propagation of shocks’. Neither explanation frames the difficulties of maintaining supply chain operations in explicit competitive geo-political terms. But, it is difficult to escape the conclusion that China’s rise is challenging US economic hegemony, including within the world of global supply chains (Rolf: 2021).

The White House report is much more explicit about US geopolitical concerns and objectives. China is mentioned 458 times in its ‘Building resilient supply chains’ report, signifying an increasingly visible geo-political dynamic in the world of global supply chains. For example:

China was estimated to control 55 percent of global rare earths mining capacity in 2020 and 85 percent of rare earths refining. The United States must secure reliable and sustainable supplies of critical minerals and metals to ensure resilience across U.S. manufacturing and defense needs (The White House: 2021b, 6, 9).

Using the time-honoured ideology of upholding free trade principles, the Report notes how:

China stands out for its aggressive use of measures—many of which are well outside globally accepted fair trading practices—to stimulate domestic production and capture global market share in critical supply chains (ibid: 11).

Indeed, the US state openly interprets supply chain resilience in geopolitical terms:
[T]he United States has a strong national interest in U.S. allies and partners improving the resilience of their critical supply chains in face of challenges—such as the COVID-19 pandemic, extreme weather events due to climate change, and geopolitical competition with China—that affect both the United States and our allies (ibid: 12).

The political-economic implications of Biden’s response to the global supply chain crisis is to signal the American state’s willingness and ability to undertake gigantic investments in R&D, infrastructure (sea ports, air ports, highways, and logistics infrastructure including warehouses and transport terminals) and directly in manufacturing. Federal state investments of ‘tax payer’s dollars’ will be dedicated to revamping the foundations of private-capital dominated global supply chains - another huge public subsidy to the private sector. The OECD report noted above (Arriola et al; 2020) also advises states to increase public spending to support private-sector capital accumulation.

But it is not only the US state that deploys the mutual-benefit ideology of free-trade as part of its promotion of supply chain resilience. Gereffi et al; (2022, 65) warn how ‘nationalistic policies that restrict trade and investment flows could have a deleterious impact on companies that operate in the hyperconnected global economy.’ Richard Baldwin and Simon J. Evenett (2020, 2) argue bluntly that ‘in the 21st century, open trade routes and international supply chains are critical to controlling and defeating the pandemic.’ They highlight the dangers of protectionism, and extoll the virtues of the free market in responding to the pandemic whereby ‘a liberal world trading system gives health ministries, hospitals, and other medical service providers a wide range of suppliers to choose from’ (Baldwin and Evenett (2020, 16).
However, these authors obscure how ‘free trade’ regulations restricted covid vaccine distribution to the world’s poor. Although Gereffi et al. (2022, 64) note how policies such as vaccine export controls ‘that give primacy to domestic interests could jeopardize global public health concerns’ (See also Baldwin and Evenett: 2020, 9), they fail to mention, theorise, still less critique, how global trade regulations such as the WTO’s TRIPS agreement contributed to dominant pharmaceutical oligopolies’ ownership of Covid-vaccine patents. As the People’s Vaccine campaign (2022) details, while the latter paid out vast shareholder dividends, they effectively blocked poor countries’ attempts to develop generic vaccines. Making GSC’s more resilient would do nothing to address these fundamental injustices in the global trading architecture.

7 CONCLUSIONS
The mainstream GSC literature promotes resilience as a strategy reflecting the general interest of all lead firms, nations, and their populations. In this commentary we have argued that the notion of resilience is limited – in explanatory and in policy terms - in four ways. First, its advice is pitched as if relevant to all GSC lead firms. In reality, the high costs entailed in enhancing supply chain resilience mean that only a minority of relatively well-resourced lead firms will be able to implement comprehensive forms of resilience upgrading. Second, it ignores how supply-chain mapping represents an agenda and a strategy for increased buyer control over suppliers. Both of these dynamics will, in all likelihood, generate new rounds of concentration and centralisation, as successful lead firms are able to enhance their competitiveness through greater surveillance and control over their suppliers.

Third, the literature obscures the capital-labour dynamics inherent in the resilience agenda. However, ample evidence already suggests that digital...
technologies are being deployed to increase labour exploitation through enhanced productivity under conditions of precarity. The literature also excludes from its notion of resilience capital’s age-old strategy when in trouble – of making workers pay for crises through pay cuts, increased hours, wage-theft and worsened conditions.

Finally, the emergent literature underplays how resilience is interpreted and deployed geopolitically by the US state. The heightened geopolitics associated with, and underpinning, global supply chains means that it is increasingly difficult to claim that resilience represents a general, rather than a specific, interest.

For these reasons, we argue that the resilience strategy will likely contribute to enhanced lead firm control over suppliers, greater concentration amongst GSC firms, and heightened labour exploitation.
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